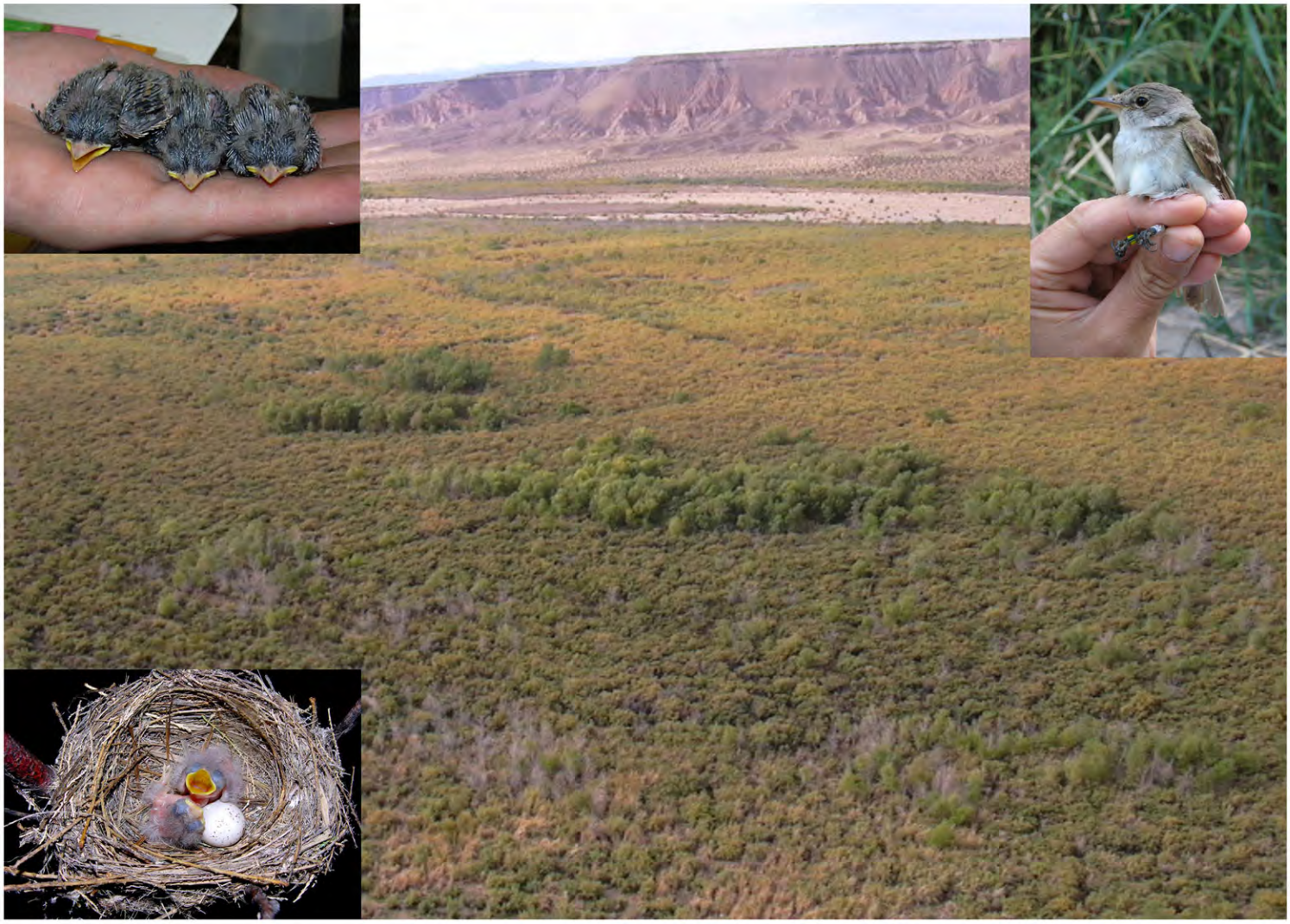
Lower Colorado River Multi-Species Conservation Program

Balancing Resource Use and Conservation

Southwestern Willow Flycatcher Surveys, Demography, and Ecology along the Lower Colorado River and Tributaries, 2012. Annual Report



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Lower Colorado River
Multi-Species Conservation Program

Southwestern Willow Flycatcher Surveys, Demography, and Ecology along the Lower Colorado River and Tributaries, 2012 Annual Report

Prepared by Mary Anne McLeod and Anne Pellegrini,
SWCA Environmental Consultants, Flagstaff, Arizona

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EXECUTIVE SUMMARY

The Southwestern Willow Flycatcher (*Empidonax traillii extimus*), listed as federally endangered in 1995, breeds in dense, mesic riparian habitats at scattered, isolated sites in New Mexico, Arizona, southern California, southern Nevada, southern Utah, southwestern Colorado, and, at least historically, extreme northwestern Mexico. Historical breeding records and museum collections indicate a sizable population of Southwestern Willow Flycatchers may have existed along the extreme southern stretches of the lower Colorado River region. Factors contributing to the decline of flycatchers on the breeding grounds include loss, degradation, and/or fragmentation of riparian habitat; invasion of riparian habitat by nonnative plants; and brood parasitism by Brown-headed Cowbirds (*Molothrus ater*).

Willow flycatcher studies have been conducted along the Virgin and lower Colorado Rivers and tributaries annually since 1996, in compliance with requirements set forth by the U.S. Fish and Wildlife Service (USFWS) regarding U.S. Bureau of Reclamation (Reclamation) routine operations and maintenance along the lower Colorado River. Biological Assessments and the resulting Biological Opinions on operations and maintenance were prepared as steps to developing a Multi-Species Conservation Program (MSCP) for long-term endangered species compliance and management in the historical floodplain of the lower Colorado River (LCR). The LCR MSCP was signed in April 2005, and implementation of the program began in October 2005. The LCR MSCP calls for continued surveys and monitoring of willow flycatchers along the lower Colorado River. SWCA Environmental Consultants (SWCA) was contracted by Reclamation to continue surveys, monitoring, and demographic and ecological studies of the Southwestern Willow Flycatcher in suitable and/or historical riparian and wetland habitats throughout the Virgin and lower Colorado River regions in 2012. We did not gather data on microclimate or vegetation characteristics in occupied habitat in 2012, and all microclimate and vegetation data collected in prior years are compiled and presented in a summary report to be completed in 2012.

Reclamation and USFWS completed a separate consultation on the potential effects to threatened and endangered species from implementation of surplus guidelines through 2016 and an annual change in the point of diversion for up to 400,000 acre-feet of California apportionment water for 75 years. In 2004, Reclamation biologists initiated studies of the microclimate within potentially affected areas. In 2005, these studies were continued and expanded by SWCA to address how the hydrological changes might affect riparian habitats along the Parker to Imperial reach. All data collected for the habitat monitoring study in 2012 are compiled and presented, along with data from all prior years, in a summary report to be completed in 2012.

Following the breeding season of 2008, USFWS and Reclamation initiated discussions regarding the declining number of willow flycatcher territories at Topock Marsh and possible measures to enhance flycatcher habitat at Topock. A plan was developed to pump water into a portion of the flycatcher breeding habitat at Topock. Water delivery commenced 1 March 2011 and continued into July. Baseline conditions of vegetation, microclimate, and hydrology in the target area were documented in 2009 and 2010, and these studies were continued in 2011 to document conditions during the water delivery period. Conditions of microclimate and hydrology were documented in the target area again in 2012. All data collected in 2012 are compiled and presented, along with data from 2009–2011, in a summary report to be completed in 2012.

SWCA was retained by Nevada Department of Wildlife (NDOW) in 2012 to complete flycatcher surveys, site descriptions, nest monitoring and color-banding at Key Pittman Wildlife Management Area, River Ranch, and Warm Springs Natural Area. We also completed surveys for Yellow-billed Cuckoos at these study areas.

Approximately 100 sites are included in the Reclamation study of flycatchers along the Virgin and lower Colorado Rivers, but a portion of the sites are surveyed biennially rather than annually. In 2012, we completed presence/absence surveys, following a 5-survey protocol, and site descriptions at a subset of the 100 sites. At study areas where territorial flycatchers were detected in 2012, we searched for nests in all areas occupied by territorial flycatchers; monitored willow flycatcher nests to document nest fate, brood parasitism, and causes of nest failure; and color-banded and resighted as many willow flycatchers as possible to determine the breeding status of territorial flycatchers and document movement and recruitment.

We used recorded broadcasts of willow flycatcher song and calls to elicit responses from willow flycatchers at 59 Reclamation sites, ranging in size from <1 to 38 ha, along the Virgin and lower Colorado Rivers and tributaries from Pahranagat National Wildlife Refuge (NWR), Nevada, south to Yuma, Arizona between 14 May and 27 July 2012. We detected willow flycatchers on at least one occasion at 38 of these sites. Breeding or resident flycatchers were detected at 11 sites within Pahranagat NWR, Mesquite, Mormon Mesa, and Muddy River, Nevada; and Topock Marsh and Bill Williams River NWR, Arizona, study areas. South of the Bill Williams River, 142 willow flycatcher detections were recorded between 15 May and 15 June; no flycatcher detections were recorded at any of these sites after 15 June. Monitoring results suggest these flycatchers were not resident, breeding individuals and were most likely spring migrants.

We monitored breeding or resident flycatchers within 16 sites and completed broadcast surveys for flycatchers at 3 additional sites and within the three NDOW study areas. We also completed surveys for Yellow-billed Cuckoos at these study areas. No cuckoos were detected during surveys or incidentally.

We used targeted mist-net and passive netting techniques to capture and uniquely color-band adult and fledgling willow flycatchers at all sites where resident willow flycatchers were detected. Nestlings were banded between 8 and 10 days of age. We banded each willow flycatcher with a single, numbered U.S. federal aluminum band on one leg and one pin-striped, aluminum band on the other. We used binoculars to determine the identity of previously color-banded flycatchers by observing, from a distance, the unique color combinations on their legs.

At Reclamation study areas, we color-banded 13 new adult flycatchers and recaptured 8 adults. An additional 38 adults were identified to individual via resighting, while 3 individuals were resighted but did not have their color combinations confirmed. We detected one individual identified as a returning nestling by the presence of a single federal band, but were unable to recapture and identify the individual. One additional adult with a duplicate color combination was detected, but not identified to individual. Thirty adult flycatchers remained unbanded, and banding status was undetermined (i.e., we were unable to determine if these individuals were banded) for 35 adults. We banded 26 nestlings from 12 nests and resighted an additional nine unbanded fledglings from four nests.

At NDOW study areas, we color-banded four new adult flycatchers and recaptured three adults. An additional 33 adults were identified to individual via resighting, while one individual was resighted but did not have its color combination confirmed. One additional adult with a duplicate color combination was detected, but not identified to individual. Three adult flycatchers remained unbanded, and banding status was undetermined for one adult. We banded 19 nestlings from nine nests, captured one unbanded fledgling, and resighted an additional four unbanded fledglings from two nests.

Of the 95 resident, adult willow flycatchers identified to individual at monitored study areas in 2011, 52 (55%) were identified in 2012. Six (12%) were detected at a different study area from where they were last detected in 2011. We detected four within-year, between-study area movements from three individuals in 2012.

Of the 36 juveniles banded and not known or suspected to have died at Reclamation study areas in 2011, 9 (25%) were identified in 2012. An additional 31 juveniles were banded at NDOW study areas and not known or suspected to have died in 2011; 6 (19%) were identified in 2012. A total of 21 individuals originally banded as nestlings in previous years were identified for the first time in 2012. Of the 21 returning nestlings identified in 2012, 9 (43%) dispersed away from their natal study area. The median dispersal distance for all returning juvenile flycatchers in 2012 was 1.9 km.

We recorded 51 territories at all Reclamation study areas. Of these, 36 (71%) consisted of paired flycatchers, 1 (2%) consisted of paired individuals with no documented breeding activity, and 14 (27%) consisted of unpaired individuals. Ten breeding males were polygynous, one pairing with four females and nine pairing with two females. One female mated consecutively with two different males. Two males moved and established a second territory within the same study area. We recorded 24 territories at NDOW study areas. Of these, 17 (71%) consisted of breeding individuals, 1 (4%) consisted of a pair for which no nest could be found, and 6 (25%) consisted of unpaired males. One male was polygynous with two females.

At Reclamation study areas, we documented 46 willow flycatcher nesting attempts, 38 of which contained eggs and were used in calculating nest success and productivity. Sixteen (42%) nests were successful and fledged young; and 22 (58%) failed. Mayfield survival probability ranged from 0.003 to 0.709, and was 0.396 for all sites combined (except Bill Williams, where Mayfield nest success could not be calculated due to a lack of data). Depredation was the major cause of nest failure, accounting for 43% of all failed nests and 59% of nests that failed after flycatcher eggs were laid.

We documented 34 flycatcher nesting attempts at NDOW study areas; 29 of these were known to contain flycatcher eggs and were used in calculating nest success and productivity. Of nests known to contain flycatcher eggs, 11 (38%) were successful and fledged young, and 18 (62%) failed. Depredation accounted for the majority (65%) of all nest failures and 72% of nests that failed after flycatcher eggs were laid. Mayfield survival probability was 0.375 at Key Pittman and 0.010 at Warm Springs; no breeding flycatchers were detected at River Ranch.

At Reclamation study areas, 5 of 34 nests (15%) with flycatcher eggs and known contents were brood parasitized by Brown-headed Cowbirds. Brood parasitism at Reclamation study areas ranged from 0 to 80% and was highest at Mesquite. At NDOW study areas, 5 of 27 nests (19%) with flycatcher eggs and known contents were brood parasitized. Brood parasitism was 20% at Key Pittman and 0% at Warm Springs. We addled cowbird eggs via vigorous shaking at all easily accessible flycatcher nests. None of the cowbird eggs we addled hatched, and the addling program reduced the hatch rate of cowbird eggs in 2010–2012 to 11%, compared to the 74% hatch rate observed at Reclamation study areas in 2003–2009. Small sample size precludes a meaningful comparison of productivity for parasitized nests in which cowbird eggs have been addled versus other parasitized nests, but monitoring data from 2003–2009 show that parasitized nests in which the cowbird egg failed to hatch produced, on average, more flycatcher fledglings than parasitized nests that also contained a cowbird nestling.

Chapter 1

INTRODUCTION

SPECIES INTRODUCTION

The Southwestern Willow Flycatcher (*Empidonax traillii extimus*) is one of four subspecies of willow flycatcher currently recognized (Unitt 1987), although Browning (1993) posits a fifth subspecies (*E. t. campestris*) occurring in the central portions of the United States (Figure 1.1). The Southwestern Willow Flycatcher breeds in dense, mesic riparian habitats at scattered, isolated sites in New Mexico, Arizona, southern California, southern Nevada, southern Utah, southwestern Colorado, and, at least historically, extreme northwestern Mexico and western Texas (Unitt 1987).

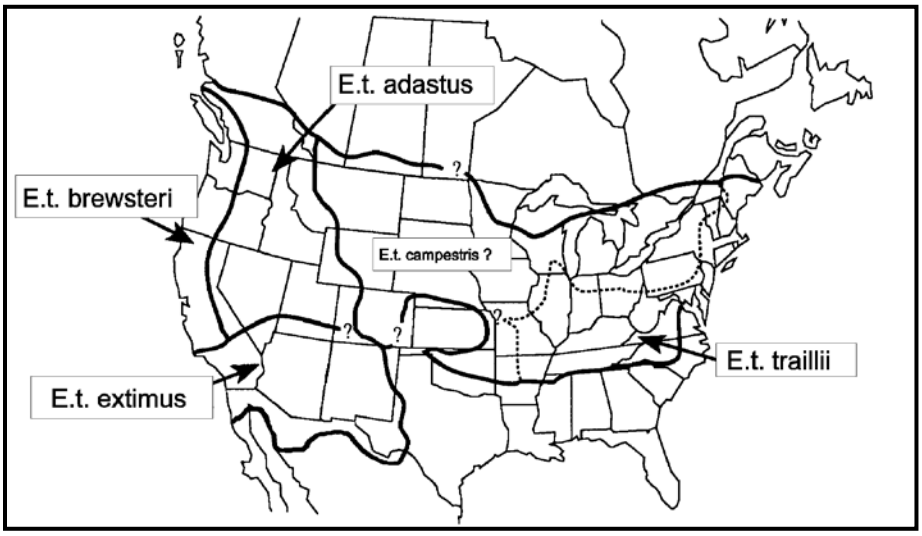

Figure 1.1. Breeding range distribution of the subspecies of the willow flycatcher (*Empidonax traillii*). Adapted from Unitt (1987), Browning (1993), and Sogge et al. (1997).

In the Southwest, most willow flycatcher breeding territories are found within small breeding sites containing five or fewer territories (Durst et al. 2006). One of the last long-distance Neotropical migrants to arrive in North America in spring, Southwestern Willow Flycatchers have a short, approximately 100-day breeding season, with individuals typically arriving in May or June and departing in August (Sogge et al. 1997). All four subspecies of willow flycatchers spend the non-breeding season in portions of southern Mexico, Central America, and northwestern South America (Stiles and Skutch 1989, Ridgely and Tudor 1994, Howell and Webb 1995, Unitt 1997), with wintering ground habitat similar to the breeding grounds (Lynn et al. 2003). Willow flycatchers have been recorded on the wintering grounds from central Mexico to southern Central America as early as mid-August (Stiles and Skutch 1989, Howell and Webb 1995), and wintering, resident individuals have been recorded in southern Central America as late as the end of May (Koronkiewicz et al. 2006b).

Historical breeding records and museum collections indicate that a sizable population of Southwestern Willow Flycatchers may have existed along the extreme southern stretches of the lower Colorado River (LCR) region (Unitt 1987). However, no nests have been located south of the Bill Williams River,

Arizona, in over 65 years (Unitt 1987), though northbound and southbound migrant willow flycatchers use the riparian corridor (Phillips et al. 1964; Brown et al. 1987; McKernan and Braden 2002; McLeod et al. 2008a; McLeod and Koronkiewicz 2009, 2010; McLeod and Pellegrini 2011, 2012; this document). Factors contributing to the decline of flycatchers on the breeding grounds include loss, degradation, and/or fragmentation of riparian habitat; invasion of riparian habitat by nonnative plants; and brood parasitism by Brown-headed Cowbirds (USFWS 1995, Marshall and Stoleson 2000). Because of low population numbers range-wide, identifying and conserving willow flycatcher breeding sites is thought to be crucial to the recovery of the species (USFWS 2002).

Tamarisk beetles (*Diorhabda* spp.) may pose an additional threat to Southwestern Willow Flycatchers. Tamarisk beetles defoliate tamarisk (*Tamarix* spp.) plants during flycatcher breeding season, likely exposing flycatcher nests to adverse microclimate conditions and increased risk of depredation and parasitism. Tamarisk beetles were released in St. George, Utah, in 2006, and widespread defoliation was first observed in St. George in 2008. The area of defoliation on the Virgin River has expanded downstream annually since then, encompassing Littlefield, Arizona, in 2009; the Highway 170 bridge downstream of Bunkerville, Nevada, in 2010; and the entire stretch of the Virgin River to Lake Mead by the end of the breeding season in 2011. Tamarisk beetles continued spreading downstream on the LCR in 2012 and by the end of the 2012 breeding season were found as far downstream as the lower end of Lake Mohave (T. Dudley, University of California Santa Barbara, pers. comm.).

PROJECT HISTORY

In 1995, the U.S. Bureau of Reclamation (Reclamation), other federal, state, and tribal agencies, and environmental and recreational interests agreed to form a partnership to develop and implement a Multi-Species Conservation Program (MSCP) for long-term endangered species compliance and management in the historical floodplain of the LCR. As a step to developing the LCR MSCP, Reclamation prepared a Biological Assessment (BA) in August 1996, evaluating the effects of dam operations and maintenance activities on threatened, endangered, and sensitive (TES) species. These species included the Southwestern Willow Flycatcher, which was listed by the U.S. Fish and Wildlife Service (USFWS) as endangered in 1995 (60 FR 10694–10715). In response to the BA, the USFWS issued a Biological Opinion (BO) in April 1997 outlining several terms and conditions Reclamation must implement in order not to jeopardize the species. Among these terms and conditions was the requirement to survey and monitor occupied and potential habitat for Southwestern Willow Flycatchers along the LCR for a period of five years. The studies were intended to determine the number of willow flycatcher territories, status of breeding pairs, flycatcher nest success, the biotic and abiotic characteristics of occupied willow flycatcher sites, and Brown-headed Cowbird (*Molothrus ater*) brood parasitism rates. In 2002, Reclamation reinitiated consultation with USFWS on the effects of continued dam operations and maintenance on TES species along the LCR. The USFWS responded with a BO in April 2002 requiring continued Southwestern Willow Flycatcher studies along the LCR through April 2005. The BO also required implementation of a study to evaluate the effectiveness of Brown-headed Cowbird trapping for conservation of the flycatcher.

Reclamation and USFWS completed a separate consultation on the potential effects to threatened and endangered species from implementation of surplus guidelines through 2016 and an annual change in the point of diversion for up to 400,000 acre-feet for 75 years. A Biological Opinion for Interim Surplus Criteria, Secretarial Implementation Agreements, and Conservation Measures was issued in January 2001 and required monitoring of 150.5 ha of existing, occupied Southwestern Willow Flycatcher habitat between Parker and Imperial Dams.

The LCR MSCP is a 50-year program that seeks to protect 26 TES species and their habitats along the LCR while maintaining river regulation and water management required by law. The LCR MSCP was approved in April 2005 with the signing of a Record of Decision by the Secretary of the Department of the Interior, and implementation of the program began in October 2005. Documentation for the LCR MSCP includes a Habitat Conservation Plan (HCP), BA/BO, and an Environmental Impact Statement. The HCP specifies monitoring and research measures that call for surveys and research to better define habitat requirements for the Southwestern Willow Flycatcher and studies to determine the effects of cowbird nest parasitism on flycatcher reproduction.

Reclamation initiated willow flycatcher studies along the LCR in 1996, in anticipation of the requirements outlined in the BOs that were part of LCR MSCP development. These studies have been conducted annually since 1996. From 1997 to 2011,[1] breeding populations of Southwestern Willow Flycatchers were documented at eight study areas along the Virgin and lower Colorado Rivers and tributaries: (1) Pahranagat National Wildlife Refuge (NWR), Nevada; (2) Beaver Dam Wash at Littlefield, Arizona; (3) Mesquite and (4) Mormon Mesa on the Virgin River, Nevada; (5) Overton Wildlife Management Area (WMA) along the Muddy River, Nevada; (6) Grand Canyon, Arizona; (7) Topock Marsh on the Colorado River, Havasu NWR, Arizona; and (8) Bill Williams River NWR (Bill Williams), Arizona (McLeod et al. 2008a; McLeod and Koronkiewicz 2009, 2010; McLeod and Pellegrini 2011, 2012; Braden and McKernan unpubl. data). From 1997 to 2011, willow flycatchers, including two banded migrant Southwestern Willow Flycatchers (Koronkiewicz et al. 2006a, McLeod and Pellegrini 2012), were detected during the breeding season at several sites along the Colorado River south of the Bill Williams River to the Mexico border, but no nesting activity was confirmed.

In compliance with the consultation on Interim Surplus Criteria and Secretarial Implementation Agreements, Reclamation biologists deployed temperature/humidity data loggers in 2004 at a subset of sites currently monitored for Southwestern Willow Flycatcher along the Colorado River in California and Arizona. These studies were expanded the following year to include annual monitoring of groundwater levels, vegetation, and soil moisture in addition to temperature and humidity, and have been completed annually since 2005.

Following the breeding season of 2008, USFWS and Reclamation initiated discussions regarding the declining number of willow flycatcher territories at Topock Marsh in 2004–2008, the importance of the flycatcher population in the Topock area to flycatcher conservation along the LCR, and possible measures to enhance flycatcher habitat at Topock. A plan was developed to pump water into a portion of the flycatcher breeding habitat at Topock beginning in February or March and continuing into the flycatcher breeding season. The selected area at Topock had seen the greatest decline in numbers of resident flycatchers but had not experienced any dramatic changes in vegetation. Water delivery was anticipated to commence in 2010, and monitoring of vegetation, microclimate, and hydrologic condition in the target area was initiated in 2009 to obtain baseline conditions in the target area. Water delivery was delayed until 2011, so additional monitoring of baseline conditions occurred in 2010. Water delivery was initiated in March 2011, and conditions within the target area were monitored during the 2011 breeding season.

PURPOSE AND DESCRIPTION OF STUDY

The purpose of the 2012 study is to continue surveys, monitoring, and demographic and ecological studies of the Southwestern Willow Flycatcher in suitable and/or historical riparian and wetland habitats throughout the lower Colorado and Virgin River region. Lower Grand Canyon was not monitored in 2009–2012 because the declining level of Lake Mead dramatically reduced the amount of potential

[1] Studies in 1996 did not include any sites in Nevada.

flycatcher habitat, and the formation of rapids at Pearce Ferry and Iceberg Canyon made access difficult and dangerous. However, Lower Grand Canyon below Pearce Ferry was visited once in July 2012 for habitat reconnaissance. This project encompasses four types of studies: (1) presence/absence surveys, including site descriptions, at preselected sites along the lower Colorado River and portions of major tributaries; (2) intensive studies at all study areas where breeding flycatchers are located to assess Southwestern Willow Flycatcher demographics and ecology, habitat selection, and the effects of Brown-headed Cowbird brood parasitism; (3) monitoring of microclimate, vegetation, and groundwater conditions of currently occupied[2] Southwestern Willow Flycatcher habitat between Parker and Imperial Dams; and (4) monitoring microclimate, vegetation, and surface hydrology in a selected portion of flycatcher habitat within Topock Marsh to document the effects of habitat enhancement efforts. SWCA's contract specifies the following field tasks:

Presence/absence Surveys. At approximately 100 sites along the LCR, conduct presence/absence surveys, following a 5-survey protocol (per USFWS 2000).

Site Descriptions. Provide a general site description for each site, including major types of vegetation and hydrological conditions, at least three times during the survey period.

Nest Monitoring. Search for nests in all areas occupied by territorial flycatchers, and monitor all nests to determine nest fate, brood parasitism, and causes of nest failure.

Banding. Band as many adult and juvenile flycatchers as possible at sites with territorial flycatchers.

Vegetation, Soils, and Microclimate. Collect vegetation, soil, and microclimate data at the within-territory level at breeding locations in order to quantify conditions at flycatcher territories for replication at restoration areas. Data collection for this task was completed in 2011. A complete analysis of the vegetation, soil, and microclimate data can be found in SWCA's summary report (McLeod and Pellegrini, report in preparation).

Habitat Monitoring. At 15 previously identified sites, monitor vegetation, microclimate, and groundwater conditions to determine how these may be affected by water transfer actions at Parker Dam. Data collection for this task continued in 2012, and a complete analysis of data collected in 2005–2012 can be found in SWCA's summary report (McLeod and Pellegrini, report in preparation).

Surface Hydrology, Vegetation, and Microclimate Monitoring. Within a selected portion of Topock Marsh, monitor surface hydrology, microclimate, and vegetation conditions. Data collection for this task continued in 2012, and a complete analysis of data collected in 2009–2012 can be found in SWCA's summary report (McLeod and Pellegrini, report in preparation).

Each distinct aspect of the 2012 study that is not identified above as being addressed only in the summary report is addressed in a separate chapter in this report, as follows:

Chapter 2 – Presence/absence Surveys and Site Descriptions. This chapter presents the methodology and results for presence/absence surveys and gives a general site description for each survey site.

Chapter 3 – Color-banding and Resighting. Details of banding activities and resighting of previously banded flycatchers are presented in this chapter. Also included are discussions of within- and between-year movement of individual flycatchers.

[2] As per Reclamation (1999), we defined occupied Southwestern Willow Flycatcher habitat as patches of vegetation that are similar to and contiguous with areas where willow flycatchers were detected after 15 June in any year, 1996–2012.

Chapter 4 – Nest Monitoring. This chapter summarizes nesting attempts, nest fates, and productivity for all Southwestern Willow Flycatcher nesting activity.

Chapter 5 – Management and Study Design Recommendations. Recommendations from all previous report chapters are summarized for ease of reference.

RELATED STUDIES

Prior to 2010, Nevada Department of Wildlife (NDOW) completed nest monitoring at Key Pittman WMA, and SWCA Environmental Consultants (SWCA) banded flycatcher nestlings and adults opportunistically in cooperation with the monitoring efforts. In 2010, NDOW retained SWCA to conduct surveys, site descriptions, nest monitoring, and banding at flycatcher breeding areas at Key Pittman WMA and Warm Springs Natural Area. This work was expanded in 2011 to include River Ranch in the Pahranagat Valley, and SWCA again completed flycatcher monitoring, as well as surveys for Yellow-billed Cuckoo (*Coccyzus americanus occidentalis*) at all three study areas in 2012. Results of surveys, site descriptions, nest monitoring, and banding efforts at Key Pittman, River Ranch, and Warm Springs are presented in Chapters 2, 3, and 4.

Utah Division of Wildlife Resources has monitored breeding flycatchers annually in St. George, Utah, from 2008 through 2012. In 2008–2011, SWCA banded adults and nestlings opportunistically in St. George in cooperation with the monitoring efforts. Resights from 2012 of banded flycatchers in St. George are presented in a separate table in Chapter 3.

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Chapter 2

PRESENCE/ABSENCE SURVEYS AND SITE DESCRIPTIONS

INTRODUCTION

Broadcasts of recorded conspecific vocalizations are useful in eliciting responses from nearby willow flycatchers, and multiple broadcast surveys conducted throughout the breeding season are the standard technique for determining the presence or absence of *E. t. extimus* (Sogge et al. 2010). According to Sogge et al. (2010) and USFWS (2002), willow flycatchers detected between approximately 15 June and 20 July in the breeding range of *E. t. extimus* probably belong to the southwestern subspecies. However, because northbound individuals of all western subspecies of the willow flycatcher migrate through areas where *E. t. extimus* are actively nesting, and southbound migrants occur where *E. t. extimus* are still breeding (Sogge et al. 2010, USFWS 2002), field confirmation of the southwestern subspecies is problematic.[3] For example, the northwestern *E. t. brewsteri*, far more numerous than *E. t. extimus*, has been documented migrating north in southern California as late as 20 June (Garrett and Dunn 1981 as cited in Unitt 1987), and Phillips et al. (1964 as cited in Unitt 1987) documented *E. t. brewsteri* collected in southern Arizona on 23 June. An understanding of willow flycatcher migration ecology in combination with multiple broadcast surveys conducted throughout the breeding season is therefore needed to assess the presence and residency of Southwestern Willow Flycatchers.

Migration routes used by *E. t. extimus* are not well documented, though more is known of northbound migration in spring than the southbound migration in fall because flycatchers are more vocal in spring and can therefore be distinguished from other *Empidonax* species. During northbound migration, all subspecies of willow flycatchers use riparian habitats similar to breeding habitat along major river drainages in the Southwest such as the Rio Grande (Finch and Kelly 1999), Colorado River (McKernan and Braden 1999), San Juan River (Johnson and Sogge 1997), and the Green River (M. Johnson unpubl. data). Although migrating willow flycatchers may favor young, native willow habitats (Yong and Finch 1997), migrants are also found in both spring and fall in a variety of habitats that are unsuitable for breeding. These migration stopover habitats, even though not used for breeding, are likely important for both reproduction and survival. For most long-distance Neotropical migrant passerines, migration stopover habitats are needed to replenish energy reserves to continue northbound or southbound migration.

In 2012, as part of our contract with Reclamation, we completed multiple broadcast surveys at sites in 12 study areas[4] (hereafter Reclamation study areas) along the LCR and its tributaries to detect both migrant and resident willow flycatchers (Figure 2.1). We also completed surveys in three additional study areas (Key Pittman, River Ranch, and Warm Springs; hereafter NDOW study areas) as part of our contract with NDOW.

Special Concern Species

The Yuma Clapper Rail (*Rallus longirostris yumanensis*) is listed as federally endangered by the USFWS, and the Yellow-billed Cuckoo is a candidate for federal listing. Both species occur along the LCR and its tributaries and are of concern to managing agencies. Nine additional avian species [California Black Rail (*Laterallus jamaicensis coturniculus*), Least Bittern (*Ixobrychus exilis*), Elf Owl (*Micrathene whitneyi*),

[3] Throughout this document, the terms "flycatcher" and "willow flycatcher" refer to *E. t. extimus* when individuals are confirmed as residents. For individuals for which residency is undetermined, subspecies is unknown.

[4] Study areas consist of 1–18 survey sites that are grouped geographically (see Table 2.2).

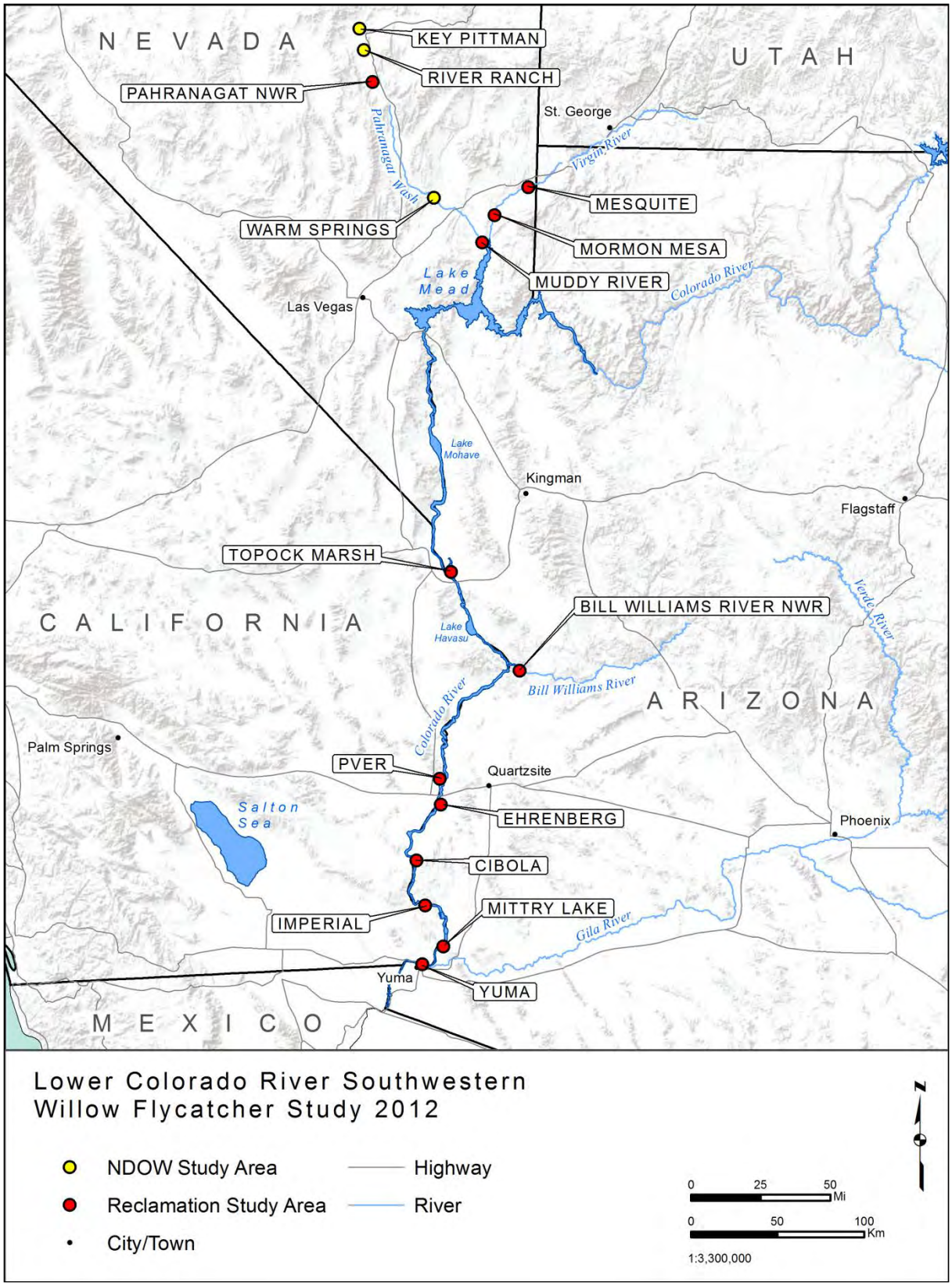

Figure 2.1. Locations of Southwestern Willow Flycatcher study areas along the lower Colorado River and tributaries, 2012. (Note, study area labels represent the approximate center of multiple sites within that region; see Table 2.2.)

Gila Woodpecker (*Melanerpes uropygialis*), Gilded Flicker (*Colaptes chrysoides chrysoides*), Vermilion Flycatcher (*Pyrocephalus rubinus*), Arizona Bell's Vireo (*Vireo bellii arizonae*), Sonoran Yellow Warbler (*Dendroica petechia sonorana*), and Summer Tanager (*Piranga rubra*)] are considered to be special-concern species under the LCR MSCP. The Yellow-breasted Chat (*Icteria virens*) is also considered a special concern species in California. We did not survey specifically for these species at the 12 Reclamation study areas but recorded all incidental detections. We recorded all incidental detections of special concern species at all three NDOW study areas and completed surveys for Yellow-billed Cuckoos at Key Pittman, River Ranch, and Warm Springs.

METHODS

Site Selection

Survey sites were selected based on locations surveyed during previous years of willow flycatcher studies on the LCR (McKernan 1997; McKernan and Braden 1998, 1999, 2001a, 2001b, 2002; McLeod et al. 2008a; McLeod and Koronkiewicz 2009, 2010; McLeod and Pellegrini 2011, 2012) and reconnaissance on foot during the 2012 survey period. Sites consisting of mature native or exotic woody riparian vegetation with high canopy closure (>50%) and standing water or saturated soil under or adjacent to the vegetation were considered the most suitable habitats for flycatchers. Early successional stands of young riparian vegetation >3 m in height in proximity to surface water or saturated soil were also considered potentially suitable flycatcher habitat. Riparian vegetation contiguous with suitable habitat was often included as part of survey areas. Reclamation biologist Chris Dodge guided and approved site selection at the 12 Reclamation study areas. For sites surveyed in previous years, we retained original site names.

In 2008 we implemented a biennial survey schedule (Table 2.1) at selected sites in study areas where resident flycatchers had not been documented in the previous 10 years of surveys. Sites were selected for biennial surveys based on the absence of damp or wet soils within the site and/or the relative absence of dense vegetation that might provide suitable nesting habitat for flycatchers. After the 2008 survey season, we revised the survey schedule based on conditions observed in the field and added several sites at Bill Williams to the biennial schedule. These sites were ones at which no resident flycatchers had been detected since 2003. Two sites (Three Fingers Lake and Mittry South) that were schedule for surveys in 2012 burned to the ground during 2011 and were removed from the schedule.

Table 2.1. Proposed Survey Schedule for Selected Sites

Study Area[1]	Site	Habitat Comments	Proposed Survey Schedule		
			Annual	2008, 2010, 2012	2009, 2011
TOGO[2]	Pulpit Rock	Tiny. Wet soil adjacent to river; upland edge dry.			X
	Blankenship Bend North	Stand of willow adjacent to marsh.	X		
	Blankenship Bend South	Mosaic of cattail, bulrush, willow. Areas with water under vegetation.	X		
	Havasu NE	Mature vegetation; interior of site is completely dry, no water beneath the vegetation.		X	

Table 2.1. Proposed Survey Schedule for Selected Sites (Continued)

Study Area[1]	Site	Habitat Comments	Proposed Survey Schedule		
			Annual	2008, 2010, 2012	2009, 2011
BIWI	Site #1	Mixed-native vegetation; dry soils and stands of dense arrowweed in the center of the site; coyote willow and surface water along the site edge, bordering an arm of Lake Havasu.		X	
	Site #2[2]	Mature mixed-native vegetation; dry soils and extensive deadfall within the site; bordered by an arm of Lake Havasu.		X	
	Site #11[2]	Mature mixed-native vegetation; dry soils and extensive deadfall within the site; bordered by an arm of Lake Havasu.		X	
	Black Rail	Mixed-native vegetation; generally sparse understory; narrow strip of dense vegetation.		X	
	Mineral Wash	Mixed-native vegetation; sparse canopy closure; dry soil underneath the vegetation; water only within river channels.		X	
	Beaver Pond	Mixed-native vegetation; sparse canopy closure; dry soil underneath the vegetation; water only within river channels.		X	
	Site #8[2]	Mixed-native vegetation; sparse canopy closure; dry soil underneath the vegetation; water only within the river channel.		X	
PVER	PVER Phase 2	Restoration area.	X		
	PVER Phase 3	Restoration area.	X		
EHRE	Ehrenberg	Emergent cottonwood and Goodding willow; understory primarily arrowweed and *Baccharis* sp.; formerly contained a dense stand of coyote willow but these willows have died.		X	
CIBO	CVCA Phase 1	Restoration area.	X		
	CVCA Phase 2	Restoration area.	X		
	CVCA Phase 3	Restoration area.	X		
	Cibola Nature Trail	Generally dry and sparse. Restoration area; habitat improvements taking place, may improve.	X		
	Cibola Site 2	No dense canopy. Mostly tamarisk with some emergent willow. Cattail marshes in parts of the site, but dry soil under the tamarisk.			X
	Cibola Site 1	No dense canopy. Mostly tamarisk with some emergent willow. Cattail marshes in parts of the site, but dry soil under the tamarisk.			X
	Cibola Lake #1 (North)	Patchy vegetation, hot and dry in interior.		X	
	Cibola Lake #2 (East)	Patchy vegetation, hot and dry in interior.			X
	Cibola Lake #3 (West)	Patchy vegetation, hot and dry in interior.		X	
	Walker Lake	Tamarisk with emergent willows; water under vegetation along lake edge.	X		
IMPE	Paradise	Some big willows with tamarisk understory, sometimes has water in marshes.	X		
	Hoge Ranch	Mosaic of tamarisk, willow, and marshes. Sometimes wet.	X		
	Adobe Lake	Perched above river, very dry; dense tamarisk with many dead branches in understory.		X	
	Rattlesnake	Dense willows, wet soils.	X		

Table 2.1. Proposed Survey Schedule for Selected Sites (Continued)

Study Area[1]	Site	Habitat Comments	Proposed Survey Schedule		
			Annual	2008, 2010, 2012	2009, 2011
IMPE	Milemarker 65	Very narrow strip (<50m) of tamarisk adjacent to bulrush marsh. Understory of *Phragmites* creates extremely dense vegetation within 3 m of ground.			X
	Clear Lake/The Alley	Mature tamarisk, very dense understory. Very dry except immediately next to backwater channel.		X	
	Nursery NW	Dense tamarisk interspersed with marsh areas.	X		
	Imperial Nursery	Plantation. No understory.		X	
	Ferguson Lake	Mix of willow and tamarisk with water under vegetation on west side of site. East side dry and scrubby.	X		
	Ferguson Wash	Mature tamarisk with emergent willow. Very dry in interior of site. Borders backwater channel and Ferguson Lake. Moist soils only along channel edge.		X	
	Great Blue Heron	Goodding willow overstory, tamarisk understory; moist soils in parts of the site.	X		
	Powerline	Very small. Stringer of trees around cattail marsh that sometimes contains water. Sparse canopy.			X
	Martinez Lake	Scattered willows, tamarisk and arrowweed understory, sparse canopy closure.			X
MITT	Mittry West	Willow overstory, tamarisk understory, 80% canopy closure; sometimes wet.	X		
YUMA	Gila Confluence North	Patchy. A few small stands of mature willows around cattail marshes. Marshes sometimes contain water. Half of site burned in 2006. Overall canopy closure 50%.		X	
	Gila River Site #2	Cottonwood/willow overstory, tamarisk and arrowweed understory; dry soils in interior; canopy closure 50%.			X
	Fortuna Site #1	Narrow (30m) strip of cottonwood/willow. Patchy understory of tamarisk and arrowweed on periphery, no understory within cottonwood/willow. Interior dry.			X
	Fortuna North	Mature tamarisk, 80% canopy closure. Interior very dry. Adjacent to Gila River.			X

[1] TOGO = Topock Gorge, BIWI = Bill Williams River NWR, PVER = Palo Verde Ecological Reserve, EHRE = Ehrenberg, CIBO = Cibola, IMPE = Imperial, MITT = Mittry Lake, YUMA = Yuma.

[2] No surveys were completed in Topock Gorge or in Bill Williams River NWR Site #2, Site #11, and Site #8 in 2012 because effort was redirected to hydrology monitoring at Topock Marsh.

We provided field personnel with high-resolution aerial photographs of all selected survey sites. The photographs were overlain with a UTM grid (NAD 83) and an outline of the proposed survey area. The boundaries of all survey sites were refined to include potential flycatcher habitat actually present. New boundaries were delineated on the aerial photographs based on UTM coordinates obtained in the field. All UTM coordinates were obtained using a Garmin Rino 110 GPS unit and were in NAD 83 to comply with Federal Geographic Data Committee standards.

Additional Site Evaluation

During the survey season, we conducted on-the-ground habitat reconnaissance and evaluation to locate additional potentially suitable willow flycatcher habitat and to reevaluate areas we had visited in previous years and had noted as having the potential to become suitable habitat. Field personnel were provided

high-resolution aerial photographs overlain with a UTM grid to aide with navigation and the identification of potentially suitable flycatcher habitat. We focused habitat reconnaissance and evaluation in areas that contained or were adjacent to standing water or saturated soils, and that had vegetation characteristics similar to that of flycatcher breeding sites (i.e., dense vegetation within 2–4 m of the ground and high canopy closure). Broadcast surveys were conducted opportunistically during ground reconnaissance. Field personnel formulated qualitative site descriptions of all evaluated areas.

Broadcast Surveys

To elicit responses from nearby willow flycatchers, we broadcast conspecific vocalizations previously recorded throughout the Southwest from 1996 to 1998. All flycatcher surveys were conducted according to methods described in Sogge et al. (2010), and we followed a 5-survey protocol, as recommended by the U.S. Fish and Wildlife Service (USFWS 2000). The 5-survey protocol specified in the project contract calls for one survey between 15 and 31 May, at least one survey between 1 and 15 June, and three additional surveys between 16 June and 25 July. Surveys were separated by a minimum of five days whenever logistically possible. Field personnel surveyed within the habitat wherever possible, using a Sansa® ClipMP3 player coupled to a Radio Shack 277-1008C mini amplified speaker. Surveyors stopped every 30–40 m and broadcast willow flycatcher primary song (*fitz-bew*) and calls (*breets*). Field personnel watched for flycatchers and listened for vocal responses for approximately one to two minutes before proceeding to the next survey station. Wherever territorial flycatchers were detected, we discontinued broadcast surveys within a radius of 50 m of territories and commenced territory and nest monitoring, which involves more frequent visits (see Chapter 4). If an unidentified *Empidonax* flycatcher was observed but did not respond with song to the initial broadcast, we broadcast other conspecific vocalizations including *creets/breets*, *wee-oos*, *whitts*, *churr/kitters*, and a set of interaction calls given by a mated pair of flycatchers (per Lynn et al. 2003). These calls are frequently effective in eliciting a *fitz-bew* song, thereby enabling surveyors to positively identify willow flycatchers. To produce a spatial representation of all survey areas, field personnel recorded survey start and stop UTM coordinates as well as the UTM coordinates of intermediate survey points. Observers recorded start and stop times and the location(s) and behavior of all willow flycatchers detected (see survey form, Appendix A). Field personnel also recorded the presence of Brown-headed Cowbirds (hereafter cowbirds) and livestock, as requested by the Arizona Game and Fish Department. Cowbirds may affect flycatcher populations by decreasing flycatcher productivity (see Chapter 4), while livestock may substantially alter the vegetation in an area (USFWS 2002).

Site Description

Because vegetation structure and hydrology within riparian habitats are seasonally dynamic, field personnel completed site description forms (Appendix A) for each survey site at least three times throughout the survey season: early season (mid-May), mid-season (mid-June), and late season (mid-July). Vegetation composition (native vs. exotic) at survey sites followed the definitions of Sogge et al. (2010) and the Southwestern Willow Flycatcher Range-wide Database. Vegetation composition was defined as (1) native: >90% of the vegetation at a site was native; (2) exotic: >90% of the vegetation at a site was exotic/introduced; (3) mixed-native: 50 to 90% of the vegetation at a site was native; or (4) mixed-exotic: 50 to 90% of the vegetation at a site was exotic/introduced. Information from site description forms was used in conjunction with habitat photographs and comments in field notebooks and on survey forms to formulate qualitative site descriptions.

RESULTS

Reclamation Study Areas

Field personnel spent 442.0 observer-hours conducting willow flycatcher broadcast surveys at 59 sites along the Virgin and lower Colorado Rivers and tributaries.[5] Willow flycatcher survey and monitoring results are summarized in Table 2.2 and are presented below along with site descriptions. No flycatchers were detected after 15 June in sites where residency or breeding was not confirmed. Details of occupancy, pairing, color-banding, and breeding are presented in Chapters 3 and 4. The boundaries of survey sites and occupancy in 2012 are shown on orthophotos in Appendix B, along with historically occupied habitat.[6] We did not complete surveys at sites in Topock Gorge; Bill Williams River NWR Site #2, Site #11, Last Gasp, and Site #8; or Topock Marsh Pig Hole and Barbed Wire because effort was redirected toward hydrology monitoring within Topock Marsh. Each site that was not occupied by territorial flycatchers was formally surveyed four to six times. A summary of willow flycatcher survey effort and survey site occupancy status is presented in Appendix C. Field personnel spent an additional 26.9 observer-hours completing habitat reconnaissance and evaluation and opportunistic surveys. The results of reconnaissance for each study area are presented below following the results for the regularly surveyed sites. Yellow-billed Cuckoo and Yuma Clapper Rail detections are listed in Tables 2.3 and 2.4, respectively, and overall numbers of detections of all special concern species are listed in Appendix D. Hydrologic characteristics of each site are summarized in Table 2.5.

Table 2.2. Adult Willow Flycatcher Detections at Reclamation Study Areas, 2012*

Study Area[1]	Survey Site	Area (ha)	Number Detected (Date(s) of Detection)[2,3,4,5]
PAHR	North	4.6	22 (17 May–6 Aug)
	West	1.5	ND
MESQ	Hafen Lane	5.2	1 (29 May)
	Dumb Luck Bridge[6]	1.2	2 (18 Jun–3 Jul)
	West	10.6	6 (19 May–18 Jul), 1 (29 May–3 Jun), 1 (19–21 Jun), 1 (21 Jun), 1 (12–15 Jul)
	Left Foot[7]	1.1	1 (24–27 May), 2 (27 May)
MOME	Mormon Mesa South	11.8	1 (26 May)
	Virgin River #1	21.5	24 (13 May–30 Jul), 1 (15–21 May), 1 (1 Jun & 18 Jul), 1 (3 Jun), 1 (26 Jul)
	Virgin River #2[8]	11.2	ND
MUDD	Overton WMA Pond	0.7	5 (27 May), 1 (4 Jun–3 Jul)
	Overton WMA	9.2	12 (13 May–19 Jul), 1 (31 May)

[5] We started the survey season with 55 sites scheduled for surveys in 2012. Four sites were added after reconnaissance revealed potential flycatcher habitat. Surveys were discontinued at one site because of poor quality habitat.

[6] As per Reclamation (1999), we defined occupied Southwestern Willow Flycatcher habitat as patches of vegetation that are similar to and contiguous with areas where willow flycatchers were detected after 15 June.

Table 2.2. Adult Willow Flycatcher Detections at Reclamation Study Areas, 2012* (Continued)

Study Area[1]	Survey Site	Area (ha)	Number Detected (Date(s) of Detection)[2,3,4,5]
TOPO	Pipes #1	5.2	ND
	Pipes #3	5.7	1 (8–18 May)[9], 1 (24 May)
	The Wallows	0.7	2 (24–26 May)
	PC6-1	4.8	ND
	In Between	7.7	ND
	800M	4.7	ND
	Pierced Egg	6.7	1 (14 May), 1 (26–27 Jun)
	Swine Paradise	0.7	2 (9 Jun)
	Platform	1.9	ND
	250M	1.9	ND
	Hell Bird	6.3	2 (7 Jun)
	Glory Hole	5.0	1 (16–28 May)
	Beal Lake	18.0	1 (23 May–9 Jul)[9], 1 (23 May), 1 (1 Jun), 1 (3 Jul)
	Lost Lake	3.3	ND
	Marshside[10]		2 (18 May)
BIWI	Wispy Willow	0.9	1 (19 May), 1 (20 May), 1 (23 May), 2 (27 May), 1 (29 May), 2 (6 Jun), 2 (12 Jun), 1 (12–14 Jun)
	Site #1	3.0	1 (29 May–16 Jun), 1 (29 May), 2 (6 Jun), 1 (6–8 Jun), 1 (8 Jun), 1 (14 Jun), 1 (14–16 Jun), 1 (20 Jun), 1 (26–28 Jun), 1 (4 Jul)
	Burn Edge	4.1	1 (21 May)
	Site #4	9.9	1 (6–8 Jun), 1 (18 Jun)
	Site #3	13.0	3 (15 May–19 Jun)
	Guinness	3.4	1 (19 May)
	Site #5	6.8	ND
	Black Rail	1.2	ND
	Cougar Point	1.3	ND
	Mineral Wash	18.8	ND
	Beaver Pond	21.7	ND
	Upstream from Site #8	1.5	ND
	Planet Ranch Road	3.3	ND
PVER	PVER Phase 2	21.4	4 (24 May), 1 (12 Jun)
	PVER Phase 3	21.4	5 (24 May)
EHRE	Ehrenberg	4.7	ND
CIBO	CVCA Phase 1	26.2	6 (23 May), 11 (6 Jun)
	CVCA Phase 2	25.5	2 (23 May), 8 (6 Jun)
	CVCA Phase 3	38.4	1 (13 Jun)
	Cibola Nature Trail	13.7	3 (23 May), 1 (13 Jun)
	Cibola Lake #1 (North)	8.9	1 (14 Jun)
	Cibola Lake #3 (West)	6.8	2 (29 May), 2 (14 Jun)
	Walker Lake	11.4	ND

Table 2.2. Adult Willow Flycatcher Detections at Reclamation Study Areas, 2012* (Continued)

Study Area[1]	Survey Site	Area (ha)	Number Detected (Date(s) of Detection)[2,3,4,5]
IMPE	Paradise	7.8	5 (16 May)
	Hoge Ranch	20.7	4 (30 May), 1 (15 Jun)
	Adobe Lake	7.5	1 (30 May)
	Rattlesnake	7.6	ND
	Clear Lake	8.3	5 (22 May), 3 (3 Jun)
	Nursery NW	7.0	7 (18 May), 1 (1 Jun)
	Imperial Nursery	1.4	ND
	Ferguson Lake	21.1	28 (19 May), 16 (5 Jun)
	Ferguson Wash	6.8	10 (19 May), 3 (5 Jun)
	Great Blue Heron	7.0	ND
MITT	Mittry West	4.4	3 (6 Jun)
YUMA	Gila Confluence North	2.2	6 (17 May), 2 (2 Jun)

* This table includes only sites where regular surveys were scheduled or where flycatcher were detected and does not include sites where habitat reconnaissance or opportunistic surveys were conducted and no flycatchers were detected.

[1] PAHR = Pahranagat NWR, MESQ = Mesquite, MOME = Mormon Mesa, MUDD = Muddy River, TOPO = Topock Marsh, BIWI = Bill Williams River NWR, PVER = Palo Verde Ecological Reserve, CIBO = Cibola, IMPE = Imperial, MITT = Mittry Lake, YUMA = Yuma.

[2] ND = No willow flycatchers were detected.

[3] See Chapter 3 for details on territories, residency, pairing, and color-banding; see Chapter 4 for details on nesting activity.

[4] Flycatchers in territories that were occupied throughout the breeding season are shown as being present throughout the season. Flycatchers detected on a single occasion or for a short period of time are listed separately.

[5] We detected several within-season movements between study areas in 2012. For details on movements see Table 3.9.

[6] Site discovered with breeding flycatchers in the middle of the survey season.

[7] Site surveyed at beginning of season for reconnaissance. Not added to formal survey list due to unsuitable habitat.

[8] Surveys discontinued because of poor quality habitat.

[9] This individual was detected 8–18 May in Pipes #3 and 23 May–9 July in Beal Lake. While in Pipes #3, this individual was also detected in The Wallows and 800M within a single day.

[10] Not an official survey site. Incidental detections recorded.

Table 2.3. Yellow-billed Cuckoo Detections at Reclamation Study Areas, 2012

Study Area[1]	Site	Date	Behavioral Observations
PAHR	North	21 Jun	One individual heard (primary song)
MOME	Mormon Mesa South (South)	18 Jun	One individual heard
TOPO	Pipes #3	13 Jul	One individual heard
TOGO	Havasu NE	31 Jul	One individual heard
BIWI	Site #5	2 Jul	One individual heard
		14 Jul	One individual heard
PVER	Phase 2	12 Jul	Two individuals heard
	Phase 3	12 Jul	One individual heard
CIBO	CVCA Phase 1	4 Jul	One individual heard
	CVCA Phase 2	10 Jul	Two individuals heard
	Cibola Nature Trail	19 Jul	One individual heard
IMPE	Imperial Nursery	2 Jul	One individual seen

[1] PAHR = Pahranagat NWR, MOME = Mormon Mesa, TOPO = Topock Marsh, TOGO = Topock Gorge, BIWI = Bill Williams River NWR, PVER = Palo Verde Ecological Reserve, CIBO = Cibola, IMPE = Imperial.

Table 2.4. Yuma Clapper Rail Detections at Reclamation Study Areas, 2012

Study Area[1]	Site	Date(s)	Behavioral Observations
TOPO	Lost Lake	7 Jul	One individual heard
BIWI	Wispy Willow	21 Jul	One individual heard
	Planet Ranch Rd	22 Jul	One individual heard
IMPE	Ferguson Lake	5 Jun	Two pairs, clattering

[1] TOPO = Topock Marsh, BIWI = Bill Williams River NWR, IMPE = Imperial.

Table 2.5. Summary of Hydrologic Conditions at Each Survey Site at Reclamation Study Areas, 2012*

Study Area[1]	Survey Site	% Site Inundated[2]	Depth (cm) of Surface Water[2]	% Site with Saturated Soil[2,3]	Distance (m) to Surface Water or Saturated Soil[2]
PAHR	North[4]	15/--/<1	20/--/20	15/--/4	0/--/0
	West[4]	0/0/0	0/0/0	0/0/0	8/15/10
MESQ	Hafen Lane[4]	35/1/1	20/3/10	5/1/1	0/0/0
	West[4]	20/1/2	15/10/10	1/1/<1	0/0/0
	Dumb Luck Bridge[5]	--/15/--	--/20/--	--/5/--	--/0/--
MOME	Mormon Mesa South	0/0/0	--/0/0	--/0/0	40/40/40
	Virgin River #1	15/12/4	10/10/4	5/8/1	0/0/0
	Virgin River #2[4]	0/0/--	0/0/--	0/0/--	0/0/--
MUDD	Overton WMA Pond	5/5/3	10/20/5	0/10/0	0/0/0
	Overton WMA	3/1/3	40/40/40	5/2/5	0/0/0
TOPO	Pipes #1	0/0/0	0/0/0	0/0/0	40/40/40
	Pipes #3	15/1[6]/1[6]	10/5/5	20/5/5	0/0/0
	The Wallows	20/1/20	30/5/15	2/10/1	0/0/0
	PC6-1	15/2/20	10/10/10	10/10/5	0/0/0
	In Between	1/0/5	5/0/5	1/0/2	0/45/0
	800M	15/0/5	8/0/10	50/0/5	0/70/0
	Pierced Egg	5/2/1[6]	10/10/5	1/15/1	0/0/0
	Swine Paradise[7]	0/5/5	0/10/10	0/1/1	10/0/0
	Platform[7]	1/0/5	5/0/15	1/0/1	0/20/0
	250M[7]	0/0/0	0/0/0	0/0/0	0/0/0
	Hell Bird[7]	25/30/85	50/40/50	10/10/2	0/0/0
	Glory Hole	25/35/25	50/70/50	1/1/10	0/0/0
	Beal Lake[8]	50/1/2	10/5/5	15/0/2	0/0/0
	Lost Lake[7]	3/2/0	10/5/0	--/1/0	0/0/5
BIWI	Wispy Willow[4]	35/15/80	10/10/20	5/15/10	0/0/0
	Site #1[4,5]	--/25/80	--/<5/20	--/1/15	--/0/0
	Burn Edge	3/1/5	15/10/30	2/0/2	0/0/0
	Site #4[4]	8/5/10	50/50/60	2/0/1	0/0/0
	Site #3	15/0/0	10/0/0	2/0/0	0/250/250

Table 2.5. Summary of Hydrologic Conditions at Each Survey Site at Reclamation Study Areas, 2012* (Continued)

Study Area[1]	Survey Site	% Site Inundated[2]	Depth (cm) of Surface Water[2]	% Site with Saturated Soil[2,3]	Distance (m) to Surface Water or Saturated Soil[2]
BIWI	Guinness	20/2/1	70/35/20	5/2/1	0/0/0
	Site #5	3/2/2	10/--/50	<1/0/0	0/0/0
	Black Rail	10/0/0	<5/0/0	80/0/0	0/660/660
	Cougar Point	10/10/15	30/30/15	3/3/5	0/0/0
	Mineral Wash[4]	8/5/5	60/60/60	5/5/5	0/0/0
	Beaver Pond[4]	10/10/10	60/40/50	3/5/3	0/0/0
	Upstream from Site #8[5,7]	--/5/2	--/10/<5	--/2/5	--/0/0
	Planet Ranch Road[9]	--/--/--	--/--/--	--/--/--	--/--/--
PVER	PVER Phase 2[8]	30/0/0	15/0/0	<5/0/0	0/20/20
	PVER Phase 3[8]	0/0/0	0/0/0	0/0/0	20/20/20
EHRE	Ehrenberg	10/0/0	5/0/0	3/5/10	0/0/0
CIBO	CVCA Phase 1[8]	30/0/0	10/0/0	0/0/0	0/10/10
	CVCA Phase 2[8]	<1/0/0	5/0/0	<1/0/0	0/10/10
	CVCA Phase 3[8]	20/0/0	10/0/0	25/0/0	0/400/400
	Cibola Nature Trail[8]	1/0/0	5/0/0	0/0/0	0/5/5
	Cibola Lake #1 (North)[4]	<1/<1/2	3/3/3	0/0/3	0/0/0
	Cibola Lake #3 (West)[4]	0/<1/1	0/5/5	3/1/3	0/0/0
	Walker Lake[4]	5/<1/10	5/3/60	3/10/--	0/0/0
IMPE	Paradise[4]	20/--/5	20/--/10	5/--/5	0/--/0
	Hoge Ranch[4]	10/20/5	15/40/10	3/8/8	0/0/0
	Adobe Lake[4]	--/--/--	--/--/--	--/--/--	0/0/0
	Rattlesnake[7]	0/3/0	0/3/0	0/5/0	160/0/160
	Clear Lake[4]	0/3/15	0/10/10	0/1/40	5/0/0
	Nursery NW[7]	--/--/--	--/--/--	--/--/--	0/0/0
	Imperial Nursery[8]	0/0/0	0/0/0	0/0/0	15/15/15
	Ferguson Lake[4]	0/3/5	0/10/10	4/1/4	0/0/0
	Ferguson Wash[4]	0/0/3	0/0/--	0/0/1	0/0/0
	Great Blue Heron[7]	0/0/1	0/0/10	0/0/0	100/100/0
MITT	Mittry West	15/<1/0	5/1/0	10/5/10	0/0/0
YUMA	Gila Confluence North[4]	0/0/0	0/0/0	0/0/0	5/5/5

[*] Values are given for each site as recorded in mid-May, mid-June, and mid-July.

[1] PAHR = Pahranagat NWR, MESQ = Mesquite, MOME = Mormon Mesa, MUDD = Muddy River, TOPO = Topock Marsh, BIWI = Bill Williams River NWR, PVER = Palo Verde Ecological Reserve, CIBO = Cibola, IMPE = Imperial, MITT = Mittry Lake, YUMA = Yuma.

[2] -- = Hydrologic information not recorded.

[3] Percent of site with saturated soil does not include inundated areas.

[4] Site bordered by a river, lake, or pond.

[5] Site not visited until mid-June.

[6] Saturated soil or water was present only in pig wallows.

[7] Site borders marsh.

[8] Site is irrigated as part of restoration efforts; amount of standing water highly variable throughout survey season.

[9] Due to property access issues, the site was surveyed from the periphery.

Pahranagat National Wildlife Refuge, Nevada

Pahranagat National Wildlife Refuge consists of a series of lakes and marshes in Pahranagat Valley approximately 150 km north of Las Vegas, Nevada. Patches of primarily native vegetation exist at the inflow and outflow of Upper Pahranagat Lake and along the lakeshore. Prior to the 2008 survey season, the majority of the riparian vegetation along the north side of the upper lake (Pahranagat North) was inundated annually with up to 1 m of water, with the highest water levels occurring in May. Major structural problems with the dam that impounds the upper lake resulted in the upper lake being drained in early 2008, and the riparian vegetation at the north end of the lake was not flooded during the 2008 or 2009 breeding seasons. The dam was repaired prior to the 2010 breeding season. Lake levels in 2010–2012 were higher than they had been before dam repair, but not as high as they had been before 2008.

PAHRANAGAT NORTH

Area: 4.6 ha Elevation: 1,026 m

Pahranagat North is a stand of large-diameter Goodding willow (*Salix gooddingii*) at the inflow of Upper Pahranagat Lake. Fremont cottonwood (*Populus fremontii*; hereafter cottonwood) lines the northern, upland edge of the site and extends in narrow stringers around the edge of the lakebed. Canopy height within the patch is around 20 m. Canopy closure varies from approximately 80% at the center of the site to approximately 50% along the site exterior. Many of the large trees in the northeastern section of the site are dead or dying. Additional scattered cottonwood trees have fallen throughout the site creating multiple small clearings. A dense understory of Indian hemp (*Apocynum cannabinum*) up to 2 m in height was present throughout the site. Standing water was present throughout the season in an inflow channel that runs along the northern side of the site and drains into the lakebed at the southeastern corner of the site. Standing water and saturated soils were also present in May within the southern half of the site. The site slowly dried out during the survey season, with no water or saturated soils present by the middle of July except in the inflow channel.

We detected 20 breeding willow flycatchers and two resident, unpaired males. The site lies immediately adjacent to a cattle pasture, and a lack of fencing coupled with low lake levels allowed cattle to access the site periodically throughout the breeding season. We surveyed the unoccupied eastern arm of the site five times, totaling 1.8 observer-hours. No cowbirds were detected.

PAHRANAGAT WEST

Area: 1.5 ha Elevation: 1,026 m

This native site consists of a stringer of cottonwood, one to three trees wide and 20 m in height, on the western edge of Upper Pahranagat Lake. The site has no significant understory vegetation, and canopy closure varies from <50 to 80%. The eastern edge of the site is vegetated with bulrush (*Schoenoplectus californicus*), which extends into the lakebed to the east. The western edge of the site is vegetated in yerba mansa (*Anemopsis californica*) extending into dry, upland desert. During the survey season, the interior of the site was dry, but surface water was present adjacent to the site in the lakebed.

We detected no willow flycatchers. We surveyed the site five times, totaling 3.0 observer-hours. Cowbirds were detected on two visits, and there was no sign of livestock use.

GROUND RECONNAISSANCE RESULTS

Pahranagat South

The majority of this site was affected by a fire prior to the start of the 2010 survey season. The fire removed all understory vegetation and charred the trunks and lower branches of the overstory trees. The site now consists of a stringer of cottonwood, 20 m tall, along a human-made channel that carries the outflow from Upper Pahranagat Lake. The understory contains Indian hemp and some small patches of coyote willow (*Salix exigua*) 3 m in height. Canopy closure within the cottonwood stringer is approximately 50%. The channel held water during the site visit in May; surrounding soils were dry. While suitable understory components are now present, they are not currently of sufficient size to resemble typical occupied willow flycatcher habitat. We recommend reassessing this site in future years. We surveyed the site once, totaling 0.8 observer-hours. No willow flycatchers were detected.

Littlefield, Arizona

In recent years, our survey and monitoring activities focused on Beaver Dam Wash near the Highway 91 Bridge. In December 2010, a flood scoured much of the area, and we evaluated the site (Littlefield Poles) at the beginning of the 2012 season for suitability.

GROUND RECONNAISSANCE RESULTS

Littlefield Poles

The site consists of primarily native vegetation and is located on Beaver Dam Wash, immediately upstream of the Highway 91 Bridge. In December 2010, the area experienced a flood that scoured much of the wash. Sediment deposits from the flood changed the hydrology within the site significantly. Vegetation along the northern edge of the site consists of a scattered overstory of cottonwood averaging 25 m in height. The southern portion of the site consists of stands of coyote willow and young Goodding willow and cottonwood approximately 5 m in height, with roughly 25% canopy closure. No surface water was present in May or June, and the nearest water was Beaver Dam Wash, which was restricted to a channel about 40 m from the site. We surveyed the site once, totaling 0.5 observer-hours. No willow flycatchers were detected. Because of the lack of surface water within the site and the low canopy closure, this site does not currently resemble typical occupied flycatcher breeding habitat. We recommend reassessing the site at the beginning of future breeding seasons.

Pioneer Road

We re-evaluated an area on Beaver Dam Wash approximately 1.2 km upstream of Littlefield Poles. Vegetation is native and consists of cottonwood up to 15 m in height and coyote willow 3–5 m in height. Canopy closure ranged from 70–90 %. Soils were dry to damp throughout the site during our visit. The nearest surface water was Beaver Dam Wash which surfaced adjacent a portion of southern edge of the site. We surveyed the site once, totaling 2.25 observer-hours. No willow flycatchers were detected. Because of the lack of surface water within the site, this site does not currently resemble typical occupied flycatcher breeding habitat. We recommend reassessing this site if flood events occur that have the potential to alter the hydrology within the site.

Mesquite, Nevada

The Mesquite study area is in the floodplain of the Virgin River near Mesquite and Bunkerville, Nevada.

HAFEN LANE

Area: 5.2 ha Elevation: 475 m

This mixed-exotic site lies within the floodplain of the Virgin River in Mesquite, Nevada, between Hafen Lane and the active river channel. Two drainage ditches that pass underneath Hafen Lane flow into the site; the eastern inflow supports a dense stand of 12-m-tall Goodding willow, with some coyote willow 5 m in height in the understory. The western inflow supports a stringer of coyote willow 5–6 m in height and scattered Goodding willow 12–15 m in height, with 70–80% canopy closure. A few cottonwood up to 25 m in height are scattered along both drainage ditches. Between the stringers, the site is vegetated by 6-m-tall tamarisk with 45–65% canopy closure. Water was documented on all three visits within the drainage ditches. Tamarisk beetles and heavily defoliated tamarisk were noted at the site starting in late May.

We detected one willow flycatcher for which residency could not be determined. We surveyed the site five times for a total of 17.3 observer-hours. Cowbirds were detected on four surveys, and no sign of livestock use was observed.

DUMB LUCK BRIDGE

Area: 1.2 ha Elevation: 475 m

This mixed-native site lies within the floodplain of the Virgin River in Mesquite, Nevada, immediately upstream from the Riverside Bridge. The active channel of the Virgin River is approximately 100 m north of the site. Vegetation on the terrace adjacent to the southern boundary of the site burned between 2008 and 2010 and has not yet recovered. The site is dominated by 6-m-tall coyote willow with 70–90 % canopy closure. Clumps of emergent Goodding willow 20 m in height are scattered throughout the site. Some tamarisk is present throughout the site, but is most abundant along the site edges. A few emergent cottonwoods are present along the northern edge of the western side of the site. An old road bisects the site north to south, and a drainage ditch from an irrigation canal flows into an area of dense coyote and Goodding willow just east of the road. During our site visits in June and July, water fanned out from this drainage ditch and created an area of very wet soils and standing water. Soils in the remainder of the site were very dry and sandy.

We detected two breeding flycatchers. Portions of the site not known to be occupied were surveyed twice, totaling 2.3 observer hours. Cowbirds were detected on both surveys. No signs of livestock were noted.

MESQUITE WEST

Area: 10.6 ha Elevation: 470 m

This mixed-native site lies within the floodplain of the Virgin River in Mesquite, Nevada. Golf courses and housing developments border the site to the north, and the Virgin River borders the site to the south. This large site is primarily a mosaic of cattail (*Typha* spp.) and bulrush marshes separated by narrow (40–50 m) strips of dense coyote willow with interspersed tamarisk. The coyote willows are generally 5–6 m in height, and canopy closure varies from 30 to >90%. The eastern portion of the site is primarily coyote willow, while the western portion contains a mix of willow and tamarisk. Several small areas of dead coyote willow are present in the eastern portion, and canopy closure in these areas is as low as 30%. Overall canopy closure in the eastern third of the site is notably lower than it has been in previous years at

around 60%. Hydrology at the site is influenced by irrigation return flows and by human manipulation of the channel that carries the return flows. In June 2011, the channel was dredged, resulting in all return flows bypassing the site. The site remained dry until April 2012, when a berm was constructed in the channel to direct flow into the northeastern corner of the site. The site was intermittently inundated throughout the survey season. When standing water was noted, it only reached a portion of the area inundated in previous years. Tamarisk beetles and defoliated tamarisk were noted within the site in mid-May, and the tamarisk partially refoliated beginning in early July.

We detected five breeding willow flycatchers and one resident, unpaired male. We detected four additional willow flycatchers for which residency and breeding status could not be confirmed. Areas of Mesquite West not known to be occupied by flycatchers were surveyed five times, totaling 16.8 observer-hours. Cowbirds were detected on all surveys. Some signs of cattle were observed throughout the site but were concentrated near the river.

GROUND RECONNAISSANCE RESULTS

Backyard

This mixed-native site lies on the northern side of the Virgin River floodplain approximately 6.5 km upstream from the Riverside Bridge in Mesquite, Nevada. The site is a 40-m-wide and 150-m-long band of dense native vegetation consisting of 6–8-m-tall coyote willow, 10–14-m-tall Goodding willow, and 14-m-tall cottonwood. Tamarisk 4-6 m in height surrounds the band of native vegetation and is also present in the understory. Canopy closure reaches 80–90% within the coyote willow. Patches of dead cattail were present within the band of native vegetation. Soils were dry and sandy, and no water was present during our visit in May. Heavy tamarisk defoliation was noted during the visit as well. Due to the lack of standing water, this site does not currently resemble typical occupied flycatcher breeding habitat. We recommend reassessing this site at the beginning of future breeding seasons to determine if the hydrology has changed.

Ball Park

This mixed-exotic site lies on the northern side of the Virgin River floodplain approximately 200 m upstream from Hafen Lane. It is bordered by a park and housing developments to the north and the active floodplain to the south. The site is dominated by 6-m-tall tamarisk, with an emergent overstory of 12–15-m-tall Goodding willow and some 18–20-m-tall cottonwoods scattered throughout the site. Several small (20 m x 20 m) patches of coyote willow 3–6 m in height with 75–85% canopy closure are scattered throughout the site. Canopy closure throughout the rest of the site averaged 60%, sometimes dropping below 50%. Dense patches of 2-m-tall cattail are also present in the understory. No water was observed in the site during our visit in May. Heavy defoliation by tamarisk beetles was also noted during this visit. Most of the vegetation is not dense enough to be considered suitable flycatcher habitat. The coyote willow patches would be considered suitable if they covered a larger area. This site also does not currently resemble typical occupied flycatcher breeding habitat due to the lack of standing water. We recommend reassessing this site at the beginning of future breeding seasons to determine if the hydrology has changed and if the extent of the coyote willow has increased.

Up the Creek

This native site lies within the floodplain of the Virgin River in Mesquite, Nevada, approximately 1 km upstream from the Riverside Bridge. The site is bordered by the Virgin River to the north and upland desert to the south. This site is a mosaic of patches of coyote and Goodding willow approximately 4 m in height, with 70–90% canopy closure and areas of 20-m-tall cottonwood with sandy soils and sparse

understory vegetation. Patches of tamarisk and arrowweed (*Pluchea sericea*) occur between the patches of native trees. An outflow channel from an irrigation canal bisects the site and flows into the Virgin River. Water was present during visits in June and July, but was restricted to this channel. We surveyed the site twice, totaling 4.0 observer hours. No willow flycatchers were detected. Because of the lack of surface water within the site, the majority this site does not currently resemble typical occupied flycatcher breeding habitat. The coyote willow are also currently shorter than what is typically found in occupied habitat. We recommend reassessing the site at the beginning of future breeding seasons to determine if the hydrology has changed or the coyote willow have grown in height and extent.

Electric Avenue Pond

This native site is located on the south side of the Virgin River floodplain near Bunkerville, Nevada, approximately 2 km downstream from Mesquite West. It is bordered to the north by a stand of cottonwood and tamarisk and to the south by agricultural fields. The site consists of a cattail marsh ringed by a narrow strip (< 5 m wide) of coyote willow 2–3 m in height. Overall canopy closure is < 25%. A dense patch of coyote willow, 20 m in diameter and 3–4 m in height, is present on the eastern end of the site where water enters the marsh from an irrigation canal. The entire site was wet during our visit in May. Vegetation in the site is currently too short and limited in extent to be suitable for willow flycatchers. We recommend reassessing the site at the beginning of future breeding seasons to determine if the coyote willow has matured to a more suitable height and extent.

Boomerang

This mixed-exotic site lies within the floodplain of the Virgin River near Bunkerville, Nevada, approximately 3 km downstream of Mesquite West, and is part of the proposed Bennell Wetlands restoration. It is bordered by a pond to the northwest and a wet meadow complex to the east. The northern third of the site consists of tamarisk 3–4 m in height and patches of arrowweed. This portion of the site is perched approximately 1 m above the pond, and soils within this portion of the site were dry during our visits. To the south of this tamarisk area is an open meadow that bisects the site from northeast to southwest. This meadow was wet during our site visit in May but dry in June. South of the meadow, the western half of the site consists of an open mix of tamarisk, arrowweed, and screwbean mesquite (*Prosopis pubescens*) with approximately 30% canopy closure. The southeastern portion of the site consists of a stand of tamarisk 4–6 m in height with 80% canopy cover. This tamarisk stand has a few openings vegetated by sedges (*Carex* sp.) and scattered, spindly clumps of 2-m-tall coyote willow. These openings were wet during our visits in both May and June. Heavy defoliation of the tamarisk within the site was noted by early June. We surveyed the site twice for a total of 1.5 observer hours. No willow flycatchers were detected, and cowbirds were detected on both visits. The majority of the vegetation within this site is too short or open to be considered suitable willow flycatcher habitat, and water at the site is confined to open meadows and does not extent into the woody vegetation. We do not recommend visiting this site in the future unless restoration activities increase the density of native vegetation.

Bunker Marsh North

This mixed-exotic site lies within the Virgin River floodplain near Bunkerville, Nevada, approximately 4 km downstream of Mesquite West. The site is between agricultural fields to the southeast and the Virgin River to the northwest. Breeding flycatchers were present on the northern edge of the site in 2009, but the coyote willows that were present in the former breeding area have since died. The northern edge of the site was also scoured by a flood in December 2010. The site is dominated by tamarisk 4–6 m in height. In the southern portion of the site, the vegetation forms an open mosaic of tamarisk and scattered Goodding willows 10–12 m in height, with an average canopy closure of 25–50%. One small patch of coyote willow 4–5 m in height occurs in the middle of the site near the western boundary. Canopy closure is highest in

the middle of the site, averaging 70–90 %. Beetle larvae and heavy defoliation were noted in the northern portion of the site in late May. The site borders the river, but a cutbank 1–2 m high prevents water access from the river into the site. During our visit, signs of cattle were present within the site and were most prevalent along the western edge. The site was completely dry and thus does not resemble typical occupied flycatcher habitat. Additionally, the vegetation at the site consists primarily of tamarisk, which is unsuitable for flycatchers when it is defoliated. We do not recommend visiting this site in future years.

Left Foot

This mixed-exotic site lies within the Virgin River floodplain, approximately 7 km downstream of the Bunkerville Bridge, between the Virgin River to the southeast and desert upland to the northwest. The vegetation is composed primarily of a mosaic of 1.5–2-m-tall arrowweed and 2–3-m-tall tamarisk, with pockets of 4–6-m-tall screwbean mesquite. Canopy cover is <25% throughout the site. Soils were dry and sandy throughout the site on all our visits. We detected one willow flycatcher on 24 May during the initial site evaluation and two additional flycatchers on the follow-up visit on 27 May. None of these flycatchers engaged in unsolicited song or other territorial behaviors, and no flycatchers were detected on three subsequent territory monitoring visits. We surveyed the site three times, totaling 2.6 observer hours. No willow flycatchers were detected during surveys. Cowbirds were detected during all three surveys, and signs of cattle were noted throughout the site on all visits. Beetle larvae and heavy defoliation were noted beginning in late May. Vegetation within the site is too short and open to be considered suitable habitat, and the site lacks surface water. We do not recommend visiting this site again in the future.

Mormon Mesa, Nevada

For approximately 15 km upstream of its confluence with the Muddy River, the Virgin River flows through a 1-km-wide floodplain with a mosaic of habitats, including cattail marshes and tamarisk and willow forest. Much of the area is typically seasonally inundated from snowmelt in the spring and monsoon rains in mid and late summer, and the entire study area experienced severe flooding over the 2004–2005 and 2010–2011 winters. All the areas surveyed at Mormon Mesa are at least 10 km upstream of the Muddy River confluence. Tamarisk beetles and heavy defoliation were noted throughout the study area by late May.

MORMON MESA SOUTH

North half: Area: 8.4 ha Elevation: 385 m

South half: Area: 3.4 ha Elevation: 385 m

This mixed-exotic site was split into two contiguous areas to facilitate tracking of survey activity. The site has scattered Goodding willow up to 20 m, but more typically 12–15 m, in height and a patchy understory of tamarisk 4–6 m in height. The willows vary in health, with the healthiest located in the center of the northern half of the site, and the western edge of the southern half. The rest of the willows are dead or dying. Dead cattail and arrowweed are scattered in the understory of the northern half. Overall canopy closure varied within the survey season from >80% to <50%, depending on the level of tamarisk defoliation. There was no surface water within the site, but damp soils were noted in the southern half of the site in May and July. The presence of dead cattails and deadfall suggests that this site was formerly considerably wetter, and portions of the site still have the structure to provide potential flycatcher habitat with wetter soil conditions.

We detected one willow flycatcher for which residency could not be confirmed. We surveyed the northern and southern halves five times each, totaling 10.7 and 8.9 observer-hours, respectively. Cowbirds were

detected on three surveys in the northern half of the site and four surveys in the southern half. Signs of cattle were noted within the site on all occasions.

VIRGIN RIVER #1

North half: Area: 10.4 ha Elevation: 380 m
South half: Area: 11.1 ha Elevation: 380 m

Virgin River #1 was also divided into two areas, Virgin River #1 North and Virgin River #1 South, to facilitate streamlining of field logistics. Virgin River #1 North is primarily tamarisk 4–6 m in height, with areas of emergent Goodding willow in the central and southwestern portions of the site. Canopy closure under the willows is 70–85%. In areas with a pure tamarisk canopy, closure was <20% throughout the 2012 breeding season due to defoliation. Standing water was present in the site during May and June, with only damp soils noted in July.

We detected two breeding willow flycatchers in the southwestern corner of Virgin River #1 North. We also detected one additional flycatcher for which residency and breeding status could not be determined. Areas of this site not known to be occupied by flycatchers were surveyed five times, totaling 21.4 observer-hours. Cowbirds were detected on all surveys, and cattle were observed in the site on multiple occasions.

Virgin River #1 South consists of two disjunct sections; the northern section is immediately south of Virgin River #1 North, while the southern section is approximately 700 m south-southeast of Virgin River #1 North. Reconnaissance was conducted at the beginning of the breeding season in the southern section of the site to determine suitability and is described in Ground Reconnaissance Results below. The northern section is primarily tamarisk 4–6 m in height with patches of coyote willow 6 m in height and scattered Goodding willow 8–12 m in height. Canopy closure varies from >90% in areas of dense willow to 25–50% in tamarisk and marshy openings. Standing water was present in the center of the northern section throughout the breeding season.

We detected 21 breeding willow flycatchers and two unpaired, resident males in the northern section of Virgin River #1 South. We detected two additional willow flycatchers for which residency and breeding status could not be confirmed. Areas of the site not known to be occupied by willow flycatchers were surveyed six times, totaling 16.8 observer-hours. Cowbirds were observed on all but one survey, and signs of cattle were observed throughout the season.

VIRGIN RIVER #2

Area: 11.2 ha Elevation: 380 m

This site received extensive sedimentation from the flood in December 2010. The depth of new sediment ranges from 15 to 60 cm and is most extensive in the southern portion of the site. The site consists of mixed-exotic vegetation with tamarisk 4–6 m in height with a cluster of emergent Goodding willow at the northern end of the site and scattered, emergent Goodding willow at the southern end of the site. Many of the Goodding willow, particularly in the southern third of the site, are dead or dying. Canopy closure within the northern willows remained steady throughout the season at 60–85%, while closure in the southern portion of the site declined from <50% to <10% due to defoliation. The Virgin River, on the eastern edge of the site, had surface water throughout the season, but a high bank prevents the water from entering the site. We recommend discontinuing surveys at this site except for the stand of Goodding willow at the northern end of the site, which should be evaluated at the beginning of future breeding seasons.

No willow flycatchers were detected. We surveyed the site three times, totaling 11.4 observer-hours. We discontinued surveys after three visits because of poor habitat quality. Cowbirds were observed on all surveys, and cattle sign were observed at the site.

GROUND RECONNAISSANCE RESULTS

Bluff

This exotic site is located approximately 1 km upstream from Mormon Mesa North. It is dominated by clumps of 3-m-tall tamarisk interspersed with open, sandy areas vegetated with arrowweed. Canopy closure reaches 70–90% within the tamarisk clumps. The site was completely dry during our visit in late May. We did not formally survey the site, but no willow flycatchers were detected during our visit. Due to the lack of suitable vegetation and hydrology, we do not recommend visiting this site in the future.

Virgin River #1 South

In 2011, we recommended that willow flycatcher surveys in the southern section of Virgin River #1 South be discontinued if dry conditions persisted. At the beginning of 2012, we investigated the site to determine if hydrological conditions had improved. This portion of the site is dominated by 4–6-m-tall tamarisk, with a few emergent Goodding willows on the western side. Canopy closure varies from 50 to 80%. Soils were completely dry during our visit, with the exception of a few damp spots along a dry channel running through the site. We recommend discontinuing surveys at this site until another flood event occurs that has the potential to alter the hydrology within the site.

Muddy River, Nevada

The Muddy River study area is along the Muddy River in the Overton Wildlife Management Area (WMA) near Overton, Nevada.

OVERTON WMA POND

Area: 0.7 ha Elevation: 378 m

This site consists of a patch of mixed-native vegetation approximately 150 m long and 75 m wide at the north end of Overton WMA just south of Honeybee Reservoir. The dominant vegetation consists of Goodding willow 15–20 m in height with a sparse 5–7-m-tall tamarisk understory. Cattail and sedges are also present on the edges of the site and along a stream channel that drains through the site. Arrowweed is present in scattered, dense patches within and along the edges of the site. Canopy closure is variable, ranging up to 90%. The small stream channel runs north to south through the site, and held surface water throughout the season.

We detected one territorial willow flycatcher and five flycatchers for which residency could not be confirmed. We surveyed the site five times for a total of 6.2 observer-hours. Cowbirds were detected on two visits, and no sign of livestock use was observed.

OVERTON WMA

Area: 9.2 ha Elevation: 378 m

This site consists of a 150-m-wide strip of riparian vegetation along both sides of the Muddy River. The site is bordered to the southwest by open agricultural fields and to the northeast by sparser areas of riparian vegetation. The site flooded heavily during the 2004–2005 winter, but vegetation at the site was relatively unchanged. The northern two-thirds of the site is dominated by very dense tamarisk up to 7 m

in height with canopy closure of 70–90%. The tallest tamarisk are adjacent to the river channel on the eastern bank, and height and density of the tamarisk decreases with distance from the channel. Two stretches of the channel of the Muddy River within this portion of the site were dredged with heavy equipment over the 2007–2008 winter, resulting in a cleared swath 10–15 m wide on the western bank of the river. The river channel in the northern two-thirds of the site is incised 1–2 m below the surrounding land surface and contained flowing water throughout the survey season. Soils outside the channel were dry throughout the survey season.

The southern portion of the site consists primarily of a stand of Goodding willow 10–15 m in height with an understory of tamarisk and cattail. Canopy closure in this area is up to 90%. The main channel through the southern portion of the site contained flowing water until the middle of June, at which point the channel was damp or saturated but contained no surface water. In the southern portion of the site, smaller channels drain off the main river channel, and these side channels were also saturated or damp throughout the season, with all adjacent soils dry. Beavers have felled swaths of Goodding willow in the southern portion of the site, resulting in gaps in the canopy. Approximately 0.3 ha of the southern portion of the site was bulldozed in 2005 as part of Overton WMA efforts to repair flood damage to their water control system, creating an open, marshy area. Tamarisk beetle larvae and yellowing were noted in the northern portion of the site in late May, and extensive defoliation throughout the site was noted by mid-June. The tamarisk had partially refoliated by early August.

We located nine breeding willow flycatchers and three unpaired, resident males. We also detected one flycatcher for which residency could not be confirmed. One of the breeding pairs and one unpaired male were in the northern portion of Overton WMA, where resident flycatchers were last detected in 2007. Portions of the site not known to be occupied by flycatchers were surveyed five times, totaling 19.0 observer-hours. We observed no signs of livestock but detected cowbirds on all surveys.

Grand Canyon, Arizona

Lower Grand Canyon was not surveyed in 2009–2011 because the declining level of Lake Mead dramatically reduced the amount of potential flycatcher habitat, and the formation of rapids at Pearce Ferry and Iceberg Canyon made access difficult and dangerous. The level of Lake Mead increased from 330 m above mean sea level in November 2010 to 346 m in January 2012, and lake levels were still high enough (340 m) in July 2012 to allow passage up Iceberg Canyon but not beyond Pearce Ferry rapid. We completed a reconnaissance trip with Reclamation personnel on 8 and 9 July from Iceberg Canyon upstream to the Pearce Ferry rapid. We visited previously surveyed sites and assessed new vegetation along this stretch of river. Tamarisk beetles were present during the visit, and the condition of the tamarisk ranged from completely defoliated at Iceberg Canyon to green farther upriver. We noted a small group of cattle within a few river miles of Pearce Ferry, but otherwise there were no signs of livestock.

GROUND RECONNAISSANCE RESULTS

Iceberg Canyon

We visited the previously surveyed Iceberg Canyon site, which lies at the mouth of Iceberg Canyon. This site was last surveyed in 2008 (McLeod et al. 2008a). Vegetation within the site consists primarily of patchy Goodding willow and a sparse, scattered understory of tamarisk. All the tamarisk in the site are dead (if near the water) or defoliated (near the uplands). Some of the tamarisk along the upland edge of the site are resprouting basally. Most of the willows were 3–6 m in height above the water level, with a few trees to 8 m. A few of the willow patches are of sufficient height and density but are too small in extent to be suitable for flycatchers. The site was completely flooded during our visit and showed signs of lowered water levels since earlier in the season. To the southeast of the old site is another patch of

inundated Goodding willow approximately 3–5 m in height. This patch has the best potential for suitability given its extent, but is currently too short and sparse. We surveyed the site but did not detect any flycatchers. This site may develop into suitable flycatcher habitat if Lake Mead remains near the level observed in July or recedes very slowly.
We recommend reassessing this area in future years if it remains accessible.

Grand Wash Bay

Grand Wash Bay (RM 285.3N) was last surveyed in 2008 (McLeod et al. 2008a). We obtained an overview of the Grand Wash Bay area from the uplands on the eastern edge of the old survey site. No water was visible in the bay, though exposed sediment on the far western side of the bay indicated the presence of water within the recent past. The old survey site was completely dry, and all the willows are dead. A few willow patches are visible on the far side of the bay over a kilometer away, but these did not appear to be near any surface water. The remainder of the riparian vegetation, both in the old survey site and in the bay, is scrubby tamarisk. We do not recommend visiting this site again unless a dramatic increase in lake levels occurs that would improve the hydrology of the site and potentially restore the vegetation.

Other Canyon Sites

We also assessed the old survey sites at Chuckwalla Cove, Bradley Bay, Twin Coves, Kowlp Corner, and RM 286. All of these sites were last surveyed in 2007 (McLeod et al. 2008a). They are now all perched roughly 7 m above the level of the river with either no live vegetation or scrubby tamarisk. These sites are clearly no longer suitable for flycatchers, given the lack of water and vegetation. We also assessed the old survey site at Center Point (McLeod et al. 2008a). There are a few small stringers of willows right at the water's edge on either side of Center Point and just upstream from Bradley Bay. There were also two stringers between Iceberg Canyon and Center Point, one on river right and the other on river left. While each of the stringers is of an appropriate height, none is more than 10 m wide and thus currently too narrow to be suitable for breeding flycatchers. We surveyed in several locations along the willow stringers but detected no flycatchers. If lake levels continue to drop, potentially suitable patches of vegetation may continue to develop along newly exposed sediments. We recommend visits to this stretch of river in future years to assess the development of the vegetation.

Topock Marsh, Arizona

Topock Marsh lies within Havasu NWR and encompasses over 3,000 ha of open water, cattail and bulrush marsh, and riparian vegetation. A large expanse (over 2,000 ha) of riparian vegetation occupies the Colorado River floodplain between the Colorado River on the western edge of the floodplain and the open water of Topock Marsh on the eastern edge of the floodplain. The vegetation is primarily monotypic tamarisk with isolated patches of tall Goodding willow. Seasonally wet, low-lying areas are interspersed throughout the riparian area. Construction was completed between the 2011 and 2012 breeding seasons on a new water delivery channel, and water levels within Topock Marsh were noticeably higher at the beginning of the 2012 season than they were in 2011. Problems with the new water delivery system, however, prevented it from being fully utilized in 2012. Topock Marsh was affected by unusually strong monsoonal activity in mid-July, with nearly an inch of rain recorded in Needles, California, on 15 July. The increase in soil moisture levels as a result of these storms is noted in the site descriptions for several sites that were visited immediately after the rain event. Feral pigs are present throughout the Topock Marsh study area, and evidence of pigs was observed in most survey sites.

PIPES #1

Area: 5.2 ha Elevation: 140 m

This exotic site is bordered to the east by the refuge road and consists primarily of monotypic tamarisk 6–9 m in height. Arrowweed occurs in dense patches within 50 m of the refuge road. The tamarisk is densest within 100 m of the refuge road and becomes more open toward the western edge of the site. The northern edge of the site has the tallest canopy, and there is relatively little deadfall in this area compared to the rest of the site. The central and southern portions of the site have many dead stems and clusters of fallen trees. Canopy closure is 70–90%. The site contained no standing water during the survey season.

No willow flycatchers were detected. We surveyed the site five times, totaling 6.8 observer-hours. Cowbirds were detected on all surveys.

PIPES #3

Area: 5.7 ha Elevation: 140 m

This site is bordered to the east by the refuge road. Arrowweed occurs in dense patches within 50 m of the road. Most of the site is vegetated by tamarisk 5–7 m in height. The southern portion of the site has a few emergent Goodding willow up to 15 m in height and open areas with marsh vegetation. Canopy closure generally exceeds 70%. The southwestern portion of the site held standing water in May and early June. By mid-June, standing water was limited to pig wallows. Saturated soils were noted in this region throughout the season, while soils in the rest of the site were dry throughout the season.

We detected one resident, territorial flycatcher that moved and established a second territory at Beal Lake. This individual was also detected at The Wallows and 800M while actively maintaining his territory at Pipes #3. We also detected a second individual for which residency could not be confirmed. Portions of Pipes #3 not known to be occupied by flycatchers were surveyed five times, totaling 7.1 observer-hours. Cowbirds were detected on all surveys.

THE WALLOWS

Area: 0.7 ha Elevation: 140 m

The Wallows is primarily vegetated by tamarisk 5–6 m in height with emergent Goodding willow on the western side of the site. The northwestern edge of the site borders an open cattail marsh. The eastern side is dry and grades from 2-m-tall arrowweed along the refuge road to tamarisk up to 8 m in height in the center of the site. Overall canopy closure ranges from 50% in the marshy area to 90% in the tamarisk. Approximately 20% of the site was inundated in mid-May but contained primarily saturated soils by mid-June. The arrival of monsoon storms in July returned the area of inundation to levels recorded in May.

We detected two individuals for which residency could not be confirmed. Additionally, the resident male from Pipes #3 was detected in this site on multiple occasions. We surveyed the site five times, totaling 2.0 observer-hours. Cowbirds were detected on four surveys.

PC6-1

Area: 4.8 ha Elevation: 140 m

PC6-1 is a mixed-exotic site consisting primarily of tamarisk 5–6 m in height, with a few patches of arrowweed and cattails present in the understory. A scattered overstory of Goodding willow approximately 10–15 m in height is present in the southwestern corner of the site. Arrowweed 1–2 m

in height is present under the willow. A portion of the site within approximately 50 m of the refuge road contains thick stands of arrowweed. Canopy closure in the interior of the site is approximately 90%, while canopy closure on the periphery of the site near the refuge road is approximately 50%. Approximately 20% of the site was inundated in mid-May but dried to a few puddles by mid-June. In mid-July, after the arrival of monsoon storms, water returned to the levels seen in May.

No willow flycatchers were detected. The site was surveyed five times, totaling 6.0 observer-hours. Cowbirds were detected on all surveys.

IN BETWEEN

Area: 7.7 ha Elevation: 140 m

In Between consists of monotypic tamarisk 6–8 m in height. The lowest 3 m of the stand generally lacks foliage, resulting in a relatively open understory. Canopy closure is 70–90%, and the western edge of the site borders a marsh. The site was mostly dry throughout the season, with a small area of inundation noted in the center of the site in May. This area quickly dried to saturated-to-damp soils. Standing water and/or saturated soil was found throughout the season in the marsh along the western border of the site.

No willow flycatchers were detected. We surveyed the site five times, totaling 7.4 observer-hours. Cowbirds were observed on all surveys.

800M

Area: 4.7 ha Elevation: 140 m

800M adjoins the western edge of In Between, and the eastern half of the site consists of a cattail and bulrush marsh with clumps of tamarisk 5–7 m in height and scattered, emergent Goodding willow. The remainder of the site is vegetated by tamarisk 4–7 m in height. Canopy closure in the tamarisk is generally >90%, while canopy closure in the marsh is around 60%. Standing water was present in the marsh in May, and dried out to saturated soils in June. The arrival of monsoon storms in July returned water levels in the marsh to those recorded in May. The rest of the site was dry throughout the season.

We did not detect any willow flycatchers during surveys. The resident male from Pipes #3 was detected within the marsh on one visit. The site was surveyed five times, totaling 6.1 observer-hours. Cowbirds were observed on all surveys.

PIERCED EGG

Area: 6.7 ha Elevation: 140 m

This mixed-exotic site borders the western edge of 800M and consists of dense tamarisk 7 m in height, with a scattered overstory of Goodding willow 15 m in height. Areas with willows tend to have a more open understory and contain patches of cattail and bulrush. Overall canopy closure is approximately 80%. Some areas of inundated and saturated soils were noted in May in the southern and northeastern portions of the site, totaling about 5% of the site. These areas dried out during the season, and the only water or saturated soil within the site in July was in deep pig wallows.

We detected two flycatchers for which residency could not be confirmed. We surveyed the site five times for a total of 9.0 observer-hours. Cowbirds were observed on all surveys.

SWINE PARADISE

Area: 0.7 ha Elevation: 140 m

Vegetation at this mixed-exotic site consists of tamarisk 6–8 m in height and scattered, emergent Goodding willow up to 15 m in height. A dense, 25-m-wide patch of coyote willow 3–5 m in height is present in the northeastern corner of the site, adjacent to the new water delivery structure. Overall canopy closure is approximately 80%. Except for the coyote willow patch, which was inundated, the site was dry throughout the survey season.

We detected two willow flycatchers for which residency could not be confirmed. We surveyed the site five times, totaling 1.5 observer-hours. Cowbirds were detected on three visits.

PLATFORM

Area: 1.9 ha Elevation: 140 m

This site lies between the main refuge road to the west and open bulrush and cattail marsh to the east. Vegetation at the site consists of tamarisk 8 m in height with a few emergent Goodding willow. A narrow line of 5-m-tall coyote willow approximately 5 m wide runs along the eastern edge of portions of the site. Overall canopy closure is approximately 90%. Soils within the site were very dry throughout the survey season, except for the very eastern edge bordering the marsh.

No willow flycatchers were detected. The site was surveyed five times, totaling 2.5 observer-hours. Cowbirds were detected on three surveys.

250M

Area: 1.9 ha Elevation: 140 m

This site lies between the main refuge road and the open marsh. Vegetation composition and structure varies with distance from the marsh. Closest to the refuge road the site is dominated by mesquite trees (*Prosopis* sp.) with an understory of arrowweed. The center of the site is dominated by tamarisk approximately 7 m in height. Closest to the marsh, the site contains patches of coyote willow and a few emergent Goodding willows approximately 12 m in height. Canopy closure within the site ranges from 70 to 90%. The site was completely dry throughout the survey season.

No willow flycatchers were detected. The site was surveyed five times, totaling 2.0 observer-hours. Cowbirds were detected on four surveys.

HELL BIRD AND GLORY HOLE

Hell Bird: Area: 6.3 ha Elevation: 140 m

Glory Hole: Area: 5.0 ha Elevation: 140 m

These contiguous mixed-exotic sites are located on an island separated from the main riparian area by a narrow, deep channel. Vegetation composition and structure are highly variable, with the survey areas vegetated primarily by a mosaic of tamarisk 6–8 m in height and Goodding willow 15 m in height. Screwbean mesquite 9–10 m in height are also scattered throughout the sites. Canopy closure ranges from 50 to 90%. The survey areas are bordered on the west by a sand dune and on other sides by open marsh. Marshes vegetated by cattail and bulrush are interspersed throughout both sites, and during the survey season most of the marsh vegetation was brown and flattened, with very little live growth. The marshes, totaling approximately 50% areal extent in Hell Bird and 35% in Glory Hole, were inundated to knee depth throughout the season. Adjacent soils were generally dry.

We detected one resident flycatcher in Glory Hole. Two additional flycatchers for which residency could not be confirmed were detected in Hell Bird. Hell Bird and Glory Hole were surveyed five times each, totaling 6.1 and 6.0 observer-hours, respectively. Cowbirds were detected during all surveys in Hell Bird and four surveys in Glory Hole.

BEAL LAKE

Area: 18.0 ha Elevation: 140 m

This mixed-native restoration site consists of a mosaic of cottonwood, Goodding willow, coyote willow, mesquite, and arrowweed, with some tamarisk scattered throughout the site. Canopy height is highly variable and averages approximately 3–4 m over most of the site and up to 12 m in the cottonwood stands; canopy closure is sparse and averages 35%, reaching 90% in the cottonwood stands. The amount of standing water and saturated soil is highly variable because the site is flood irrigated. Sandy soil at the site allows the water to drain rapidly after irrigation.

We detected one territorial willow flycatcher from 23 May to 9 July that moved from a territory previously held in Pipes #3. We also detected one willow flycatcher on 23 May, one on 1 June, and one on 3 July; residency could not be confirmed for any of these flycatchers. Portions of this site not known to be occupied were surveyed five times, totaling 9.5 observer-hours. Cowbirds were detected on all surveys.

LOST LAKE

Area: 3.3 ha Elevation: 140 m

This site consists of a narrow (<100-m-wide) strip of riparian vegetation separated from the Colorado River to the southwest by a low ridge of barren sand dunes and bordered to the northeast by marshy areas. The northern edge of the site consists of an overstory of planted cottonwoods 10–15 m in height, with an understory of tamarisk 5 m in height, on the edge of a cattail marsh. South of the cottonwoods, the site is primarily tamarisk, 5–8 m in height, with small openings vegetated by arrowweed. The western side of the site is dominated by scattered mesquite. Overall canopy closure is approximately 80%. Surface water or saturated soil was present in the marsh on the northern edge of the site throughout the season, but the interior of the site was dry.

No willow flycatchers were detected. We surveyed the site five times, totaling 2.7 observer-hours. Cowbirds were detected on all surveys.

Bill Williams River National Wildlife Refuge, Arizona

The Bill Williams River NWR contains the last expanse of native cottonwood-willow forest in the LCR region. The refuge encompasses over 2,500 ha along the Bill Williams River upstream from its mouth at Lake Havasu and contains a mixture of native forest, stands of monotypic tamarisk, beaver ponds, and cattail marsh. Survey sites within Bill Williams are listed below from west to east, moving progressively farther upstream. Signs of cattle were observed in May and June at Cougar Point, Mineral Wash, and Beaver Pond but not at any other sites.

WISPY WILLOW

Area: 0.9 ha Elevation: 140 m

This site is approximately 200 m downstream of Site #1 along the north bank of the Bill Williams River. The site consists of a patch of young coyote willow approximately 70 x 120 m in size, with some

scattered cattail marshes along the western edge. Canopy height is 4–5 m, and stem diameter is generally ~3 cm. Canopy closure is 70–90%. Some 5-m-tall tamarisk are present along the southern and eastern edges of the site. Standing water was present within the majority of the coyote willow throughout the season.

We detected 11 willow flycatchers for which residency could not be confirmed. We surveyed the site five times, totaling 4.5 observer-hours. Cowbirds were detected on four visits.

BILL WILLIAMS SITE #1

Area: 3.0 ha Elevation: 140 m

Site #1 is a mixed-native site near the mouth of the Bill Williams River, on the southern edge of an area that burned in 2006. Goodding willow dominates the overstory at a height of 20 m but does not form a continuous canopy. Tamarisk 8 m in height dominates the understory throughout much of the site. Towards the center of the site, there are patches of dense arrowweed 2–3 m in height. A stand of large-diameter coyote willow 6–8 m in height is present along the western and southern edges of the site. Canopy closure is approximately 70–80%. Standing water was present within the coyote willow stand in June and July.

We detected one resident male and 10 individuals for which residency could not be confirmed. The site was surveyed four times, totaling 2.1 observer-hours. Cowbirds were detected on all visits.

BURN EDGE

Area: 4.1 ha Elevation: 140 m

Burn Edge is near the northern edge of the Bill Williams riparian corridor, on the eastern edge of an area that burned in 2006. A cattail marsh with an overstory of Goodding willow and cottonwood 15–20 m in height runs east-west through the center of the site. The understory is dominated by tamarisk up to 6 m in height. Canopy closure in the marshy area varies from around 60% at the eastern end to 25% at the western end. The area on either side of the marsh consists of tamarisk 6 m in height with up to 90% canopy closure. Standing water and saturated soils were present in the marsh in May, with the extent of this wet area shrinking in June and July. The site generally dried out to the east, and soils away from the marsh were dry.

On 21 May, we detected one willow flycatcher for which residency could not be confirmed. The site was surveyed five times, totaling 3.2 observer-hours. Cowbirds were detected on all visits.

BILL WILLIAMS SITE #4 AND SITE #3

Site #4: Area: 9.9 ha Elevation: 140 m
Site #3: Area: 13.0 ha Elevation: 140 m

These two sites are contiguous and together are known as Mosquito Flats. Vegetation is mixed-native, with an overstory of Goodding willow and cottonwood 15–20 m in height and patches of monotypic tamarisk up to 8 m in height. Small patches of coyote willow are also present throughout both sites. Canopy closure is variable and overall is approximately 50%. Stands of cattails and marshy areas occupy approximately 10% of Site #3. The understory in some areas is very open, and the ground in these areas is covered with herbaceous vegetation. Many large willows and cottonwoods have fallen over the past several years, leaving large gaps in the canopy and creating patches of thick, dead, fallen woody vegetation. Mosquito Flats had a network of small, flowing streams with some open marshes in May.

By mid-June, the streams and marshes were muddy but contained no standing water, and the only surface water remaining was in a deep, backwater channel on the western side of Site #4.

We detected two flycatchers for which residency could not be confirmed in Site #4. Three breeding flycatchers were detected in Site #3. Portions of the sites not known to be occupied by flycatchers were visited five times, totaling 8.7 observer-hours at Site #4 and 15.8 observer-hours at Site #3. Cowbirds were detected on all surveys of Mosquito Flats.

GUINNESS

Area: 3.4 ha Elevation: 140 m

This site is located approximately 150 m east of Site #3. It is dominated by a patchy overstory of Goodding willow 10–15 m in height, with an understory of 5–6-m-tall tamarisk. Some sporadic, emergent cottonwood are present along the eastern and western edges of the site. Canopy closure is approximately 70%. A stream bisecting the site held water in May but was reduced to isolated pools in June and July. Soils adjacent to the stream were dry. We recommend adding Guinness to the biennial survey schedule and reassessing the site if a flood event occurs that has the potential to alter its hydrology.

We detected one willow flycatcher for which residency could not be confirmed. The site was surveyed five times, totaling 3.2 observer-hours. Cowbirds were detected on four visits.

BILL WILLIAMS SITE #5

Area: 6.8 ha Elevation: 143 m

Site #5 is located on the eastern edge of the Bill Williams River floodplain and is bordered to the northeast by steep cliffs and to the west by a dry river channel. Vegetation in the site is mixed-native, with Goodding willow 12–15 m in height and cottonwood 15–20 m in height forming a broken overstory. The understory consists of tamarisk 6–8 m in height as well as some young Goodding willow and cottonwood. Ground cover in portions of the site consists of thick, dead, fallen woody vegetation. Canopy closure in the site is variable, ranging from 25% in open areas to 70–90% in the denser vegetation. Standing water was present throughout the survey season along the northeastern edge of the site in a series of deep beaver ponds. Soils in the majority of the site were dry.

No willow flycatchers were detected. We surveyed the site five times, totaling 7.5 observer-hours. Cowbirds were detected on four surveys.

BLACK RAIL

Area: 1.2 ha Elevation: 146 m

We visited Black Rail in 2006 and determined that although the site had suitable hydrology, the site was small and the willows were likely too short to support breeding flycatchers. We recommended revisiting the site in the future to assess any changes. We reassessed this site in 2010 and recommended adding it to the biennial survey schedule. Vegetation in this mixed-native site is multi-layered with an overstory of cottonwood and Goodding willow up to 15 m in height. A mid-layer of cottonwood and Goodding willow 7–10 m in height is present throughout the site, along with several clumps of tamarisk 6 m in height in the understory. Patches of dense cattail and bulrush 2–3 m in height are scattered through the interior of the site. Canopy cover varies from 30–80%. A stand of even-aged Goodding willow and cottonwood 10–12 m in height, with a continuous canopy, 90% canopy closure, and an open understory is present along the southwestern edge of the site. Standing water was present throughout the site in May, but only damp soils remained by June. We recommend adding this site to the annual survey schedule.

No willow flycatchers were detected. We surveyed the site five times, totaling 3.0 observer-hours. Cowbirds were detected on four visits.

COUGAR POINT

Area: 1.3 ha Elevation: 157 m

The site consists of dense, even-age stands of Goodding willow and cottonwood 9–12 m in height along a channel of the Bill Williams River. Seep willow (*Baccharis salicifolia*) is present in the understory but appears to be dying back as it becomes shaded by the taller cottonwoods and willows. Cattail marshes are present within and around the site. Canopy closure within the woody vegetation exceeds 80%. Surface water was present within the river channel and marshes throughout the season but did not extend under the woody vegetation.

No willow flycatchers were detected. We surveyed the site five times, totaling 3.4 observer-hours. Cowbirds were detected on four visits.

MINERAL WASH

Area: 18.8 ha Elevation: 162 m

The majority of this mixed-native site has an overstory of cottonwood and Goodding willow up to 20 m in height and an understory of tamarisk averaging 5 m in height. In the northern third of the site, the vegetation changes to a mix of tamarisk, honey mesquite (*Prosopis glandulosa*), and arrowweed with a few emergent cottonwood. The site contains two channels of the Bill Williams River, one along the southwestern edge of the site and the other through the center of the site. Areas of bulrush and cattail and several deep beaver ponds are present in both channels. Overall canopy closure is <50%. Both channels of the Bill Williams River contained surface water throughout the season, but soils away from the channels were dry and sandy.

No flycatchers were detected. We surveyed the site five times, totaling 7.0 observer-hours. Cowbirds were detected on four visits.

BEAVER POND

Area: 21.7 ha Elevation: 165 m

This mixed-native site consists of cottonwood and Goodding willow averaging 15–20 m in height with an understory of tamarisk 5–7 m in height along two channels of the Bill Williams River. One channel runs along the southern border of the site and the other through the center. Both channels are being actively dammed by beavers, creating several pools. Areas not immediately adjacent to the channels are vegetated by tamarisk and honey mesquite 5–7 m in height. Cattail and bulrush are present along most of the channels. Overall canopy closure at the site is <50%. Both channels held running surface water throughout the survey season, but soils away from either channel were dry and sandy.

No willow flycatchers were detected. We surveyed the site five times, totaling 7.9 observer-hours. Cowbirds were detected on four visits.

UPSTREAM FROM SITE #8

Area: 1.5 ha Elevation: 170 m

Vegetation in the majority of the site consists of an overstory of cottonwood and Goodding willow up to 15 m in height and an understory of tamarisk. The western third and southern edge of the site are

vegetated by Goodding willow and cottonwood up to 10 m in height. The eastern third is dominated by dry tamarisk 4–6 m in height with scattered, emergent Goodding willow and cottonwoods. The northern edge of the site borders a cattail marsh. Canopy cover is variable and ranges from 50 to 80%. The western portion of the site contained surface water throughout the breeding season, with dry soils throughout the rest of the site.

We detected no willow flycatchers. We surveyed the site four times, totaling 1.75 observer-hours. Cowbirds were detected on three visits.

PLANET RANCH ROAD

Area: 3.3 ha Elevation: 170 m

This mixed-native site follows the Bill Williams River at the southern edge of the riparian area. Due to property access issues in 2012, we were unable to access the interior of the site. In previous years, the vegetation immediately adjacent to the river was dominated by Goodding willow and cottonwood up to 15 m in height. Both riverbanks were steep, and vegetation on top of the banks more than a few meters from the water was dominated by arrowweed and tamarisk 4–5 m in height. Canopy cover and hydrological conditions are unknown for 2012.

No willow flycatchers were detected. We surveyed from the property boundary four times, totaling 2.8 observer-hours. We detected cowbirds on three surveys.

Palo Verde Ecological Reserve, California

PVER PHASE 2

Area: 21.4 ha Elevation: 85 m

This habitat creation site is vegetated with a mosaic of cottonwood, Goodding willow, and coyote willow, which reach heights of 12, 10, and 5 m, respectively. Height and density of the vegetation varies within and between cells of the site. Canopy closure is highly variable, ranging from <25 to 90%. The entire site has a ground covering of alfalfa (*Medicado sativa*). The site is flood irrigated, and a portion of the site contained surface water during one visit in May.

We detected four willow flycatchers on 24 May and one on 12 June. We surveyed the site five times, totaling 8.75 observer-hours. Many cowbirds were detected on all visits, and no evidence of livestock use was recorded.

PVER PHASE 3

Area: 21.4 ha Elevation: 85 m

This habitat creation site is vegetated with a mosaic of rectangular cells of cottonwood, Goodding willow, and coyote willow that reach heights of approximately 15, 8, and 5 m, respectively. Height and density of the vegetation varies within and between the cells of the site. Canopy closure is highly variable, ranging from 50 to 90%. The entire site has a ground covering of alfalfa. The site is flood irrigated, but did not contain surface water during any visits.

We detected five willow flycatchers on 24 May. We surveyed the site five times, totaling 9.9 observer-hours. Cowbirds were detected on all visits, and no evidence of livestock was recorded.

Ehrenberg, Arizona

EHRENBERG

Area: 4.7 ha Elevation: 78 m

This mixed-native site consists primarily of a canopy of cottonwood and Goodding willow 15 m in height with an understory of arrowweed. Approximately 5% of the site contains a cattail marsh surrounded by mostly dead stands of coyote willow. Sparse, wispy coyote willow 3 m in height are growing in the marsh and immediately to the south. The periphery of the site is vegetated with a mix of tamarisk and mesquite 3–5 m in height. Canopy closure at the site varies from 25 to 50%. The cattail marsh was inundated in May and contained saturated soil in June and July. The site is separated from the Colorado River by a levee. Most of the site lacks a live understory other than arrowweed, making it unsuitable for breeding flycatchers. The coyote willow patch appears to be increasing in extent, and we recommend checking this site in the future to see if hydrology and vegetation structure have improved.

We did not detect any willow flycatchers. We surveyed the site five times, totaling 4.1 observer-hours. Cowbirds were detected on all but one survey, and no evidence of livestock use was observed.

Cibola, Arizona and California

CVCA PHASE 1

Area: 26.2 ha Elevation: 73 m

This habitat creation area consists of a mosaic of rectangular cells of cottonwood, Goodding willow, and coyote willow of varying size and density. Each cell generally contains a single species and age class. The tallest cottonwoods are 15 m in height, and the tallest willows are around 12 m in height. Canopy closure in the densest areas is >90%. Coyote willow reaches 3–6 m in height. The site is flood irrigated and contained standing water in approximately 30% of the site during visits in May. The Colorado River is about 100 m from the northern edge of the site; the southern edge is adjacent to CVCA Phase 2; and the remaining two sides are surrounded by agriculture. An irrigation canal adjacent to the western edge of the site held surface water throughout the season.

We detected six willow flycatchers on 23 May and 11 on 6 June. The site was surveyed five times, totaling 11.5 observer-hours. Large flocks of cowbirds were detected on all visits, and no evidence of livestock use was observed.

CVCA PHASE 2

Area: 25.5 ha Elevation: 73 m

This habitat creation area consists of a mosaic of rectangular cells of cottonwood, Goodding willow, and coyote willow of varying size and density. The tallest cottonwoods and Goodding willow reach approximately 12 m, and canopy closure reaches 95% in the densest areas. Coyote willow reach 3–6 m in height. The site is flood irrigated and contained standing water immediately adjacent to water valves in May. The northern edge of the site is adjacent to CVCA Phase 1, and the remaining sides are surrounded by agriculture. An irrigation canal 80 m from the western edge of the site held surface water throughout the season.

We detected two willow flycatchers on 23 May and eight flycatchers on 6 June. The site was surveyed five times, totaling 10.1 observer-hours. Large flocks of cowbirds were detected on all visits, and no evidence of livestock use was observed.

CVCA PHASE 3

Area: 38.4 ha Elevation: 73 m

This habitat creation area consists of a mosaic of rectangular cells of cottonwood, Goodding willow, and coyote willow of varying size and density. The tallest cottonwoods reach approximately 12 m in height, Goodding willows reach 10 m, and coyote willows reach 5 m. Canopy closure varies from 20 to 90%. The site is flood irrigated, and a portion of the site contained surface water during a visit in May. On other visits, the closest water was 400 m away in the Colorado River. The site is surrounded by agricultural fields.

We detected one willow flycatcher on 13 June. The site was surveyed five times, totaling 9.9 observer-hours. Large flocks of cowbirds were detected on all visits, and no evidence of livestock use was observed.

CIBOLA NATURE TRAIL

Area: 13.7 ha Elevation: 70 m

This habitat creation site consists of a mosaic of cottonwood, Goodding willow, and mesquite. Approximately half the site consists of scattered screwbean and honey mesquite up to 5 m in height with a thick understory of Emory baccharis (*Baccharis salicina*). The northern half of the site contains an extensive stand of Goodding willow 10 m in height. The northern edge of the willow stand has canopy closure <25%, and many of the willow are dead. The southern half of the willow stand has canopy closure around 70%. Overall canopy closure averages 25–50%. The southwestern corner of the site has a small stand of cottonwoods, and stringers of cottonwoods up to 18 m in height occur throughout the site. The site is flood irrigated but contained only a few small puddles during a visit in May.

We detected three willow flycatchers on 23 May and one flycatcher on 13 June. The site was surveyed five times, totaling 3.9 observer-hours. Large numbers of cowbirds were detected on all surveys, and no evidence of livestock use was observed.

CIBOLA LAKE NORTH

Area: 8.9 ha Elevation: 64 m

This mixed-exotic site borders Cibola Lake. The perimeter of the site adjacent to the lake is vegetated by cattail and bulrush. The area immediately inland from the cattail marshes is vegetated by dense tamarisk 4–6 m in height. Goodding willow 12–15 m in height are scattered around the perimeter. The interior of the site has patchy vegetation with a mix of tamarisk, arrowweed, screwbean mesquite, and open sandy areas. Small patches of coyote willow 5–6 m in height are located on the very northern end of the site around a marshy opening. Canopy closure along the marsh edges is 50–70%, while the interior of the site has canopy closure <25%. Surface water was confined to the marshes on the periphery of the site, and soils within the interior of the site were very dry throughout the survey period.

We detected one willow flycatcher on 14 June. We surveyed the site five times, totaling 8.4 observer-hours. Cowbirds were detected on all surveys, and no evidence of livestock use was observed.

CIBOLA LAKE WEST

Area: 6.8 ha Elevation: 64 m

This mixed-exotic site borders Cibola Lake. The perimeter of the site adjacent to the lake is vegetated by a narrow strip of cattail and bulrush. Areas immediately inland from the cattail marshes are vegetated by

dense tamarisk that is typically 5–6 m in height but occasionally reaches 8 m in height. A few emergent Gooding willow are scattered on the northern perimeter of the site. Cottonwood patches 12–15 m in height are scattered throughout the southern portion of the site. The interior of the site has patchy vegetation with a mix of tamarisk, arrowweed, screwbean mesquite, and open sandy areas. Canopy closure averages 90% in the dense tamarisk and <25% in the clearings. Soils within the interior of the site were dry throughout the survey period, with surface water in the marshy areas immediately adjacent to the site.

We detected two willow flycatchers on 29 May and two on 14 June. The site was surveyed five times, totaling 6.5 observer-hours. Cowbirds were detected on all visits, and no evidence of livestock use was observed.

WALKER LAKE

Area: 11.4 ha Elevation: 64 m

This mixed-exotic site is located along the northeastern edge of Walker Lake. The majority of the site consists of very dense tamarisk approximately 5 m in height with 90% canopy closure. The southeastern end of the site contains scattered emergent Goodding willow up to 20 m in height, as well as a couple of emergent cottonwoods. This portion of the site also contains a small opening with dead cattails and a small patch of half-dead coyote willow. Walker Lake and the southern tip of the site contained surface water throughout the season. The level of Walker Lake rose dramatically in mid-July as the result of unusually intense monsoonal activity during which 1.4 inches of rain were recorded in Blythe over a two-day period.

No willow flycatchers were detected. The site was surveyed five times, totaling 6.3 observer-hours. Cowbirds were detected on all surveys, and no evidence of livestock use was observed.

Imperial, Arizona and California

PARADISE

Area: 7.8 ha Elevation: 62 m

The center of this mixed-native site consists of stringers of cottonwood and Goodding willow 15–20 m in height. Tamarisk (5 m in height) and arrowweed (3 m in height) make up the understory. The cottonwoods and willows are separated from the Colorado River by a 50-m-wide strip of dense tamarisk. A marsh borders the western side of the southern third of the site. This marsh had been vegetated by cattails in previous years but now consists primarily of common reed (*Phragmites australis*). Canopy closure within the site is variable. Standing water was present within the marsh throughout the season.

We detected five willow flycatchers on 16 May. The site was surveyed five times, totaling 6.6 observer-hours. Cowbirds were detected on every visit, and no evidence of livestock was noted.

HOGE RANCH

Area: 20.7 ha Elevation: 61 m

This mixed-exotic site borders the Colorado River and is dominated by tamarisk 4–6 m in height, with a few emergent cottonwood and Goodding willow (15 to 18 m in height) at the southern end of the site near the old ranch. Linear marshes with cattail, bulrush, and common reed occupy less than 20% of the interior of the site, and there are a few patches of coyote willow. Canopy closure is variable and reaches 70–90%

in areas of dense, woody vegetation. The marshes in the interior of the site were inundated throughout the season.

We detected four willow flycatchers on 30 May and one on 15 June. The site was surveyed five times, totaling 6.3 observer-hours. Cowbirds were detected on four visits, and no evidence of livestock was noted.

ADOBE LAKE

Area: 7.5 ha Elevation: 60 m

This mixed-exotic site consists primarily of dense tamarisk (5 to 7 m in height) with many dead branches in the understory. There are scattered Goodding willows up to 10 m in height. Canopy closure within the site is 70–90%. The site is adjacent to the Colorado River, but hydrological conditions in the interior of the site were undetermined.

We detected one willow flycatcher on 30 May. The site was surveyed five times, totaling 1.0 observer-hours. Cowbirds were detected on one visit, and no evidence of livestock use was observed.

RATTLESNAKE

Area: 7.6 ha Elevation: 60 m

This mixed-exotic site is a patchwork of tamarisk 7 m in height and strips of dense coyote willow 6–8 m in height with emergent Goodding willow up to 15 m in height. The coyote willow consists primarily of large diameter stems (≥10 cm dbh), many of which are leaning over or fallen, creating very tangled habitat. The dense deadfall and debris within the coyote willows reduces the suitability of the area for willow flycatchers. Canopy closure is 70–90%. Extensive cattail marshes separate this site from the Colorado River. Standing water was present in the interior of the site in June.

No willow flycatchers were detected. The site was surveyed five times, totaling 7.1 observer-hours. Cowbirds were detected on all surveys, and no evidence of livestock use was observed.

CLEAR LAKE

Area: 8.3 ha Elevation: 59 m

Vegetation at this site is primarily exotic, consisting of monotypic tamarisk 8–10 m in height. Emergent Goodding willows, up to 13 m in height, are scattered throughout the site. The tamarisk is mature, with large amounts of deadfall ground cover, and canopy closure is approximately 90%. The site is surrounded on the east, north, and west by upland desert and is bordered on the south by cattail marshes and common reed. A narrow, backwater channel runs northward from the Colorado River into the center of the site, and soils immediately adjacent to the channel were inundated or saturated. Soils in the interior of the site were dry in May and June. In mid-July, a heavy flash flood flowed through the site, removing trees and opening up several corridors through the site. Soils were saturated to inundated in these corridors during a visit in July immediately post-flood. Soils were damp during a follow-up visit at the end of July.

We detected five willow flycatchers on 22 May and three flycatchers on 3 June. We surveyed the site five times for a total of 10.3 observer-hours. Cowbirds were detected on all visits, and no evidence of livestock use was observed.

NURSERY NW

Area: 7.0 ha Elevation: 58 m

This mixed-exotic site lies between the Colorado River and a cattail marsh. The dominant vegetation is tamarisk approximately 6–8 m in height with an understory of common reed. Mesquite trees are scattered along the western edge of the site. The eastern edge of the site, adjacent to the cattail marsh, has a stand of Goodding willow 10 m in height. Overall canopy closure is around 70%, and the densest portions of the site have canopy closure >90%. Surface water was present in marsh and the eastern edge of the site throughout the survey season.

We detected seven willow flycatchers on 18 May and one on 1 June. The site was surveyed five times, totaling 4.4 observer-hours. Cowbirds were detected on all visits, and there was no evidence of livestock use.

IMPERIAL NURSERY

Area: 1.4 ha Elevation: 58 m

This site is a cottonwood planting managed by the Imperial NWR. The cottonwoods are approximately 12 m in height, with canopy closure of approximately 90%. The understory is very sparse, except for two clumps of Goodding willow 5 m in height that each cover an area <20 m in diameter. The edges of the site are vegetated by arrowweed and *Baccharis* sp. with a few honey mesquite in the northwestern corner of the site. The site is bordered to the north by a patchwork of cattails, common reed, and tamarisk, and by open fields to the south. This site is flood irrigated and was completely dry during all site visits.

No willow flycatchers were detected. The site was surveyed five times, totaling 1.2 observer-hours. A cowbird was detected on one visit, and no evidence of livestock use was observed.

FERGUSON LAKE

Area: 21.1 ha Elevation: 57 m

The Ferguson Lake site is on a strip of land between Ferguson Lake and the Colorado River. Vegetation is mixed-native, with scattered, emergent Goodding willow 10 m in height throughout the site and areas of 3-m-tall coyote willow in the northeastern corner of the site. Tamarisk 5–6 m in height is the dominant understory species, and it forms a continuous canopy in portions of the site. The site also contains patches of arrowweed and scattered screwbean mesquite with little canopy cover. The western and northern edges of the site up to 50 m from the lakeshore had standing water in June and July.

We detected 28 willow flycatchers on 19 May and 16 flycatchers on 5 June. The site was surveyed five times, totaling 10.3 observer-hours. Cowbirds were detected on all visits, and no signs of livestock use were observed.

FERGUSON WASH

Area: 6.8 ha Elevation: 58 m

This mixed-exotic site, at the outflow of Ferguson Wash into Ferguson Lake, is dominated by dense, mature tamarisk approximately 7 m in height, with dense deadfall in the understory. A few scattered, emergent Goodding willows 10 m in height are present near the lake, and canopy closure is around 90%. The site is bordered on the lakeside by cattails and bulrush and on the upland side by desertscrub. A backwater channel penetrates to the interior of the site, although the banks along the channel are abrupt

and do not allow water to flow under the vegetation in this area. Soils in the interior of the site were dry throughout the survey season, although debris from a flash flood was observed at the site in late July.

We detected 10 willow flycatchers on 19 May and three flycatchers on 5 June. The site was surveyed five times, totaling 3.8 observer-hours. Cowbirds were recorded on all visits, and evidence of burros was noted near the site.

GREAT BLUE HERON

Area: 7.0 ha Elevation: 58 m

This site, on the eastern shore of Martinez Lake, consists of mixed-exotic vegetation. Near the shore of Martinez Lake, Goodding willow forms an overstory 15 m in height, with an understory of tamarisk, common reed, and giant reed (*Arundo* sp.). Canopy closure in this area is 80%. Portions of the site contain thickets of willow deadfall. Farther from the lake, the site is vegetated by scattered arrowweed and tamarisk 6 m in height, with canopy closure <50%. Soils within the site were dry in May and June, with new sediment deposition and some standing water from a recent flash flood noted in mid-July.

No willow flycatchers were detected. The site was surveyed five times, totaling 15.0 observer-hours. Cowbirds were detected on all visits, and no signs of livestock use were observed.

Mittry Lake, California

MITTRY WEST

Area: 4.4 ha Elevation: 48 m

The center of this mixed-native site is dominated by Goodding willow 12 m in height with a dense understory of arrowweed and tamarisk. Deadfall is common throughout the site, and canopy closure varies from 30% in clearings to 70% under the willows and up to 90% within dense tamarisk patches. Honey and screwbean mesquite are scattered throughout the site but are more common near the periphery. A sparse clump of coyote willow 4–5 m in height and 50 m in diameter is present in the northeastern corner of the site. Surface water was present in the site in May with a few puddles remaining in June.

We detected three willow flycatchers on 6 June. The site was visited five times, totaling 7.5 observer-hours. Cowbirds were detected during all surveys, and no evidence of livestock use was observed.

Yuma, Arizona

GILA CONFLUENCE NORTH

Area: 2.2 ha Elevation: 40 m

This mixed-native site borders the northern side of the Colorado River at the confluence of the Gila and Colorado Rivers. Overstory vegetation at the site is a combination of Goodding willow and cottonwood 12 m in height. Dense stands of these trees surround a cattail marsh near the northern side of the site. Cattail marsh is also present along the river, and there is an open area of common reed in the center of the site. Canopy closure is variable and averages around 50%. Arrowweed, tamarisk, and Emory baccharis are common in the understory. Soils were dry throughout the survey season.

We detected six willow flycatchers on 17 May and two flycatchers on 2 June. The site was surveyed five times, totaling 8.2 observer-hours. Cowbirds were detected on all visits, and no evidence of livestock use was observed.

NDOW Study Areas

Field personnel spent 3.9 observer-hours completing broadcast surveys for willow flycatchers at 3 of 19 sites at Key Pittman WMA, River Ranch, and Warm Springs Natural Area. The remaining 16 sites were occupied by resident flycatchers from the beginning of the season and were monitored but not surveyed. Willow flycatcher survey and monitoring results are summarized in Table 2.6 and are presented below along with site descriptions. Details of occupancy, pairing, color-banding, and breeding are presented in Chapters 3 and 4. The boundaries of survey sites and occupancy in 2012 are shown on orthophotos in Appendix B.

In addition to willow flycatcher surveys, field personnel spent 12.6 observer-hours completing broadcast surveys for Yellow-billed Cuckoo at Key Pittman, River Ranch, and Warm Springs. The results of cuckoo surveys are summarized below.

Table 2.6. Willow Flycatcher Detections at NDOW Study Areas, 2012

Study Area[1]	Survey Site	Area (ha)	Number Detected (Date(s) of Detection)[2,3,4]
KEPI	Patch 0	0.04	1 (2–20 Jun)
	Patch 1	0.1	2 (17 May–29 Aug)
	Patch 2	0.1	3 (6 Jun–9 Aug)
	Patch 3	0.1	2 (17 May–4 Aug), 1 (17–23 May)[5]
	Patch 4	0.1	1 (23 May–20 Jun)[5]
	Patch 4.5	0.02	1 (6–20 Jun), 1 (17 Jul)
	Patch 5	0.1	2 (17 May–17 Jul)
	Patch 6	0.2	2 (17 May–17 Jul)
	Patch 7	0.1	4 (17 May–31 Jul)
	Patch 8	0.1	1 (23 May–17 Jul)
	Patch 9	0.3	6 (17 May–4 Aug), 1 (4 Jul)
	Patch 10	0.1	3 (17 May–6 Aug)
	Patch 10.5	0.02	2 (23 May–23 Jul), 1 (23 May–2 Jun)[6]
	Patch 11	0.1	2 (17 May–6 Aug)
	Patch 12	0.1	6 (17 May–4 Aug), 1 (17 May)[6], 1 (25 Jul)
RIRA	West Side	0.3	ND
	East Side	0.4	1 (12 Jul)
	Smalls	0.5	ND
WMSP	Muddy Mac	0.5	2 (29 May–5 Jul), 1 (12 Jun)

[1] KEPI = Key Pittman WMA, RIRA = River Ranch, WMSP = Warm Springs Natural Area.

[2] ND = No willow flycatchers were detected.

[3] See Chapter 3 for details on territories, residency, pairing, and color-banding; see Chapter 4 for details on nesting activity.

[4] Flycatchers in territories that were occupied throughout the breeding season are shown as being present throughout the season. Flycatchers detected on a single occasion or for a short period of time are listed separately.

[5] This individual detected 17–23 May in Patch 3 and 23 May–20 Jun in Patch 4.

[6] This individual detected 17 May in Patch 12 and 23 May–2 Jun in Patch 10.5.

Key Pittman Wildlife Management Area, Nevada

PATCHES 0–12

Area: 1.4 ha Elevation: 1,169 m

This study area is divided into 15 small stands of coyote willow. These stands form a strip of habitat between bulrush marsh on the edge of Nesbitt Lake to the east and dry upland scrub dominated by saltbush (*Atriplex* sp.) and grasses to the west. Most of the stands are independent of each other, but four stands (Patches 6–9) have grown together, forming a larger contiguous stand. Each stand is characterized by very dense, large-diameter stems of coyote willow. Some areas have fallen or leaning stems with wispy growth in the lower 2 m, making traversing those areas difficult. Canopy height ranges from 4 to 8 m with the taller stems occurring in the center of each stand, creating a rounded look. Canopy closure is 70–90%. Surface water was present along the eastern edge of the sites in May, with 10–15% of the area within the sites inundated and an additional 5% of soils saturated. Lake levels dropped slightly in June, with only about 5% of the area within the sites being inundated.

We located 33 breeding willow flycatchers across 11 of the 15 sites. We detected six resident, unpaired males and an additional three individuals for which we could not determine residency. All sites were occupied, and therefore no surveys were conducted. Cowbirds were noted throughout the season during nest monitoring activities. Signs of cattle were present in the dry upland scrub, but the sites have been fenced off to prevent damage. Deer were present within the sites, but do not appear to heavily impact the vegetation structure.

YELLOW-BILLED CUCKOO SURVEYS

We completed four surveys for Yellow-billed Cuckoo at Key Pittman, totaling 7.8 observer-hours. We surveyed the tall cottonwood patch at the south end of Nesbitt Lake and all coyote willow patches. No Yellow-billed Cuckoos were detected.

River Ranch

River Ranch is in the Pahranagat Valley, approximately 12 km south of Key Pittman, and consists of several isolated patches of vegetation. Each patch is surrounded on all sides by grazed, irrigated cattle pasture, and the perimeter of each site has a distinct browse line at 1.5 m in height.

WEST SIDE

Area: 0.3 ha Elevation: 1,100 m

This site is composed primarily of dense, large-diameter coyote willow 7 m in height. Shorter coyote willow approximately 4 m in height is present around the perimeter, giving the site a rounded look. A gap 3 to 5 m wide runs diagonally through the site from the northwestern to the southeastern corner. Some Russian olive is scattered along the perimeter of this gap. There is little to no understory, except where willows are regenerating and in the gap, where grasses and other herbaceous plants dominate. Canopy closure is 90% throughout most of the site, except in the gap where it varies from 0 to 30%. Areas of deadfall up to 1 m deep are scattered throughout the site, making travel difficult in places. Water levels fluctuated throughout the season depending on irrigation activity. Maximum water extent included a ditch approximately 1 m wide and 0.2 m deep surrounding the site, with 10% saturated soils in the site interior. Minimum water extent included damp soils throughout the site.

No willow flycatchers were detected. We surveyed the site five times, totaling 1.1 observer-hours. Cowbirds were detected on one survey. Signs of cattle were present in and surrounding the site, but the cattle do not appear to use the interior of the site extensively.

EAST SIDE

Area: 0.4 ha Elevation: 1,100 m

This site is composed primarily of dense, large-diameter coyote willow 6 to 7 m in height. Tree height is shorter at the perimeter, giving the site a rounded appearance. Russian olive and velvet ash (*Fraxinus velutina*) occur in low numbers. There are numerous piles of deadfall scattered throughout the site. Little to no understory is present, except where the willow is able to regenerate and also in some small clearings where herbaceous vegetation dominates. Canopy closure is primarily 70–90%, except in a few scattered clearings where it ranges from 0 to 25%. Water levels fluctuated throughout the season depending on irrigation activity. Maximum water extent included damp to almost saturated soils throughout the site and a ditch of water 1 m wide and 0.2 m deep surrounding the site. Minimum water extent included dry soils throughout the site.

We detected one willow flycatcher for which residency status could not be determined. We surveyed the site four times, totaling 1.75 observer hours. Brown-headed cowbirds were noted during the first two surveys. Signs of cattle were present throughout and surrounding the site, with cattle trails throughout the interior of the site.

SMALLS

Area: 0.5 ha Elevation: 1,100 m

This site is composed primarily of coyote willow 5 m tall. There is little understory except sparse, regenerating willow in the densely vegetated areas. A large gap in the vegetation, totaling approximately 25% of the site, dominates the northern half of the site. This gap is ringed by a stand of shorter coyote willow approximately 4 m in height and 4 m wide on the western, northern, and eastern sides. Canopy closure averages 80-90% in the vegetated areas. Deadfall is scattered throughout the site but typically does not occur in piles as it does in West Side and East Side. Water levels were variable throughout the season depending on irrigation activity. Maximum water extent included a pool of water at the northern end of the site and saturated soils throughout the remainder of the site. Minimum water extent included completely dry soils throughout the site.

No willow flycatchers were detected. We surveyed the site five times, totaling 1.1 observer-hours. A cowbird was detected on one survey. Signs of heavy cattle use were present throughout the site.

YELLOW-BILLED CUCKOO SURVEYS

We completed four surveys for Yellow-billed Cuckoo at River Ranch, totaling 3.7 observer-hours. All sites were covered in each survey. No Yellow-billed Cuckoos were detected.

Warm Springs Natural Area

On 1 July 2010, a wildfire burned at least part of all the survey sites at Warm Springs. Due to the severity of fire damage, surveys were discontinued after the fire at all sites except one.

MUDDY MAC

Area: 0.5 ha Elevation: 548 m

This native site lies near the head of Apcar Stream. The northern portion of the former site was heavily damaged in the 2010 fire, with the overstory being completely killed. Dense basal regeneration of velvet ash is occurring, but live vegetation is only 3 m in height. We did not survey this northern portion. The eastern half of the survey area is characterized by a very dense velvet ash stand 8 m in height with no understory and ≥90% canopy closure. The western half is dominated by sparse velvet ash approximately 12 m in height with 50% canopy closure due to a damaged canopy that is two-thirds leafless. There is a regenerating velvet ash understory in this portion 2 m in height. The area immediately south of the site has been cleared as part of a restoration effort. Surface water was present throughout the survey season in the form of a stream flowing through the woody vegetation near the southern edge of the site.

We detected two breeding flycatchers and one individual for which residency could not be determined. Due to flycatcher occupancy, this site was not formally surveyed. Cowbirds were detected periodically during nest monitoring visits. No evidence of livestock was observed.

YELLOW-BILLED CUCKOO SURVEYS

We completed four surveys for Yellow-billed Cuckoo at Warm Springs, totaling 1.1 observer-hours. We surveyed only Muddy Mac during each survey. No Yellow-billed Cuckoos were detected.

DISCUSSION

The six Reclamation study areas occupied in 2012 by resident or breeding flycatchers (Pahranagat NWR, Mesquite, Mormon Mesa, Muddy River, Topock Marsh, and Bill Williams River NWR) consistently held resident and breeding flycatchers in previous years (McKernan and Braden 2002; McLeod et al. 2008a; McLeod and Koronkiewicz 2009, 2010; McLeod and Pellegrini 2011, 2012; details of residency and breeding in 2012 are presented in Chapters 3 and 4 of this document). The two NDOW study areas (Key Pittman and Warm Springs) occupied in 2012 by breeding flycatchers also held resident and breeding flycatchers in the previous two years (McLeod and Pellegrini 2011, 2012). River Ranch held breeding flycatchers in 2011, but a flycatcher was detected at River Ranch only on a single occasion in mid-July in 2012. Dispersal from River Ranch to other breeding areas is suggestive of suboptimal habitat conditions at River Ranch (McLeod and Pellegrini 2012; Discussion in Chapter 4, this document).

From the start of flycatcher monitoring at Pahranagat NWR in 1997 through 2007, occupied flycatcher habitat at Pahranagat North, near the inflow to Upper Pahranagat Lake, was inundated annually with up to 1 m of water recorded under the vegetation in mid-May. From 2003 to 2007, as much as 100% of the site contained standing water in mid-May, and as much as 95% of the site contained standing water and saturated soil until mid-July. Major structural problems with the dam that impounds the upper lake resulted in the upper lake being drained in early 2008, and the riparian vegetation at the north end of the lake was not flooded during the 2008 and 2009 flycatcher breeding seasons. The dam was repaired prior to the 2010 breeding season, and although lake levels have been higher since this repair, they have not returned to the levels maintained prior to dam failure. Lake levels in 2012 were at their highest since repairs, and riparian vegetation at the northern end of the lake contained more water in 2012 than in the previous two years, but the site was not inundated as it had been prior to 2008.

A single pair of breeding flycatchers was detected at a new site in 2012. Along the Virgin River, breeding flycatchers were detected at Dumb Luck Bridge, which had not previously been surveyed. This site was found due to the stark contrast of native vegetation against defoliated tamarisk. It consists of native

vegetation at the outflow of an irrigation canal into the Virgin River. During our visits in June and July, water from the irrigation canal fanned out through a portion of the site, creating suitable conditions for flycatchers. Future suitability of this site is dependent on continued return flow from the irrigation canal.

Hydrologic conditions at Mesquite West in 2012 were improved from those noted in 2009 and at the end of the season in 2011. In 2009, the site was largely dry, and premature leaf abscission was observed as early as May. In 2011, the site was wet at the beginning of the breeding season. In mid-June, earthwork at the inflow to the site diverted water along the eastern edge of the site and into the Virgin River. Although the site became dry, the canopy remained largely intact with only a minor amount of leaf abscission detected in August. In April 2012, an earthen berm was constructed in the channel on the eastern edge of the site, diverting water into the northeastern corner of the site. This returned water to the site in 2012, but the areal extent of the water was not as large as recorded in previous years when the site held water. This could be related to the amount of water entering the site, which seemed reduced from previous years. Water flow was also intermittent, allowing the site to dry out completely between inundations. Additionally, many willows have died since 2011, and many of the remaining willows have reduced canopy cover. The number of resident flycatchers (6) detected at Mesquite West in 2012 was lower than the numbers detected in any other year (30, 28, 12, 25, 25, 24, 20, 16, and 11 in 2003 through 2011, respectively). The decline in flycatcher numbers between 2009 and 2012 was likely influenced by poor nest success from 2009–2011, and poor habitat conditions in 2009 and 2011 (McLeod and Pellegrini 2011, 2012). A site visit in October 2012 revealed that the temporary earthen berm was gone, and water was again flowing down the channel along the eastern edge of the site. The channel had received significant sedimentation, raising the channel bottom sufficiently to allow water to flow out of the channel and into the eastern edge of the site. All portions of the site that have been occupied by flycatchers over the last several years appeared to have surface water, and if water delivery is maintained, conditions at the site should improve.

The Muddy River study area is composed of two sites, one much larger than the other. The smaller site (Overton WMA Pond) is of marginal habitat quality, and since surveys began in 2007, the only resident flycatchers recorded prior to 2012 consisted of a breeding pair in 2007. In 2005–2007, the larger site (Overton WMA) supported two distinct breeding areas approximately 800 m apart. Over the 2007–2008 winter, the Muddy River was dredged immediately upstream and downstream of the northern breeding area. Dredging activities resulted in a cleared swath 10–15 m wide on the western bank of the river. Resident flycatchers were not documented in the northern breeding area from 2008–2011, and all breeding flycatchers were located in the very southern end of the site. In 2012, both Overton WMA and Overton WMA Pond were occupied by resident flycatchers, and nesting attempts were documented in both breeding areas of Overton WMA. Detections of flycatchers in these historically occupied areas could be related to the unusually dry conditions present in the southern end of Overton WMA in 2012, which may have influenced flycatchers to occupy alternate sites. The Muddy River is strongly channelized throughout the majority of the larger site. When the river reaches the southern end of the site, a portion of the river flow is diverted to a ditch running along the road to the southwest of the site. Any water that flows through the site enters a network of smaller, braided channels that are often ponded by beaver activity, creating a thin sheet flow of water throughout much of this end of the site. Water levels have been slowly receding in this area since 2010, and no new beaver activity was noted in 2011 or 2012. By 2012, no standing water was present in the southern breeding area downstream of the diversion, and only a little saturated soil was noted in the channels at the beginning of the season. However, water was still present in the ditch along the road. We recommend assessing the area where water formerly flowed into the southern end of the site to determine if modifications to the stream channel would allow flow to be restored.

Marsh elevations at Topock increased from their record low levels of 2010 and 2011, but were still lower than those recorded in 2006–2009 (Figure 2.2). The number of resident adults detected at Topock continued to decline, with two resident adults detected in 2012, versus 36, 29, 18, 20, 14, 11, and 5 detected in each year in 2005 through 2011, respectively. One of the two resident flycatchers did not sing spontaneously and did not appear to be defending a territory. The other resident flycatcher initially held a territory within the historic breeding area of the marsh, but then moved and established a second territory in Beal Lake, where he spent the majority of the summer. This is the first record of a territorial, banded flycatcher occupying one of the restoration sites. The establishment of this territory in the restoration site is suggestive of improving habitat suitability for flycatchers at the restoration area, but also of the poor habitat quality throughout the rest of the study area. While numerous factors are likely affecting habitat quality throughout the rest of the study area, the most obvious is lowered marsh levels. An examination of water levels within Topock Marsh shows that after 2004, water peaked at lower levels, high water levels were of shorter duration, and over-winter lows were lower than was the case prior to 2004 (Figure 2.2). Changes over the years in the timing and magnitude of fluctuations in marsh levels may have contributed to the decline in the Topock flycatcher population.

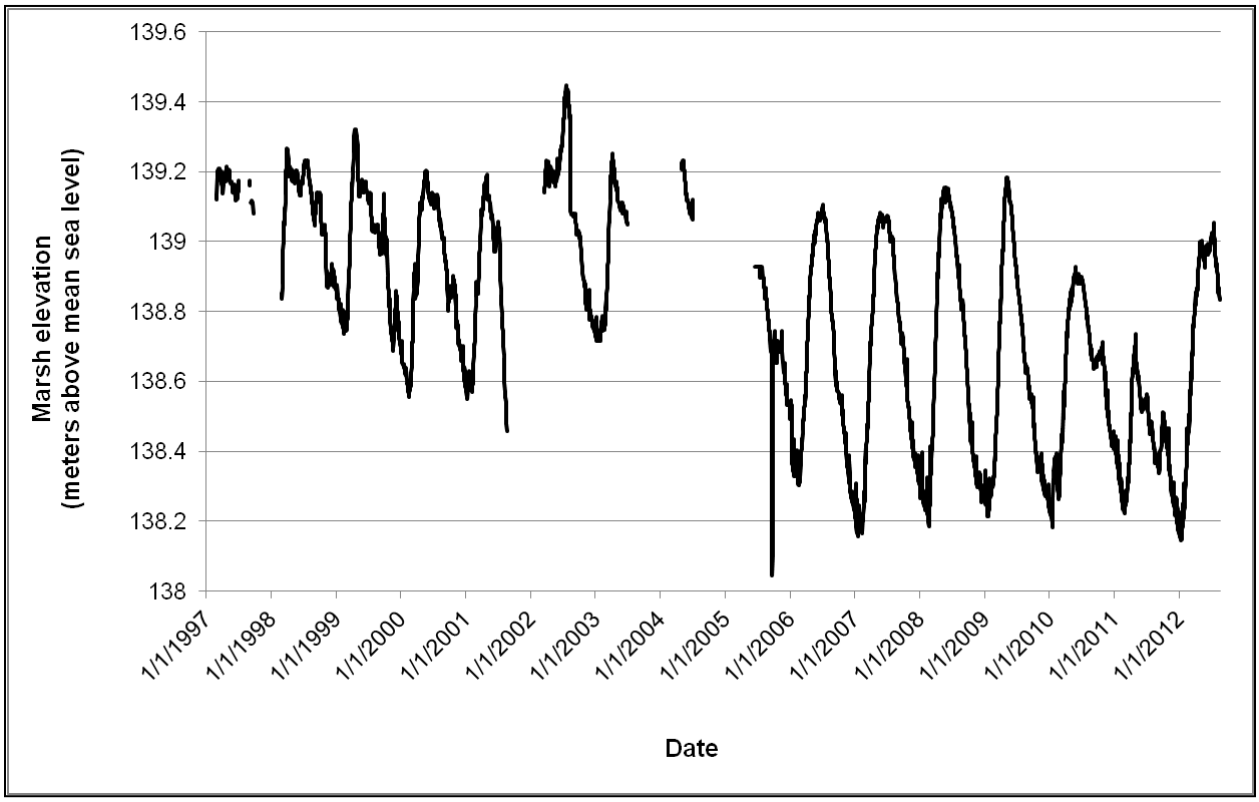

Figure 2.2. Marsh elevation (meters above sea level) measured at the South Dike at Topock Marsh, 1997–2012.

For the first year since 2004, no successful nesting attempts were documented in Bill Williams River NWR. This could be related to an exceptionally dry year in 2012. Water was present in all of the usual areas at the beginning of the season, but was limited in extent and often dried up by early June. An example of this is the recently discovered breeding site Cougar Point. In 2011, this site was mostly inundated with a thin sheet of water <5 cm deep. In 2012, standing water was limited to the channel that flows through the site, reducing habitat suitability throughout the rest of the site. Breeding flycatchers

could have gone undetected at Planet Ranch Road, where we surveyed from the property boundary approximately 80 m from the breeding area.

Tamarisk beetles were present along the entire stretch of the Virgin and Muddy Rivers in 2012. Extensive defoliation was noted along the Virgin River from just south of Littlefield downstream to Mormon Mesa by late May. This is the earliest defoliation observed on the Virgin River since the start of defoliation events in 2008. Some refoliation was starting in late June through July, but a second defoliation occurred by the beginning of August. In Mesquite, the primary breeding site consists mostly of native vegetation and did not appear to be as strongly impacted by defoliation as it was by reduced water extent and stand density. In Mormon Mesa, habitat quality seemed to be strongly impacted by defoliation due to the limited extent of native vegetation. The breeding site at Muddy River was also defoliated in 2012, though not until mid-June. The magnitude of the impact of defoliation is confounded with a lack of standing water through most of the site in 2012. Tamarisk beetles were noted as far downstream on the Lower Colorado River as Lake Mohave by the end of August (T. Dudley, UCSB, pers. comm.). Topock Marsh and Bill Williams River NWR may be affected by beetles in 2013 or 2014 if beetles continue to spread at the rate observed in 2012.

Although 142 flycatcher detections were recorded at sites surveyed south of the Bill Williams, monitoring results and behavioral observations (lack of territorial, aggressive behaviors exhibited toward conspecific broadcasts) at these sites suggest these flycatchers were not resident or breeding individuals but migrants. These results are consistent with those recorded in 2003–2011 (McLeod et al. 2008a; McLeod and Koronkiewicz 2009, 2010; McLeod and Pellegrini 2011, 2012). Banding studies in the Yuma area completed in 2003–2007 also suggested that willow flycatchers detected in mid-June were migrants (McLeod et al. 2008a). Migrant willow flycatchers along the lower Colorado River could belong to one of several subspecies (*E. t. extimus*, *E. t. adastus*, or *E. t. brewsteri*), and unless an individual is banded, it is impossible to determine in the field whether a migrant is *E. t. extimus* or one of the other two subspecies. A model based on plumage color variation predicted that approximately half of 96 willow flycatchers captured in the Yuma area in mid-June in 2004–2007 were *E. t. extimus* (Paxton et al. 2010), indicating that the southwestern subspecies does use the lower Colorado River as a migration corridor. In addition, two flycatchers banded at breeding sites monitored as part of the lower Colorado River study have been detected at sites south of the Bill Williams. Both individuals were detected for only one day and did not exhibit territorial behavior, suggesting they were migrants. The first individual was detected along the Gila River in Yuma in May 2005. It was identified by the presence of a single anodized federal band as having been banded as a nestling at one of the Reclamation study areas in either 2003 or 2004. In June 2011, a fully banded flycatcher was detected in PVER 2, one of the Reclamation habitat creation sites along the LCR. While the identity of the individual could not be confirmed by repeated observations, it was very likely banded in southern Nevada. This was the first confirmed sighting of a Southwestern Willow Flycatcher in one of the habitat creation sites south of the Bill Williams. Although the bird was likely a migrant, this detection demonstrates the importance of the habitat creation sites as stopover habitat for migrating Southwestern Willow Flycatchers. Flycatchers from breeding areas along the lower Colorado River and its tributaries may also provide a potential source population for the colonization of habitat creation sites (see Discussion in Chapter 3).

Chapter 3

COLOR-BANDING AND RESIGHTING

INTRODUCTION

Long-term monitoring of willow flycatchers of known identity, sex, and age is the only effective way to determine demographic life history parameters such as annual survivorship of adults and young, site fidelity, seasonal and between-year movements, and population structure. Thus, as an integral part of our studies, we captured and uniquely color-banded as many willow flycatchers as possible, allowing field personnel to resight individuals throughout the breeding season, as well as in subsequent years. Resighting consisted of using binoculars to determine the identity of a color-banded flycatcher by observing, from a distance, the unique color combination on its legs. This allowed field personnel to detect and monitor individuals without recapturing each bird. This was our tenth consecutive year of color-banding studies and builds upon color-banding initiated at these sites in 1997 (McKernan and Braden 1998).

METHODS

Color-Banding

From early May through mid-August, we captured, uniquely color-banded, and subsequently monitored adult and nestling willow flycatchers at all study areas where resident willow flycatchers were detected. The color-banding effort also included Key Pittman Wildlife Management Area, River Ranch, and Warm Springs Natural Area in Nevada (in cooperation with Nevada Department of Wildlife).

Adult flycatchers were captured with mist-nets, which provide the most effective technique for live-capture of adult songbirds (Ralph et al. 1993). We used a targeted capture technique (per Sogge et al. 2001), whereby a variety of conspecific vocalizations were broadcast from a CD player and remote speakers to lure territorial flycatchers into the nets. In addition, we used “passive netting,” whereby several mist-nets were erected and periodically checked, with no broadcast of conspecific vocalizations. We banded each adult willow flycatcher with a single, numbered U.S. federal aluminum band on one leg and a colored metal band on the other. The aluminum federal bands are either standard silver or anodized in one of several colors. We coordinated all color combinations with the Federal Bird Banding Laboratory and all other Southwestern Willow Flycatcher banding projects to minimize duplication of color combinations. For each color-banded bird recaptured, we visually inspected the legs and noted any evidence of irritation or injury that may be related to the presence of leg bands.

Nestlings were banded at 8 to 10 days of age, when they were large enough to retain the leg bands, yet young enough that they would not prematurely fledge from the nest (Whitfield 1990, Paxton et al. 1997). Nestlings were banded only when the location of the nest was such that nest access and removal/replacement of the nestlings would not endanger the nest, nest plant, or nestlings. Nestlings were also banded with a single, numbered federal band (standard silver or anodized) on one leg and a metal color-band on the other leg. Prior to 2008, we banded each nestling with only a single anodized federal band, identifying it as a returning nestling in the event it returned in a subsequent year.

For each captured adult willow flycatcher, we recorded morphological measurements, including culmen, tail, wing, fat level, and molt onto standardized data forms (Appendix A). Sex was determined based on the presence of a cloacal protuberance in males or brood patch and/or egg(s) in the oviduct for females. Captured flycatchers lacking breeding characteristics and not observed engaging in male advertising song (see below) were sexed as unknown. Flycatchers with retained primary, secondary, and/or primary covert feathers (multiple aged remiges) were aged as second year adults, and those without (uniformly aged remiges) were aged as after hatch year (per Kenwood and Paxton 2001 and Koronkiewicz et al. 2002). Individuals in juvenile plumage (unworn flight feathers and body plumage with broad, buff-colored wing bars and fleshy gape) were aged as hatch year.

Resighting

We determined the identity of a color-banded flycatcher by observing with binoculars, from a distance, the unique color combination on its legs. Typically, territories and active nests were focal areas for resighting, but entire sites were surveyed. Field personnel typically spent the early part of each morning color-banding, and directed their efforts to resighting as daylight increased and flycatchers became more difficult to capture. All banding, monitoring, and survey field personnel coordinated resighting efforts and recorded observations of color-banded and unbanded flycatchers onto standardized data forms (Appendix A). For resighted flycatchers (i.e., ones for which at least one leg was seen clearly enough to determine the presence or absence of a band), we recorded color-band combinations, territory number, site, standardized confidence levels of the resight, and behavioral observations. Willow flycatchers for which detections spanned one week or longer were considered resident at a site, regardless of the portion of the breeding season in which the bird was observed or whether a possible mate was observed. Flycatchers observed engaging in breeding behaviors (e.g., carrying nest material) were also considered resident regardless of the period of time over which they were observed. Flycatchers observed engaging in lengthy, primary song from high perches (male advertising song) were sexed as male, and flycatchers observed carrying nest material or constructing or incubating a nest were sexed as female. Flycatchers not observed engaging in one of these diagnostic activities were sexed as unknown.

Inactive territories were visited at least three times (each visit four days apart) before territory visits stopped. All territories were assigned a unique alphanumeric code and were plotted onto high-resolution aerial photographs, thus producing a spatial representation of the flycatcher population at each study location. If multiple females were paired with a single male, each female received a unique territory number. Flycatchers were determined to be unpaired if none of the following breeding behaviors were observed: presence of another unchallenged flycatcher in the immediate vicinity, counter calling (*whitts*) with a nearby flycatcher, interaction twitter calls (*churr/kitters*) with a nearby flycatcher, a flycatcher in the immediate vicinity carrying nesting material, a flycatcher in the immediate vicinity carrying food or fecal sac, or adult flycatchers feeding young (per Sogge et al. 2010).

Unbanded flycatchers could not be identified to individual, but an unbanded flycatcher detected in a given location on multiple, consecutive visits was assumed to be the same individual. If an unbanded flycatcher or a flycatcher whose legs were not observed was detected at a given location on multiple visits but one or more intervening visits failed to detect a flycatcher, the detections were considered to be different individuals in the absence of behavioral observations indicating the flycatcher was actively defending a territory or was a member of a breeding pair.

RESULTS

Reclamation Study Areas

Color-Banding and Resighting – Field personnel color-banded 13 new adult flycatchers and recaptured 8 adults. An additional 35 adults were identified to individual via resighting, while 4 individuals were resighted but did not have their color combinations confirmed. One additional adult was resighted with a duplicate combination. We identified one additional individual as returning nestling by the presence of a single federal band, which we were unable to recapture. Thirty adult flycatchers remained unbanded, and banding status was undetermined (i.e., we were unable to determine if these individuals were banded) for 35 adults. Overall, 49% of the adult flycatchers detected at the monitoring sites were known to be color-banded by the end of the breeding season (Table 3.1). Of the adults that were identified in 2012, 13 were identified for the first time since they were banded as nestlings. We banded 26 nestlings from 12 nests. We resighted an additional nine unbanded fledglings from 4 nests. For details on all banded flycatchers detected at the study areas from 2003 to 2012, see Appendix E.

Site-by-Site Color-Banding and Resighting

Pahranagat – We detected 22 resident, adult willow flycatchers from 14 territories at Pahranagat (Table 3.2). Of the 14 territories recorded at Pahranagat, 11 consisted of breeding pairs, 1 consisted of a pair for which no nest could be found, and 2 consisted of unpaired males. Of the breeding individuals, four males were each polygynous with two females.

Field personnel captured and color-banded two new adults and recaptured five adult flycatchers. We resighted and identified an additional 13 adults. One adult remained unbanded, and the band combination could not be confirmed for one adult. Of the adults identified in 2012, six were identified for the first time since their hatch year (see Table 3.8 for juvenile dispersal data). We banded 14 nestlings from six nests and resighted nine unbanded fledglings from four additional nests.

Mesquite – We detected eight resident, adult willow flycatchers from five territories at Mesquite. In addition to resident adults, we detected eight individuals for which residency could not be confirmed (Table 3.2). Of the five territories recorded at Mesquite, four consisted of breeding individuals and one consisted of an unpaired male. Of the breeding individuals, one male was polygynous with two females. One breeding male moved to Mesquite from Mormon Mesa and then returned to Mormon Mesa (Table 3.9).

Field personnel confirmed the identities of five adults via resighting. The identity of one additional adult with a duplicate combination could not be confirmed. Band combinations could not be confirmed for two adults. Four adults remained unbanded, and band status could not be determined for four adults. Of the adults identified in 2012, three were identified for the first time since their hatch year (Table 3.8).

Mormon Mesa – We detected 24 resident, adult willow flycatchers from 16 territories at Mormon Mesa. In addition to resident adults, we detected four individuals for which residency could not be confirmed (Table 3.2). Of the 16 territories recorded at Mormon Mesa, 14 consisted of breeding individuals and 2 consisted of unpaired males. One male detected at Mormon Mesa at the beginning of the season moved to Mesquite and established a breeding territory and then returned as an unpaired male to Mormon Mesa (Table 3.9). One female for which residency could not be confirmed moved to Muddy River (Table 3.9). One male established a territory in Virgin River #1 South and then bred in a second territory in Virgin River #1 North. Three males were polygynous, one with four females and two with two females.

Field personnel captured and color-banded seven new adults and recaptured one adult flycatcher. One newly captured adult was later recaptured in a second territory. We resighted and identified 14 additional adults. We resighted one returning nestling with a single federal band that we were unable to recapture. Four adults remained unbanded, and the band combination could not be confirmed for one adult. Of the adults identified in 2012, two were identified for the first time since their hatch year (Table 3.8). We banded nine nestlings from five nests.

Muddy River – We detected 13 resident, adult willow flycatchers from 10 territories at Muddy River. In addition to resident adults, we detected six individuals for which residency could not be confirmed (Table 3.2). Of the 10 territories recorded, 5 consisted of breeding pairs and 5 consisted of unpaired males. Of the breeding individuals, one male was polygynous with two females. One unpaired male moved from a territory in Overton WMA and then bred at a second territory within the site. One breeding female moved from Mormon Mesa (Table 3.9).

Field personnel captured and color-banded two new adults and recaptured one adult flycatcher. We resighted and identified five other adults. Six adults remained unbanded, and band status could not be confirmed for five adults. Of the adults identified in 2012, one was identified for the first time since its hatch year (Table 3.8). We banded three nestlings from one nest.

Topock – We detected two resident, adult willow flycatchers from three territories at Topock. In addition to resident adults, we detected 14 individuals for which residency could not be confirmed (Table 3.2). All three territories recorded at Topock consisted of unpaired males. One of the unpaired males established a territory at Pipes #3 and then moved to Beal Lake and established a second territory. This male was also noted moving between The Wallows and 800M while holding territory in Pipes #3.

Field personnel captured and color-banded one new adult and recaptured one resident adult flycatcher in Beal Lake. The recaptured adult was identified for the first time since its hatch year when it was banded at Bill Williams (Table 3.8). Six adults remained unbanded, and the band status of eight individuals could not be determined.

Bill Williams – We detected four resident willow flycatchers from three territories at Bill Williams. In addition to resident adults, we detected 25 individuals for which residency could not be determined (Table 3.2). Of the three territories recorded at Bill Williams, two consisted of breeding individuals and one consisted of an unpaired male. One male was polygynous with two females.

Field personnel captured and color-banded one new adult. We resighted and identified one adult. Nine adults remained unbanded, and band status could not be determined for 18 adults.

NDOW Study Areas

Color-Banding and Resighting – Field personnel color-banded four new adult flycatchers and recaptured three individuals. An additional 33 adults were identified to individual via resighting, while one individual was resighted but did not have its color combination confirmed. One additional adult was resighted with a duplicate color combination and was not identified to individual. Of the adults identified in 2012, seven were identified for the first time since their hatch year (Table 3.8). Three adult flycatchers remained unbanded, and banding status was undetermined (i.e., we were unable to determine if the individual was banded) for one adult. Overall, 91% of the adult flycatchers detected were known to be color-banded by the end of the breeding season (Table 3.3). We banded 19 nestlings from nine nests, captured one unbanded fledgling, and resighted an additional four unbanded fledglings from two nests. For details on all banded flycatchers detected at the study areas from 2003 to 2012, see Appendix E.

Table 3.1. Willow Flycatchers Detected at Reclamation Study Areas Where Resident Flycatchers Were Observed during the 2012 Breeding Season*

Study Area	Site	Adults									Juveniles			
		Total Adults Detected	New Captured	Recaptured	Resighted					% of All Adults Banded	Nestlings Banded (# nests)	Fledglings Captured (# nests)	Unbanded Fledglings (# nests)	% of All Fledglings Banded
					Color combination confirmed		Banded (color combinations unconfirmed)	Unbanded	Band Status Undetermined					
					Individual Identified	Individual Not Identified								
Pahranagat	North	22	2	5	13	0	1	1	0	95	14(6)	0	9(4)	61
	Study Area Total	**22**	**2**	**5**	**13**	**0**	**1**	**1**	**0**	**95**	**14(6)**	**0**	**9(4)**	**61**
Mesquite	Hafen Lane	1	0	0	0	0	1	0	0	100	0	0	0	--
	Dumb Luck Bridge	2	0	0	1[1]	0	0	1	0	50	0	0	0	--
	West	10	0	0	4	1[2]	1	2	2	60	0	0	0	--
	Left Foot	3	0	0	0	0	0	1	2	0	0	0	0	--
	Study Area Total	**16**	**0**	**0**	**5**	**1**	**2**	**4**	**4**	**50**	**0**	**0**	**0**	**--**
Mormon Mesa	MOME South (North)	1	0	0	0	0	0	1	0	0	0	0	0	--
	Virgin River #1 (North)	3	1	1[3]	1[4]	0	0	0	0	100	1(1)	0	0	100
	Virgin River #1 (South)	24	6[3]	1	12[1]	1[5]	1	3	0	88	8(4)	0	0	100
	Study Area Total	**27**	**7**	**1**	**13**	**1**	**1**	**4**	**0**	**86**	**9(5)**	**0**	**0**	**100**
Muddy River	Overton Pond	6	1	0	0	0	0	0	5	17	0	0	0	--
	Overton WMA	13	1	1	5[4]	0	0	6	0	54	3(1)	0	0	100
	Study Area Total	**19**	**2**	**1**	**5**	**0**	**0**	**6**	**5**	**42**	**3(1)**	**0**	**0**	**100**
Topock	Pipes #3	2	0	0	1[6]	0	0	0	1	50	0	0	0	--
	The Wallows	3	0	0	1[6]	0	0	1	1	33	0	0	0	--
	800M	1	0	0	1[6]	0	0	0	0	100	0	0	0	--
	Pierced Egg	2	1	0	0	0	0	0	1	50	0	0	0	--
	Swine Paradise	2	0	0	0	0	0	1	1	0	0	0	0	--
	Hell Bird	2	0	0	0	0	0	1	1	0	0	0	0	--
	Glory Hole	1	0	0	0	0	0	0	1	0	0	0	0	--
	Beal Lake	4	0	1[6]	0	0	0	2	1	25	0	0	0	--
	Marshside[7]	2	0	0	0	0	0	1	1	0	0	0	0	--
	Study Area Total	**16**	**1**	**1**	**0**	**0**	**0**	**6**	**8**	**13**	**0**	**0**	**0**	**--**
Bill Williams	Wispy Willow	11	0	0	0	0	0	6	5	0	0	0	0	--
	Site #1	11	1	0	0	0	0	1	9	9	0	0	0	--
	Burn Edge	1	0	0	0	0	0	0	1	0	0	0	0	--
	Site #4	2	0	0	0	0	0	1	1	0	0	0	0	--
	Site #3	3	0	0	1	0	0	1	1	33	0	0	0	--
	Guinness	1	0	0	0	0	0	0	1	0	0	0	0	--
	Study Area Total	**29**	**1**	**0**	**1**	**0**	**0**	**9**	**18**	**7**	**0**	**0**	**0**	**--**
Total		**127**	**13**	**8**	**35**	**2**	**4**	**30**	**35**	**49**	**26(12)**	**0**	**9(4)**	**74**

* Adults are identified as new captures (previously unbanded), recaptures of previously banded birds, resightings of banded birds for which band combinations were confirmed, birds known to be unbanded, birds for which band status could not be determined, and resightings of banded birds for which band combinations were undetermined. Included are total numbers of adults detected and percent of all adults banded. Juveniles are identified as banded in the nest, banded as fledglings, or unbanded, The percent of all fledglings banded is included. For breeding and/or residency status of adults see Table 3.2.

[1] One individual moved between Mormon Mesa Virgin River #1 South and Mesquite Dumb Luck Bridge and is tallied only once in the total.

[2] Duplicate color-band combination.

[3] One individual moved from Mormon Mesa Virgin River #1 South to Mormon Mesa Virgin River #1 North and is tallied only once in the total.

[4] One individual moved from Mormon Mesa Virgin River #1 North to Muddy River Overton WMA and is tallied only once in the total.

[5] Returning nestling with a single federal band.

[6] One individual detected moving between Pipes #3, The Wallows, and 800M on the same day; this individual then moved to Beal Lake and is tallied only once in the total.

[7] Not a formal survey site. Flycatchers detected en route.

Table 3.2. Willow Flycatchers Detected at All Reclamation Study Areas with Resident Flycatchers, 2012

Study Area[1]	Site	Date Banded	Federal Band #[2]	Color Combination[3]	Old Color Combination[2,3,4]	Age[5]	Sex[6]	Territory or Location[7]	Observation Status[8]
PAHR	North	INA	INA	banded	N/A	AHY	F	6	RS
	North	21-Jul-10	2540-58199	TQ:BW(M)	N/A	3Y	M	6,75	R 31 Jul
	North	N/A	N/A	UB:UB	N/A	HY	U	6	RS
	North	N/A	N/A	UB:UB	N/A	HY	U	6	RS
	North	2-Jul-11	2430-61218	XX:OYO(M)	N/A	SY	F	18	RS
	North	24-Jul-08	2430-61083	XX:YR(M)	N/A	6Y	M	18	RS
	North	N/A	N/A	UB:UB	N/A	HY	U	18	RS
	North	N/A	N/A	UB:UB	N/A	HY	U	18	RS
	North	N/A	N/A	UB:UB	N/A	HY	U	18	RS
	North	26-Jun-09	2430-61087	OB(M):XX	N/A	A5Y	F	24	RS
	North	19-Jul-08	2430-61080	YY(M):XX	N/A	6Y	M	24,61	RS
	North	10-Jul-12	2540-58301	TQ:RV(M)	N/A	L	U	24	N
	North	10-Jul-12	2430-61290	DYD(M):XX	N/A	L	U	24	N
	North	1-Jul-06	2370-40047	PU:DD(M)	N/A	A8Y	F	32	RS
	North	25-Jun-08	2430-61179	XX:KB(M)	N/A	A6Y	M	32,135	RS
	North	17-Jul-12	2430-61300	VRV(M):XX	N/A	L	U	32	N
	North	17-Jul-12	2540-58323	TQ:GYG(M)	N/A	L	U	32	N
	North	3-Jul-11	2540-58114	YDY(M):TQ	N/A	SY	F	44	RS
	North	29-May-12	2430-61257	XX:ROR(M)	N/A	AHY	M	44,50	N
	North	17-Jul-12	2430-61294	WDW(M):XX	N/A	L	U	44	N
	North	17-Jul-12	2540-58304	VK(M):TQ	N/A	L	U	44	N
	North	1-Jul-08	2430-61120	XX:no foot	XX:KO(M)	5Y	F	50	RS
	North	26-Jun-11	2540-58111[9]	RYR(M):no foot	TQ:RYR(M)	A3Y	F	61	R 12 Jul
	North	12-Jul-12	2430-61293	VWV(M):XX	N/A	L	U	61	N
	North	12-Jul-12	2540-58303	TQ:ODO(M)	N/A	L	U	61	N
	North	N/A	N/A	UB:UB	N/A	AHY	F	75	RS
	North	3-Jul-11	2430-61220	RGR(M):XX	N/A	SY	F	81	R 24 Jul

Table 3.2. Willow Flycatchers Detected at All Reclamation Study Areas with Resident Flycatchers, 2012 (Continued)

Study Area[1]	Site	Date Banded	Federal Band #[2]	Color Combination[3]	Old Color Combination[2,3,4]	Age[5]	Sex[6]	Territory or Location[7]	Observation Status[8]
PAHR	North	27-Jun-11	2540-58246	BR(M):TQ	N/A	3Y	M	81	RS
	North	N/A	N/A	UB:UB	N/A	HY	U	81	RS
	North	N/A	N/A	UB:UB	N/A	HY	U	81	RS
	North	N/A	N/A	UB:UB	N/A	HY	U	81	RS
	North	17-Jul-12	2430-61267	ROR(M):XX	N/A	SY	F	90	N
	North	24-Jun-08	2430-61176	DK(M):XX	N/A	5Y	M	90	RS
	North	19-Jul-12	2540-58266	TQ:OYO(M)	N/A	L	U	90	N
	North	19-Jul-12	2540-58267	DYD(M):TQ	N/A	L	U	90	N
	North	19-Jul-12	2660-23014	VG(M):VI	N/A	L	U	90	N
	North	6-Jul-11	2540-58286	TQ:DYD(M)	N/A	SY	F	108	R 31 Jul
	North	21-Jul-10	2540-58201[9]	no foot:BO(M)	TQ:BO(M)	3Y	M	108	R 31 May
	North	N/A	N/A	UB:UB	N/A	HY	U	108	RS
	North	18-Jul-10	2540-58293	BO(M):TQ	N/A	4Y	F	135	RS
	North	10-Jul-12	2430-61291	XX:DGD(M)	N/A	L	U	135	N
	North	10-Jul-12	2430-61292	OYO(M):XX	N/A	L	U	135	N
	North	10-Jul-12	2540-58302	TQ:RWR(M)	N/A	L	U	135	N
	North	8-Jun-09	2370-40155	PU:VB(M)	N/A	A5Y	M	T4	RS; detected 17–26 Jun
	North	18-May-04	2320-31595	WKW(M):EE	N/A	A10Y	M	T5	RS; detected 22 May–28 Jun
MESQ	West	19-Jun-09	2370-40072	OO(M):PU	N/A	4Y	F	28	RS
	West	15-Jul-05	2320-31688	EE:BG(M)	N/A	8Y	M	28,131	RS
	West	N/A	N/A	UB:UB	N/A	AHY	F	30	RS
	West	INA	INA[10]	XX:RV(M)	N/A	SY	M	30	RS
	West	N/A	N/A	UB:UB	N/A	AHY	F	131	RS
	Dumb Luck Bridge	N/A	N/A	UB:UB	N/A	AHY	F	186	RS
	Dumb Luck Bridge	22-Jul-02	2140-66709	Bs:GW(M)	N/A	A12Y	M	186	RS; detected 15–21 May at F3 in MOME Virgin River #1 South and 8–20 Jul at T5 in MOME Virgin River #1 South
	West	22-Jul-11	2590-53117	YGY(M):XX	N/A	SY	M	T149	RS; detected 26 Jun–15 Jul

Table 3.2. Willow Flycatchers Detected at All Reclamation Study Areas with Resident Flycatchers, 2012 (Continued)

Study Area[1]	Site	Date Banded	Federal Band #[2]	Color Combination[3]	Old Color Combination[2,3,4]	Age[5]	Sex[6]	Territory or Location[7]	Observation Status[8]
MESQ	Left Foot	INA	INA	undetermined	N/A	AHY	U	F9	Detected 27 May
	Hafen Lane	INA	INA	banded	N/A	AHY	U	F10	RS; detected 29 May
	West	12-Jul-11	2590-53107	XX:VKV(M)	N/A	SY	M	F31	RS; detected 19–21 Jun, then moved to Key Pittman Patch 9
	West	INA	INA	undetermined	N/A	AHY	M	F32	Detected 21 Jun
	West	INA	INA	banded	N/A	AHY	U	F33	RS; detected 12–15 Jul
	West	INA	INA	undetermined	N/A	AHY	U	F88	Detected 29 May–3 Jun
	Left Foot	N/A	N/A	UB:UB	N/A	AHY	U	F106	RS; detected 24–27 May
	Left Foot	INA	INA	undetermined	N/A	AHY	U	F107	Detected 27 May
MOME	Virgin River #1 South	16-Jul-04	2320-31632	RZ(M):EE	N/A	10Y	F	2	RS
	Virgin River #1 South	31-Jul-09	2540-58154	DO(M):TQ	N/A	4Y	M	2,4,33,167	RS
	Virgin River #1 South	INA	INA	PU:UB	N/A	AHY	F	4	RS
	Virgin River #1 South	4-Jul-12	2430-61298	KGK(M):XX	N/A	SY	F	11	N
	Virgin River #1 South	28-May-12	2430-61282	XX:YGY(M)	N/A	AHY	M	11,142	N
	Virgin River #1 South	18-Jul-12	2540-58265	TQ:KOK(M)	N/A	L	U	11	N
	Virgin River #1 South	N/A	N/A	UB:UB	N/A	AHY	F	33	RS
	Virgin River #1 South	2-Jun-06	2370-40037	PU:DR(M)	N/A	A8Y	F	46	RS
	Virgin River #1 South	30-May-12	2430-61286	XX:VD(M)	N/A	AHY	M	46,136	N
	Virgin River #1 South	12-Jul-11	2540-58184	YGY(M):TQ	N/A	3Y	F	48	RS
	Virgin River #1 South	6-Jun-10	2540-58192	TQ:BG(M)	N/A	A4Y	M	48	RS
	Virgin River #1 South	25-Jun-07	2360-59777	EE:YKY(M)	N/A	6Y	F	63	RS
	Virgin River #1 South	14-Jun-06	2370-40046	PU:DK(M)	N/A	8Y	M	63	RS
	Virgin River #1 South	2-Jul-12	2430-61265	XX:RVR(M)	N/A	L	U	63	N
	Virgin River #1 South	2-Jul-12	2430-61266	WOW(M):XX	N/A	L	U	63	N
	Virgin River #1 South	2-Jul-12	2540-58260	TQ:GVG(M)	N/A	L	U	63	N
	Virgin River #1 South	N/A	N/A	UB:UB	N/A	AHY	F	69	RS
	Virgin River #1 South	3-Jun-12	2430-61259	YK(M):XX	N/A	SY	M	69	N

Table 3.2. Willow Flycatchers Detected at All Reclamation Study Areas with Resident Flycatchers, 2012 (Continued)

Study Area[1]	Site	Date Banded	Federal Band #[2]	Color Combination[3]	Old Color Combination[2,3,4]	Age[5]	Sex[6]	Territory or Location[7]	Observation Status[8]
MOME	Virgin River #1 South	9-Jun-05	2370-39956	PU:YWY(M)	N/A	8Y	F	76	RS
	Virgin River #1 South	3-Jun-07	2370-40197	OG(M):PU	N/A	A7Y	M	76	RS
	Virgin River #1 South	6-Jul-12	2590-53156	XX:RDR(M)	N/A	AHY	F	136	N
	Virgin River #1 South	6-Jul-12	2590-53157	YVY(M):XX	N/A	L	U	136	N
	Virgin River #1 South	6-Jul-12	2540-58373	TQ:OO(M)	N/A	L	U	136	N
	Virgin River #1 South	6-Jul-12	2660-23024	GO(M):VI	N/A	L	U	136	N
	Virgin River #1 South	6-Aug-05	2360-59788	BO(M):EE	N/A	8Y	F	142	R 28 May
	Virgin River #1 South	N/A	N/A	UB:UB	N/A	AHY	F	167	RS
	Virgin River #1 South	29-Jun-10	2540-58231	TQ:GR(M)	N/A	4Y	F	169	RS
	Virgin River #1 South	8-Jun-06	2370-39938	KG(M):PU	N/A	8Y	M	169	RS
	Virgin River #1 South	6-Jul-12	2590-53155	XX:WVW(M)	N/A	L	U	169	N
	Virgin River #1 North	13-Jul-12	2540-58261	TQ:OK(M)	N/A	AHY	F	175	N
	Virgin River #1 North	26-May-12	2430-61281	OBO(M):XX	N/A	AHY	M	175,T151	N; detected 18–30 May at T151 in Virgin River #1 South; R 13 Jul at 175 in Virgin River #1 North
	Virgin River #1 North	16-Jul-12	2430-61299	VDV(M):XX	N/A	L	U	175	N
	Virgin River #1 South	22-Jul-02	2140-66709	Bs:GW(M)	N/A	A12Y	M	T5,F3	RS; detected 15–21 May at F3, then breeding at 186 in MESQ Dumb Luck Bridge; then detected 8–20 Jul at T5
	Virgin River #1 South	9-Jul-10	2430-61231	XX:KYK(M)	N/A	3Y	U	F6	RS; detected 1 Jun and 18 Jul
	Virgin River #1 South	INA	INA	banded	N/A	AHY	U	F7	RS; detected 26 Jul
	Virgin River #1 North	15-Jun-11	2540-58174	TQ:WK(M)	N/A	SY	F	F8	RS; detected 3 Jun; then breeding at 42 in MUDD Overton WMA
	MOME South (North)	N/A	N/A	UB:UB	N/A	AHY	U	F137	RS; detected 26 May
MUDD	Overton WMA	N/A	N/A	UB:UB	N/A	AHY	F	1	RS
	Overton WMA	21-May-09	2430-61085	BV(M):XX	N/A	5Y	M	1	RS
	Overton WMA	N/A	N/A	UB:UB	N/A	AHY	F	31	RS
	Overton WMA	21-Jun-10	2370-40088	PU:VG(M)	N/A	4Y	M	31,64	RS

Table 3.2. Willow Flycatchers Detected at All Reclamation Study Areas with Resident Flycatchers, 2012 (Continued)

Study Area[1]	Site	Date Banded	Federal Band #[2]	Color Combination[3]	Old Color Combination[2,3,4]	Age[5]	Sex[6]	Territory or Location[7]	Observation Status[8]
MUDD	Overton WMA	15-Jun-11	2540-58174	TQ:WK(M)	N/A	SY	F	42	RS; detected 3 Jun at F8 in MOME Virgin River #1 N
	Overton WMA	16-Jun-09	2370-40175	PU:OKO(M)	N/A	4Y	M	42	RS
	Overton WMA	N/A	N/A	UB:UB	N/A	AHY	F	64	RS
	Overton WMA	2-Jul-12	2430-61296	DVD(M):XX	N/A	L	U	64	N
	Overton WMA	2-Jul-12	2430-61297	ORO(M):XX	N/A	L	U	64	N
	Overton WMA	2-Jul-12	2540-58321	TQ:GD(M)	N/A	L	U	64	N
	Overton WMA	N/A	N/A	UB:UB	N/A	AHY	F	140	RS
	Overton WMA	25-Jun-10	2370-40000	PU:WW(M)	N/A	4Y	M	140,T49	RS; detected 16–24 May at T49
	Overton WMA	17-Jun-12	2430-61261	XX:WBW(M)	N/A	AHY	M	T16	N; detected 13 May–28 Jun
	Overton WMA Pond	4-Jun-12	2430-61260	KYK(M):XX	N/A	SY	M	T145	N; detected 4 Jun–3 Jul
	Overton WMA	N/A	N/A	UB:UB	N/A	AHY	M	T173	RS; detected 4–17 Jun
	Overton WMA	N/A	N/A	UB:UB	N/A	AHY	M	T181	RS; detected 8–17 Jun
	Overton WMA Pond	INA	INA	undetermined	N/A	AHY	U	F2	Detected 27 May
	Overton WMA Pond	INA	INA	undetermined	N/A	AHY	U	F3	Detected 27 May
	Overton WMA Pond	INA	INA	undetermined	N/A	AHY	U	F4	Detected 27 May
	Overton WMA Pond	INA	INA	undetermined	N/A	AHY	U	F5	Detected 27 May
	Overton WMA Pond	INA	INA	undetermined	N/A	AHY	U	F6	Detected 27 May
	Overton WMA	15-Jun-11	2540-58173	TQ:VW(M)	N/A	SY	M	F17	R 31 May; not detected pre- or post-capture
TOPO	Beal Lake	14-Jul-10	2540-58116	TQ:KR(M)	N/A	3Y	M	T1,T34	R 28 May; detected 8–18 May at T1 in Pipes #3, The Wallows, and 800M; detected 23 May–9 Jul at T34 in Beal Lake
	Glory Hole	INA	INA	undetermined	N/A	AHY	U	T51	Detected 16–28 May
	The Wallows	INA	INA	undetermined	N/A	AHY	U	F4	Detected 24–26 May
	The Wallows	N/A	N/A	UB:UB	N/A	AHY	U	F5	RS; detected 24–26 May
	Pipes #3	INA	INA	undetermined	N/A	AHY	U	F6	Detected 24 May
	Marshside	N/A	N/A	UB:UB	N/A	AHY	M	F13	RS; detected 18 May

Table 3.2. Willow Flycatchers Detected at All Reclamation Study Areas with Resident Flycatchers, 2012 (Continued)

Study Area[1]	Site	Date Banded	Federal Band #[2]	Color Combination[3]	Old Color Combination[2,3,4]	Age[5]	Sex[6]	Territory or Location[7]	Observation Status[8]
TOPO	Beal Lake	N/A	N/A	UB:UB	N/A	AHY	M	F16	RS; detected 23 May
	Pierced Egg	INA	INA	undetermined	N/A	AHY	U	F21	Detected 14 May
	Hell Bird	INA	INA	undetermined	N/A	AHY	U	F23	Detected 7 Jun
	Hell Bird	N/A	N/A	UB:UB	N/A	AHY	M	F24	RS: detected 7 Jun
	Swine Paradise	N/A	N/A	UB:UB	N/A	AHY	U	F25	RS: detected 9 Jun
	Marshside	INA	INA	undetermined	N/A	AHY	M	F31	Detected 18 May
	Beal Lake	N/A	N/A	UB:UB	N/A	AHY	M	F35	RS; detected 1 Jun
	Beal Lake	INA	INA	undetermined	N/A	AHY	M	F37	Detected 3 Jul
	Swine Paradise	INA	INA	undetermined	N/A	AHY	U	F42	Detected 9 Jun
	Pierced Egg	27-Jun-12	2590-53166	ODO(M):XX	N/A	AHY	M	F43	N; detected 26–27 Jun
BIWI	Site #3	N/A	N/A	UB:UB	N/A	AHY	F	12	RS
	Site #3	INA	INA	undetermined	N/A	AHY	M	12,22	
	Site #3	6-Jun-08	2430-61137	XX:BR(M)	N/A	6Y	F	22	RS
	Site #1	N/A	N/A	UB:UB	N/A	AHY	M	T40	RS; detected 29 May–16 Jun
	Site #1	INA	INA	undetermined	N/A	AHY	U	F4	Detected 4 Jul
	Site #1	INA	INA	undetermined	N/A	AHY	U	F5	Detected 26–28 Jun
	Site #1	14-Jun-12	2590-53165	GRG(M):XX	N/A	AHY	F	F6	N; detected 14–16 Jun; possibly paired with T40
	Site #1	INA	INA	undetermined	N/A	AHY	U	F7	Detected 29 May
	Site #1	INA	INA	undetermined	N/A	AHY	U	F8	Detected 6 Jun
	Site #1	INA	INA	undetermined	N/A	AHY	U	F9	Detected 20 Jun
	Site #1	INA	INA	undetermined	N/A	AHY	U	F10	Detected 14 Jun
	Site #1	INA	INA	undetermined	N/A	AHY	U	F11	Detected 8 Jun
	Site #1	INA	INA	undetermined	N/A	AHY	U	F13	Detected 6 Jun
	Wispy Willow	N/A	N/A	UB:UB	N/A	AHY	M	F14	RS; detected 19 May
	Wispy Willow	INA	INA	undetermined	N/A	AHY	M	F15	Detected 20 May
	Wispy Willow	INA	INA	undetermined	N/A	AHY	U	F16	Detected 23 May

Table 3.2. Willow Flycatchers Detected at All Reclamation Study Areas with Resident Flycatchers, 2012 (Continued)

Study Area[1]	Site	Date Banded	Federal Band #[2]	Color Combination[3]	Old Color Combination[2,3,4]	Age[5]	Sex[6]	Territory or Location[7]	Observation Status[8]
BIWI	Site #1	INA	INA	undetermined	N/A	AHY	U	F17	Detected 6–8 Jun
	Wispy Willow	N/A	N/A	UB:UB	N/A	AHY	U	F18	RS: detected 27 May
	Wispy Willow	N/A	N/A	UB:UB	N/A	AHY	U	F19	RS; detected 27 May
	Wispy Willow	INA	INA	undetermined	N/A	AHY	U	F20	Detected 29 May
	Wispy Willow	INA	INA	undetermined	N/A	AHY	M	F21	Detected 6 Jun
	Wispy Willow	INA	INA	undetermined	N/A	AHY	U	F23	Detected 6 Jun
	Wispy Willow	N/A	N/A	UB:UB	N/A	AHY	U	F24	RS; detected 12 Jun
	Wispy Willow	N/A	N/A	UB:UB	N/A	AHY	M	F25	RS; detected 12–14 Jun
	Guinness	INA	INA	undetermined	N/A	AHY	U	F32	Detected 19 May
	Burn Edge	INA	INA	undetermined	N/A	AHY	M	F33	Detected 21 May
	Wispy Willow	N/A	N/A	UB:UB	N/A	AHY	U	F36	RS; detected 12 Jun
	Site #4	N/A	N/A	UB:UB	N/A	AHY	U	F41	RS; detected 6–8 Jun
	Site #4	INA	INA	undetermined	N/A	AHY	U	F42	Detected 18 Jun

[1] PAHR = Pahranagat NWR, MESQ = Mesquite, MOME = Mormon Mesa, MUDD = Muddy River, TOPO = Topock Marsh, BIWI = Bill Williams River NWR.

[2] N/A = not applicable, INA = information not available.

[3] **Color-band codes**: EE = electric yellow federal band, PU = pumpkin federal band, Bs = blue federal band, XX = standard silver federal band, TQ = turquoise federal band, VI – violet federal band, (M) = metal pin striped band, UB = unbanded, R = red, O = orange, Y = yellow, G = green, D = dark blue, B = light blue, V = violet, W = white, K = black, Z = gold, banded = bird was banded but combination could not be determined, undetermined = presence of bands could not be determined. Color combinations are read as the bird's left leg and right leg, top to bottom; two or three letters designate every band; color-band designations for right and left legs are separated with a colon.

[4] Old combination included only if rebanded in 2012.

[5] **Age in 2012**: L = nestling, HY = hatch year, SY = 2 years, AHY = 2 years or older, 3Y = 3 years, A3Y = 3 years or older, 4Y = 4 years, A4Y = 4 years or older, etc.

[6] **Sex codes**: M = male, F = female, U = unknown.

[7] **Territory or Location code**: Number without an alpha code indicates a flycatcher pair, T = territorial individual detected for at least 7 days, F = individual detected for less than 7 days. Number indicates unique location.

[8] **Observation status codes**: N = new capture, R = recapture followed by date recaptured, RS = resight.

[9] Original federal band number.

[10] Duplicate combination; identity of individual not confirmed.

Site-by-Site Color-Banding and Resighting

Key Pittman Wildlife Management Area – We detected 39 resident willow flycatchers from 23 territories at Key Pittman Wildlife Management Area. In addition to resident adults, we detected three individuals for which residency and/or breeding status could not be determined (Table 3.4). Of the 23 territories at Key Pittman, 16 consisted of breeding individuals, 1 consisted of a pair for which no nest could be found, and 6 consisted of an unpaired male. One male was polygynous with two females.

Field personnel captured and color-banded four new adults and recaptured three flycatchers (Table 3.4). We resighted and identified 30 additional adults. Of the adults identified in 2012, seven were identified for the first time since their hatch year (Table 3.8). Three adults remained unbanded, color combination could not be confirmed for one adult, and one banded adult could not be individually identified because it had a duplicate band combination. We banded 19 nestlings from nine nests, captured one unbanded fledgling, and resighted an additional four unbanded fledglings from two nests.

River Ranch – We detected one willow flycatcher at River Ranch for whom residency and/or breeding status could not be determined (Table 3.4). This individual was resighted and identified.

Warm Springs Natural Area – We detected two resident willow flycatchers from one territory at Warm Springs Natural Area. In addition to resident adults, we detected one individual for whom residency could not be determined (Table 3.4). The single territory at Warm Springs consisted of breeding individuals.

We resighted and identified two adults. The presence of bands could not be confirmed for one adult.

Non-Monitoring Sites

This study area was monitored by another agency, and here we report only banded flycatchers that were captured or resighted. Unbanded individuals or those with unknown band status are not included.

St. George – Personnel from Utah Division of Wildlife Resources resighted and identified five adult flycatchers (Table 3.5).

Adult Between-Year Return and Dispersal

In 2011 we individually identified 95 adult, resident willow flycatchers at all monitored study areas, of which 52 (55%) were detected in 2012 (Table 3.6). Of the returning resident adults, six (12%) were detected at a different study area than where they were resident in 2011.

Adult Between-Year Dispersal

Six returning adults detected in 2012 were detected at a different study area than where they were last detected in 2011 (Table 3.7). One additional flycatcher that was last detected in 2009 exhibited between-year movement in 2012. The median dispersal distance for all returning adult flycatchers exhibiting between-year movements in 2012 was 30.2 km (min = 12.0 km, max = 126.8 km).

Juvenile Between-Year Return and Dispersal

In 2011, we banded 40 nestlings and one fledgling at the Reclamation study areas. Five of the nestlings were known or suspected to have died before fledging. Of the remaining 36 juveniles, 9 (25%) were identified in 2012. One individual originally banded as a nestling in 2009 and one individual originally banded as a nestling in 2010 were also identified for the first time in 2012 (Table 3.8).

In 2011, we banded 34 nestlings at the NDOW study areas. Three of these nestlings were suspected to have died before fledging. Of the remaining 31 juveniles, 6 (19%) were identified in 2012 (Table 3.8). One additional nestling banded in 2010 at NDOW sites was identified for the first time in 2012.

Two nestlings originally banded in 2010 in St. George were identified for the first time in 2012.

Of the 20 returning nestlings identified in 2012, 8 (40%) dispersed away from their natal study area. The median dispersal distance for all returning juvenile flycatchers in 2012 was 1.3 km (min = 0.1 km, max = 84.7 km).

One additional returning nestling from 2003–2007 was resighted in 2012 at Mormon Mesa, but the identity of this individual was undetermined because we were unable to recapture it.

Within-Year, Between-Study Area Movements

We detected four within-year, between-study area movements in 2012 (Table 3.9). One male was detected briefly (19–21 June) in Mesquite West and then for a single day (4 July) in Key Pittman Patch 9. One female was detected for a day (3 June) in Mormon Mesa Virgin River #1 North and then nested unsuccessfully in Muddy River Overton WMA (12–24 June). One male moved twice between study areas in 2012. He was first detected in Mormon Mesa Virgin River #1 South (15–21 May) and then unsuccessfully bred in Mesquite Dumb Luck Bridge (18 June–3 July). After the failed nesting attempt, this male moved back to Mormon Mesa Virgin River #1 South and established a second territory (8–20 July) within 30 m of his initial location.

Table 3.3. Willow Flycatchers Detected at NDOW Study Areas Where Resident Flycatchers Were Observed during the 2012 Breeding Season*

Study Area	Site	Adults									Juveniles			
		Total Adults Detected	New Captured	Recaptured	Resighted					% of All Adults Banded	Nestlings Banded (# nests)	Fledglings Captured (# nests)	Unbanded Fledglings (# nests)	% of Confirmed Fledglings Banded
					Color combination confirmed		Banded (color combinations unconfirmed)	Unbanded	Band Status Undetermined					
					Individual Identified	Individual Not Identified								
Key Pittman WMA	Patch 0	1	0	0	1	0	0	0	0	100	0	0	0	100
	Patch 1	2	0	0	1	0	0	1	0	50	3 (1)	0	0	100
	Patch 2	3	0	1	2	0	0	0	0	100	3 (1)	0	0	100
	Patch 3	3	0	0	3[1]	0	0	0	0	100	1 (1)	0	0	100
	Patch 4	1	0	0	1[1]	0	0	0	0	100	0	0	0	--
	Patch 4.5	2	0	0	1	1[2]	0	0	0	100	0	0	0	--
	Patch 5	2	0	0	1	0	1	0	0	100	0	0	0	--
	Patch 6	2	1	0	1	0	0	0	0	100	3 (2)	0	0	100
	Patch 7	4	0	0	3	0	0	1	0	75	0	0	0	--
	Patch 8	1	0	0	1	0	0	0	0	100	0	0	0	--
	Patch 9	7	0	1	5	0	0	1	0	86	4 (1)	0	0	100
	Patch 10	3	0	0	3	0	0	0	0	100	4 (2)[3]	0	1(1)	100
	Patch 10.5	3	0	0	3[4]	0	0	0	0	100	0	0	0	0
	Patch 11	2	1	0	1	0	0	0	0	100	0	0	3 (1)	0
	Patch 12	8	2	1	5[4]	0	0	0	0	100	1 (1)	1 (1)	0	100
	Study Area Total	**42**	**4**	**3**	**30**	**1**	**1**	**3**	**0**	**93**	**19 (9)[3]**	**1 (1)**	**4 (2)**	**86**
River Ranch	East Side	1	0	0	1	0	0	0	0	100	0	0	0	--
	Study Area Total	**1**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**100**	**0**	**0**	**0**	**--**
Warm Springs Natural Area	Muddy Mac	3	0	0	2	0	0	0	1	67	0	0	0	--
	Study Area Total	**3**	**0**	**0**	**2**	**0**	**0**	**0**	**1**	**67**	**0**	**0**	**0**	**--**
Total		**46**	**4**	**3**	**33**	**1**	**1**	**3**	**1**	**91**	**19 (9)**	**1 (1)**	**4 (2)**	**86**

* Adults are identified as new captures (previously unbanded), recaptures of previously banded birds, resightings of banded birds for which band combinations were confirmed, birds known to be unbanded, birds for which band status could not be determined, and resightings of banded birds for which band combinations were undetermined. Included are total numbers of adults detected and percent of all adults banded. Juveniles are identified as banded in the nest, banded as fledglings, or unbanded, The percent of all fledglings banded is included. For breeding and/or residency status of adults see Table 3.4.

[1] One individual detected in Patch 3 and then in Patch 4 and is tallied only once in the total.

[2] Duplicate color-band combination.

[3] Fate of two nestlings unknown.

[4] One individual detected in Patch 12 and then in Patch 10.5 and is tallied only once in the total.

Table 3.4. Willow Flycatchers Detected at NDOW Study Areas, 2012

Study Area[1]	Site	Date Banded	Federal Band #[2]	Color Combination[2]	Old Color Combination[2,3,4]	Age[5]	Sex[6]	Territory or Location[7]	Observation Status[8]
KEPI	Patch 12	10-Jul-10	2540-58224	TQ:RD(M)	N/A	3Y	F	4	RS
	Patch 12	13-Jun-12	2540-58245	TQ:KYK(M)	N/A	3Y	M	4	RS
	Patch 12	8-Jul-12	2430-61287	RVR(M):XX	N/A	L	U	4	N
	Patch 11	31-Jul-12	2540-58269	KVK(M):TQ	N/A	AHY	F	5	N
	Patch 11	10-Jul-10	2540-58223	YV(M):TQ	N/A	4Y	M	5	RS
	Patch 11	N/A	N/A	UB:UB	N/A	HY	U	5	RS
	Patch 11	N/A	N/A	UB:UB	N/A	HY	U	5	RS
	Patch 11	N/A	N/A	UB:UB	N/A	HY	U	5	RS
	Patch 9	5-Jul-11	2590-53121	XX:WRW(M)	N/A	A3Y	F	7	RS
	Patch 9	26-Jun-08	2430-61180	RD(M):XX	N/A	6Y	M	7	RS
	Patch 9	1-Jul-12	2430-61262	XX:GYG(M)	N/A	L	U	7	N
	Patch 9	1-Jul-12	2430-61263	DOD(M):XX	N/A	L	U	7	N
	Patch 9	1-Jul-12	2540-58258	TQ:VR(M)	N/A	L	U	7	N
	Patch 9	1-Jul-12	2540-58259	ORO(M):TQ	N/A	L	U	7	N
	Patch 2	8-Jul-10	2540-58159	KB(M):TQ	N/A	3Y	F	12	RS
	Patch 2	2-Jul-09	2370-40024	PU:BV(M)	N/A	4Y	M	12	RS
	Patch 2	8-Jul-12	2430-61288	XX:YBY(M)	N/A	L	U	12	N
	Patch 2	8-Jul-12	2430-61289	GOG(M):XX	N/A	L	U	12	N
	Patch 2	8-Jul-12	2540-58300	TQ:DW(M)	N/A	L	U	12	N
	Patch 12	14-Jul-12	5840-58322	TQ:WV(M)	N/A	AHY	F	14	N
	Patch 12	27-Jun-12	2590-53153	WKW(M):XX	N/A	AHY	M	14	N, R 14 Jul
	Patch 12	31-Jul-12	2540-58325	WG(M):TQ	N/A	HY	U	14	N
	Patch 10	6-Jul-11	2540-58177	TQ:KRK(M)	N/A	A3Y	F	19	RS
	Patch 10	16-Jul-09	2430-61158	RB(M):XX	N/A	A5Y	M	19,25	RS
	Patch 10	17-Jul-12	2540-58262	OG(M):TQ	N/A	L	U	19	N
	Patch 10	N/A	N/A	UB:UB	N/A	HY	U	19	RS
	Patch 10	21-Jul-10	2430-61100	XX:YKY(M)	N/A	4Y	F	25	RS

Table 3.4. Willow Flycatchers Detected at NDOW Study Areas, 2012 (Continued)

Study Area[1]	Site	Date Banded	Federal Band #[2]	Color Combination[2]	Old Color Combination[2,3,4]	Age[5]	Sex[6]	Territory or Location[7]	Observation Status[8]
KEPI	Patch 10	17-Jul-12	2540-58263	TQ:DRD(M)	N/A	L	U	25	N
	Patch 10	17-Jul-12	2660-23012	DB(M):VI	N/A	L	U	25	N
	Patch 10	17-Jul-12	2540-58264	GOG(M):TQ	N/A	L	U	25	N
	Patch 9	8-Jul-10	2540-58156	BG(M):TQ	N/A	A4Y	F	29	R 31 Jul
	Patch 9	3-Jul-08	2430-61197	XX:VY(M)	N/A	5Y	M	29	RS
	Patch 7	10-Jul-11	2540-58247	OKO(M):TQ	N/A	SY	F	40	RS
	Patch 7	N/A	N/A	UB:UB	N/A	AHY	M	40	RS
	Patch 1	14-Jul-11	2590-53173	YBY(M):XX	N/A	3Y	F	51	RS
	Patch 1	N/A	N/A	UB:UB	N/A	AHY	M	51	RS
	Patch 1	1-Jul-12	2430-61258	DGD(M):XX	N/A	L	U	51	N
	Patch 1	1-Jul-12	2430-61295	GVG(M):XX	N/A	L	U	51	N
	Patch 1	1-Jul-12	2540-58320	KO(M):TQ	N/A	L	U	51	N
	Patch 9	N/A	N/A	UB:UB	N/A	AHY	F	58	RS
	Patch 9	23-Jun-09	2430-61159	OK(M):XX	N/A	4Y	M	58	RS
	Patch 3	7-Jul-11	2540-58178	BD(M):TQ	N/A	SY	F	60	RS
	Patch 3	8-Jul-10	2540-58158	RB(M):TQ	N/A	3Y	M	60	RS
	Patch 3	17-Jul-12	2590-53158	VKV(M):XX	N/A	L	U	60	N
	Patch 6	14-Jul-09	2430-61279	XX:DW(M)	N/A	4Y	F	62	RS
	Patch 6	25-Jul-12	2540-58268	TQ:RKR(M)	N/A	AHY	M	62	N
	Patch 6	1-Jul-12	2430-61264	GKG(M):XX	N/A	L	U	62	N; R 25 Jul
	Patch 6	13-Aug-12	2540-58326	TQ:KVK(M)	N/A	L	U	62	N
	Patch 6	13-Aug-12	2540-58327	ODO(M):TQ	N/A	L	U	62	N
	Patch 12	28-Jul-11	2540-58175	TQ:WO(M)	N/A	A3Y	F	66	RS
	Patch 12	27-Jul-11	2540-58387	GWG(M):TQ	N/A	A3Y	M	66	RS
	Patch 7	27-Jun-11	2590-53171	XX:ORO(M)	N/A	3Y	F	74	RS
	Patch 7	14-Jul-07	2370-40190	RY(M):PU	N/A	6Y	M	74	RS
	Patch 10.5	30-Jun-10	2540-58240	KYK(M):TQ	N/A	3Y	F	87	RS
	Patch 10.5	17-Jul-11	2540-58211	TQ:OW(M)	N/A	SY	M	87	RS

Table 3.4. Willow Flycatchers Detected at NDOW Study Areas, 2012 (Continued)

Study Area[1]	Site	Date Banded	Federal Band #[2]	Color Combination[2]	Old Color Combination[2,3,4]	Age[5]	Sex[6]	Territory or Location[7]	Observation Status[8]
KEPI	Patch 5	INA	INA	banded	N/A	AHY	F	121	RS
	Patch 5	27-Jul-11	2590-53148	RYR(M):XX	N/A	A3Y	M	121	RS
	Patch 10.5	29-Jun-10	2370-40010	KRK(M):PU	N/A	3Y	M	T3	RS; detected 17 May in Patch 12 and 23 May–2 Jun in Patch 10.5
	Patch 8	28-Jul-10	2540-58202	TQ:BB(M)	N/A	4Y	M	T8	RS: detected 23 May–17 Jul
	Patch 0	21-Jul-11	2590-53112	BKB(M):XX	N/A	SY	M	T20	RS; detected 2–20 Jun
	Patch 4.5	7-Jul-11	2540-58179	GK(M):TQ	N/A	SY	M	T21	RS; detected 6–20 Jun
	Patch 2	6-Jul-11	2540-58285	TQ:YG(M)	N/A	SY	M	T43	R 27 Jun; detected 6–27 Jun
	Patch 4	13-Jul-10	2430-61099	XX:WOW(M)	N/A	3Y	M	T179	RS; detected 17–23 May in Patch 3 and 23 May–20 Jun in Patch 4
	Patch 9	12-Jul-11	2590-53107	XX:VKV(M)	N/A	SY	M	F6	RS; detected 4 Jul; detected 19-21 Jun at MESQ West
	Patch 12	16-Jul-11	2540-58277	TQ:YY(M)	N/A	SY	U	F15	R 25 Jul; not detected before or after capture
	Patch 4.5	INA	INA	XX:RV(M)[9]	N/A	SY	U	F22	RS; detected 17 Jul
RIRA	East Side	8-Jun-10	2430-61088	XX:BKB(M)	N/A	A4Y	M	F196	RS; detected 12 Jul
WMSP	Muddy Mac	8-Jun-10	2540-58193	TQ:DB(M)	N/A	A4Y	F	107	RS
	Muddy Mac	20-May-08	2540-58234	KD(M):TQ	N/A	A6Y	M	107	RS
	Muddy Mac	INA	INA	undetermined	N/A	AHY	U	F22	Detected 12 Jun

[1] KEPI = Key Pittman WMA; RIRA = River Ranch; WMSP = Warm Springs Natural Area.

[2] N/A = not applicable, INA = information not available.

[3] **Color-band codes**: EE = electric yellow federal band, PU = pumpkin federal band, Bs = blue federal band, XX = standard silver federal band, TQ = turquoise federal band, VI – violet federal band, (M) = metal pin striped band, UB = unbanded, R = red, O = orange, Y = yellow, G = green, D = dark blue, B = light blue, V = violet, W = white, K = black, Z = gold, banded = bird was banded but combination could not be determined, undetermined = presence of bands could not be determined. Color combinations are read as the bird's left leg and right leg, top to bottom; two or three letters designate every band; color-band designations for right and left legs are separated with a colon.

[4] Old combination included only if rebanded in 2012.

[5] **Age in 2012**: L = nestling, HY = hatch year, SY = 2 years, AHY = 2 years or older, 3Y = 3 years, A3Y = 3 years or older, 4Y = 4 years, A4Y = 4 years or older, etc.

[6] **Sex codes**: M = male, F = female, U = unknown.

[7] **Territory or Location code**: Number without an alpha code indicates a flycatcher pair, T = territorial individual detected for at least 7 days, F = individual detected for less than 7 days. Number indicates unique location.

[8] **Observation status codes**: N = new capture, R = recapture followed by date recaptured, RS = resight.

[9] Duplicate combination; identity of individual not confirmed.

Table 3.5. Banded Willow Flycatchers, Non-Monitoring Sites, 2012

Study Area[1]	Site	Date Banded	Federal Band #	Color Combination[2]	Age[3]	Sex[4]	Observation Status[5]
STGE	Snipe Pond	28-Jun-09	2430-61154	RO(M):XX	4Y	F	RS
	Snipe Pond	20-Jul-11	2590-53287	OO(M):TQ	A3Y	M	RS
	Snipe Pond	14-Jul-10	2540-58160	DD(M):TQ	3Y	M	RS
	Riverside Marsh	9-Jul-10	2430-61230	XX:GWG(M)	A4Y	F	RS
	Riverside East	22-Jun-09	2540-58132	TQ:OD(M)	A5Y	M	RS

[1] STGE = St. George.

[2] **Color-band codes**: TQ = turquoise federal band, XX = standard silver federal band, (M) = metal pin striped band, R = red, O = orange, G = green, D = dark blue, W = white. Color combinations are read as the bird's left leg and right leg, top to bottom; two or three letters designate every band; color-band designations for right and left legs are separated with a colon.

[3] **Age in 2012:** 3Y = 3 years, A3Y = 3 years or older, 4Y = 4 years, A4Y = 4 years or older.

[4] **Sex codes**: M = male, F = female.

[5] **Observation status codes**: RS = resight.

Table 3.6. Resident Adult Willow Flycatcher Annual Return from 2011 to 2012

Study Area	# Identified in 2011	# of 2011 Birds Detected in 2012	% Return	% Return to Same Study Area
Key Pittman	32[1]	18	56	100
River Ranch	6[1]	3	50	0
Pahranagat	14	10	71	100
Mesquite	8	3	38	33
Mormon Mesa	15[2]	12	80	100
Muddy River	9[2]	3	33	67
Warm Springs	2	2	100	100
Topock	3	0	0	--
Bill Williams	6	1	17	100
Total	**95**	**52**	**55**	**88**

[1] One female first nested at River Ranch and then moved to Key Pittman and renested; she is only counted in Key Pittman.

[2] One male held a territory in Muddy River, then moved and bred in Mormon Mesa; he is only counted in Mormon Mesa.

Table 3.7. Adult Willow Flycatcher Between-Year Movements for All Individuals Identified in a Previous Year and Recaptured or Resighted at a Different Study Area in 2012

Study Area/Site/Year Detected[1]	Study Area/Site Detected 2012[1]	Distance Moved (km)	Federal Band #	Color Combination[2]	Sex[3]
LIFI/Poles/2009	PAHR/North	115.9	2370-40155	PU:VB(M)	M
RIRA/East Side/2011	KEPI/10.5	12.0	2540-58240	KYK(M):TQ	F
RIRA/Smalls/2011	PAHR/North	18.0	2540-58246	BR(M):TQ	M
RIRA/Smalls/2011	KEPI/Patch 7	12.1	2590-53171	XX:ORO(M)	F
PAHR/North/2011	KEPI/Patch 12	30.2	2540-58245	TQ:KYK(M)	M
MESQ/West/2011	MUDD/Overton WMA	40.7	2370-40175	PU:OKO(M)	M
MUDD/Overton WMA/2011	RIRA/East Side	126.8	2430-61088	XX:BKB(M)	M

[1] KEPI = Key Pittman WMA, RIRA = River Ranch, PAHR = Pahranagat NWR, LIFI = Littlefield, MESQ = Mesquite, MUDD = Muddy River.

[2] **Color-band codes**: PU = pumpkin federal band, XX = standard silver federal band, TQ = turquoise federal band, (M) = metal pin striped band, R = red, O = orange, Y = yellow, B = light blue, K = black. Color combinations are read as the bird's left leg and right leg, top to bottom; two letters designate every band; color-band designations for right and left legs are separated with a colon.

[3] **Sex codes**: F = female, M = male.

Table 3.8. Juvenile Flycatchers Banded as Hatch Year Birds in a Prior Year and Identified as Adults for the First Time in 2012

Study Area/ Site Banded[1]	Year Hatched	Study Area/Site Detected 2012[1]	Distance Moved (km)	Federal Band #	Color Combination[2]	Sex[3]
MOME/Virgin River #1 (South)	2009	MESQ/West	27.2	2370-40072	OO(M):PU	F
STGE/Riverside Marsh	2010	STGE/Snipe Pond	6.3	2540-58160	DD(M):TQ	M
STGE/Riverside Marsh	2010	MOME/Virgin River #1 (South)	84.7	2430-61231	XX:KYK(M)	U
KEPI/Patch 3	2010	PAHR/North	29.6	2540-58199	TQ:BW(M)	M
BIWI/Planet Ranch Rd	2010	TOPO/Pipes #3[4]	81.0	2540-58116	TQ:KR(M)	M
KEPI/Patch 10	2011	KEPI/Patch 12	0.2	2540-58277	TQ:YY(M)	U
KEPI/Patch 7	2011	KEPI/Patch 0	0.7	2590-53112	BKB(M):XX	M
KEPI/Patch 6	2011	KEPI/Patch 4.5	0.4	2540-58179	GK(M):TQ	M
KEPI/Patch 6	2011	KEPI/Patch 3	0.6	2540-58178	BD(M):TQ	F
KEPI/Patch 4	2011	KEPI/Patch 7	0.5	2540-58247	OKO(M):TQ	F
KEPI/Patch 1	2011	KEPI/Patch 10.5	0.8	2540-58211	TQ:OW(M)	M
PAHR/North	2011	KEPI/Patch 2	29.6	2540-58285	TQ:YG(M)	M
PAHR/North	2011	PAHR/North	0.1	2430-61218	XX:OYO(M)	F
PAHR/North	2011	PAHR/North	0.3	2540-58114	YDY(M):TQ	F
PAHR/North	2011	PAHR/North	0.1	2430-61220	RGR(M):XX	F
PAHR/North	2011	PAHR/North	0.1	2540-58286	TQ:DYD(M)	F
MOME/Virgin River #1 (South)	2011	MESQ/West	27.0	2590-53107	XX:VKV(M)	M
MOME/Virgin River #1 (South)	2011	MESQ/West	27.3	2590-53117	YGY(M):XX	M
MOME/Virgin River #1 (South)	2011	MOME/Virgin River #1 (North)	1.9	2540-58174	TQ:WK(M)	F
MOME/Virgin River #1 (South)	2011	MUDD/Overton WMA	13.6	2540-58173	TQ:VW(M)	M

[1] STGE = St. George, KEPI = Key Pittman WMA, PAHR = Pahranagat NWR, MESQ = Mesquite, MOME = Mormon Mesa, MUDD = Muddy River, TOPO = Topock Marsh, BIWI = Bill Williams River NWR.

[2] **Color-band codes**: PU = pumpkin federal band, XX = standard silver federal band, TQ = turquoise federal band, (M) = metal pin striped band, R = red, O = orange, G = green, B = light blue, D = dark blue, V = violet, W = white, Y = yellow, K = black. Color combinations are read as the bird's left leg and right leg, top to bottom; two or three letters designate every band; color-band designations for right and left legs are separated with a colon.

[3] **Sex codes**: F = female, M = male, U = unknown.

[4] This individual was later recaptured at Beal Lake, where he held a territory from 23 May to 9 Jul.

Table 3.9. Adult Willow Flycatcher Within-Year Movements for All Individuals Identified at Two Different Study Areas in 2012

Start Study Area/Site[1]	End Study Area/Site[1]	Distance Moved (km)	Federal Band #	Color Combination[2]	Sex[3]
MESQ/West	KEPI/Patch 9	131.7	2590-53107	XX:VKV(M)	M
MOME/Virgin River #1 (North)	MUDD/Overton WMA	13.8	2540-58174	TQ:WK(M)	F
MOME/Virgin River #1 (South)	MESQ/Dumb Luck Bridge	28.4	2140-66709	Bs:GW(M)	M
MESQ/Dumb Luck Bridge	MOME/Virgin River #1 (South)	28.4	2140-66709	Bs:GW(M)	M

[1] KEPI = Key Pittman WMA, MESQ = Mesquite, MOME = Mormon Mesa, MUDD = Muddy River.

[2] **Color-band codes**: Bs = enameled blue federal band, XX = standard silver federal band, TQ = turquoise federal band, (M) = metal pin striped band, G = green, V = violet, K = black, W = white. Color combinations are read as the bird's left leg and right leg, top to bottom; two letters designate every band; color-band designations for right and left legs are separated with a colon.

[3] **Sex codes**: F = female, M = male.

DISCUSSION

Color-Banding Effort

Overall, 50% of the adult flycatchers detected at the monitoring sites during 2012 were banded by the end of the breeding season. This compares to 55, 57, 75, 70, 73, 69, 67, 66, and 52% in 2003–2011, respectively. Unbanded willow flycatchers with an undetermined residency status are included in calculating these percentages; therefore, in most cases, these numbers under-represent the actual proportion of resident banded flycatchers at a given site. Differences between study areas in the percentage of banded individuals are related to vegetation density and overall structure, which affect our ability to erect mist-nets in the habitat, and the percentage of adults that are residents. Topock Marsh and Bill Williams both had the lowest percentage of color-banded flycatchers because the number of resident adults was low in comparison to the total number of flycatchers detected.

Prior to 2008, we banded all nestlings with a single anodized federal band, identifying the bird as a returning nestling in the event it was sighted in a subsequent year. The individual would then have to be recaptured to determine its individual identity and to apply a unique color combination so the bird could be individually identified via resighting. The rationale for banding nestlings with a single anodized band was that the majority of nestlings do not return in subsequent years, resulting in the loss of a large number of unique color combinations. To eliminate the need to recapture returning nestlings, in 2008–2012 we applied unique color combinations to all nestlings. The use of full color combinations on nestlings in 2008–2011 has greatly reduced the number of adults with single federal bands, with only one detected across all study areas in 2012. Banding nestlings with full color combinations also allows us to record juvenile dispersal movements that might otherwise go undetected.

Adult and Juvenile Between-Year Dispersal

Adult and juvenile dispersal data for the 2012 field season show overall high site fidelity exhibited by adult flycatchers and lower natal site fidelity exhibited by juveniles, with juveniles dispersing among study areas. These dispersal data are consistent with the patterns observed at Reclamation study areas from 1998 to 2012, over which period 90% of adult returns were to the same study area, while only 49% of all juvenile returns were to the natal study area (McKernan and Braden unpubl. data; McLeod et al. 2008a; McLeod and Koronkiewicz 2009, 2010; McLeod and Pellegrini 2011, 2012). These dispersal data are also consistent with range-wide data (Paxton et al. 2007), with adult flycatchers exhibiting high site fidelity to breeding areas. Juvenile dispersal within the Virgin/lower Colorado River population(s) is largely limited to this region, and while reciprocal juvenile movements among geographically isolated flycatcher populations of the greater Southwest do occur, they are rare. Only three instances of willow flycatcher immigration from sites outside the Virgin/lower Colorado River region have been recorded since 1997 (McKernan and Braden unpubl. data, McLeod et al. 2008a), with two males originally banded as nestlings in 2003 at Roosevelt Lake recaptured in 2005 at Muddy River and Topock, and one male banded as a nestling in 1999 at Roosevelt Lake recaptured in 2002 in Grand Canyon. Although movements of this magnitude are infrequent, other instances of dispersal distances greater than 140 km have been reported for the Southwestern Willow Flycatcher (Paxton et al. 2007) and have been noted within the Virgin/lower Colorado River population (McLeod et al. 2008a, McLeod and Koronkiewicz 2010, McLeod and Pellegrini 2011). Banding studies at Roosevelt Lake and along the San Pedro River were discontinued after 2005, so immigration of juveniles produced in those areas after 2005 would have gone undetected.

The observed dispersal patterns fit well with the tenets of contemporary metapopulation theory (Hanski and Simberloff 1997), suggesting the Virgin/lower Colorado River population may be a panmictic sub-population of a greater metapopulation. Occasional juvenile dispersal between sub-populations is likely an important population variable in terms of gene flow, with movements contributing to an understanding of the observed patterns of high genetic diversity within and low genetic isolation among Southwestern Willow Flycatcher populations (Busch et al. 2000). Dispersal by juveniles or adults is required for the colonization of new breeding sites, and long-distance movements will be required if newly established Reclamation habitat creation sites are to be colonized. The closest known breeding sites are at Bill Williams River NWR and Topock Marsh, approximately 75–150 km from the PVER and CVCA habitat creation sites (see Chapter 2) and within the range of dispersal distances recorded within the Virgin/lower Colorado River population. The number of known returning nestlings since 1997 from Topock Marsh and Bill Williams River NWR are 21 and 5, respectively. Four of the Bill Williams nestlings have dispersed the 80 km between the two study areas, about the same distance from the Bill Williams study area to the PVER habitat creation sites. The most recent observation of a dispersing Bill Williams nestling is the 2012 territorial flycatcher in the Beal Lake habitat creation site, demonstrating long distance colonization of a habitat creation site is possible given relative habitat quality. However, the flycatcher population at Topock Marsh has been declining since 2004 (see Chapter 2), and no flycatcher young were produced at either Topock Marsh or Bill Williams in 2012 (see Chapter 4), reducing the likelihood of colonization from these sources.

The habitat creation sites could also be colonized by individuals from more distant breeding areas, such as those along the Virgin River. Although such long-distance movements are relatively infrequent, multiple instances of adult and juvenile dispersal between the Virgin River and Topock Marsh and Bill Williams River NWR have been documented in recent years (McLeod et al. 2008b; McLeod and Koronkiewicz 2009, 2010; McLeod and Pellegrini 2011). Physical connectivity of riparian habitats within the greater landscape is crucial in enabling these long-distance movements. Without adequate stop-over habitats and foraging areas, flycatchers attempting long-distance movements are more likely to be exposed to adverse environmental conditions.

Within-year, Between Study Area Movement

In 2012, we detected four within-year, between study area movements from three individuals. This is comparable to the number of movements in 2003–2011 where we detected between zero and seven (median = 2) movements per year. The double movement by one of the three individuals is the first recorded in this study.

Adult and Juvenile Survivorship

Annual survivorship is defined as the number of individuals that survive from one year to the next, and accurate estimates depend on year-to-year detection of uniquely marked birds. Fifty-five percent of the adult, resident willow flycatchers identified in 2011 were detected again in 2012, while of the 67 juveniles banded in 2011, only 15 (22%) were identified in 2012. Thus, minimum estimated adult and juvenile survival from 2011 to 2012 at all monitored sites was 55 and 22%, respectively. These simple annual percent survivorship calculations assume that all living flycatchers are detected in a given year, and individuals not detected are assumed to have died, unless detected elsewhere. To provide more robust estimates of annual survival, demographic data acquired from 2003 to 2012 will be combined with data collected during 1997–2002. Survival and detection probabilities will be estimated using program MARK (White and Burnham 1999) and presented in a summary report in 2012.

Chapter 4

NEST MONITORING

INTRODUCTION

Documentation of nest success and productivity is critical to understanding local population status and demographic patterns of the Southwestern Willow Flycatcher. In 2012, at all sites where willow flycatcher breeding activity was suspected, we conducted intensive nest searches and nest monitoring. Specific objectives of nest monitoring included identifying breeding individuals (see Chapter 3, Color-banding and Resighting), calculating nest success and failure, documenting causes of nest failure (e.g., abandonment, desertion, depredation, and brood parasitism), and calculating nest productivity. Nest monitoring results from 2012 were compared with those at the study areas from 1996 to 2011 (Braden and McKernan unpubl. data; McLeod et al. 2008a; McLeod and Koronkiewicz 2009, 2010; McLeod and Pellegrini 2011, 2012). Although aspects of willow flycatcher breeding ecology can vary widely across its broad geographical and elevational ranges throughout the Southwest (Whitfield et al. 2003), we compared monitoring results with range-wide data to identify specific variables that may contribute to the characterization of flycatcher breeding ecology throughout the lower Colorado and Virgin River riparian systems.

METHODS

Upon locating territorial willow flycatchers, regardless of whether a possible mate was observed, we conducted intensive nest searches following the methods of Rourke et al. (1999). Nest monitoring followed a modification of the methods described by Rourke et al. (1999) and the Breeding Biology Research and Monitoring Database (BBIRD) protocol by Martin et al. (1997).

Nests were located primarily by observing adult flycatchers return to a nest or by systematically searching suspected nest sites. Nests were monitored every two to four days after nest building was complete and incubation was confirmed. Nests at NDOW study areas were typically monitored less frequently (every three to four days or more) because of budgetary restrictions. During incubation and after hatching, nest contents were observed directly using a telescoping mirror pole to determine nest contents and transition dates. Nest monitoring during nest building and egg laying stages was limited to reduce the chance of abandonment during these periods. To reduce the risk of depredation (Martin et al. 1997), brood parasitism by the Brown-headed Cowbird, and premature fledging of young (Rourke et al. 1999), we observed nests from a distance with binoculars once the number and age of nestlings were confirmed. If no activity was observed at a previously occupied nest, the nest was checked directly to determine nest contents and cause of failure. If no activity was observed at a nest close to or on the estimated fledge date, we conducted a systematic search of the area to locate possible fledglings.

Per instructions from Reclamation biologists, we considered a willow flycatcher nest successful only if fledglings were observed near the nest or in surrounding areas. The number of young fledged from each nest was counted based on the number of fledglings actually observed. This method of determining success differs from that recommended by some nest monitoring protocols (e.g., Martin et al. 1997, Rourke et al. 1999), which consider a nest as successful if chicks are observed in the nest within two days of the estimated fledge date. The method we follow produces a conservative estimate of both nest success rate and number of fledges.

We considered a nest to have failed if (1) the nest was abandoned prior to egg laying (abandoned); (2) the nest was deserted with flycatcher eggs or young remaining (deserted); (3) the nest was found empty or destroyed more than two days prior to the estimated fledge date (depredated); (4) nestlings died in the nest despite being tended by the adults (nestlings died in nest); or (5) the entire clutch was incubated for an excess of 20 days (infertile/addled). For nests containing flycatcher eggs, parasitism was considered the cause of nest failure if (1) cowbird young outlived any flycatcher eggs or young, or (2) the disappearance of all flycatcher eggs coincided with the appearance of cowbird eggs.

During each nest check, we recorded date and time of the visit, observer initials, monitoring method (observation via binoculars or mirror pole), nesting stage, nest contents, and number and behavior of adults and/or fledges present onto standardized data forms (Appendix A) that included the nest or territory number and UTM coordinates. We calculated flycatcher nest success using both apparent nesting success (number of successful nests/total number of nests containing at least one flycatcher egg) and the Mayfield method (Mayfield 1961, 1975), which calculates daily nest survival to account for nests that failed before they were found. We assumed one egg was laid per day, and incubation was considered to start the day the last egg was laid (per Martin et al. 1997). The nestling period was considered to start the day the first egg hatched and end the day the first nestling fledged. If exact transition dates or dates of depredation events were unknown, we estimated the transition date as halfway between observations. For nests where fate was unknown, we used the last known date of activity to determine the number of observation days. To calculate Mayfield survival probabilities (MSP), we used the average length of each nest stage (2.12, 12.87, and 13.76 days for laying, incubation, and nestling stages, respectively) as observed in this study in 2003–2012 for nests where transition dates were known. Nest productivity was calculated as the number of young fledged per nesting attempt that produced at least one flycatcher egg. Fecundity was calculated as number of young produced per female over the breeding season. Parasitism rates were calculated as the percentage of nests with known contents that included at least one flycatcher egg and one cowbird egg.

In 2012, we attempted to addle cowbird eggs in easily accessible flycatcher nests at all study areas except Pahranagat. Pahranagat was not included because it is still part of the 5-year post-cowbird-trapping experiment. If the nest was accessible without a ladder, the cowbird egg was addled as soon as it was discovered. If a ladder was required, the cowbird egg was addled on the next regularly scheduled nest visit. Cowbird eggs were addled only if we could obtain a direct view of the nest contents from a secure location, either on the ground on or a ladder. We carefully removed the cowbird egg from the nest and placed it in a padded film canister. We then shook the canister vigorously for about one minute, incorporating sharp, jerky movements. The egg was then returned to the nest. The cowbird egg was not permanently removed from the nest so as not to mimic a partial depredation event, which might result in nest desertion. If a nest was found with a cowbird nestling already in the nest, or if a shaken cowbird egg still hatched, we removed the cowbird nestling from the nest.

All field personnel practiced egg addling with several button quail (*Coturnix chinensis*) eggs at the start of field season to determine how vigorously they could shake an egg without breaking it. Button quail eggs are slightly larger than cowbird eggs (19 x 25 mm vs. 16 x 21 mm) but provide a reasonable and easily available substitute. Shaken eggs were carefully opened to determine whether any damage to the internal structure of the egg was apparent. Field personnel varied in their ability to shake an egg to the point of causing internal damage without breaking the shell.

RESULTS

Reclamation Study Areas

Nest Monitoring

We documented 46 willow flycatcher nesting attempts at Pahranagat, Mesquite, Mormon Mesa, Muddy River, and Bill Williams; 38 of these nests were known to contain flycatcher eggs and were used in calculating nest success and productivity. Sixteen (42%) nests were successful and fledged young, and 22 (58%) failed. Nest success ranged from 0% at Mesquite and Bill Williams to 71% at Pahranagat (Table 4.1). For a comparison of apparent nest success at all monitoring sites from 1997 to 2012, see Table 4.2. No flycatcher pairs were detected at Topock Marsh in 2012.

Thirty-seven nesting females, of which all but three were known to have produced at least one egg, were followed through all of their nesting attempts. One additional paired female was documented for which no nesting attempt could be confirmed. Of the 37 nesting females, 26 had one nesting attempt and 10 had two nesting attempts. All 10 females with multiple nesting attempts renested after failed nests.

Table 4.1. Summary of Willow Flycatcher Nest Monitoring Results at Reclamation Study Areas, 2012

Study Area[1]	Site	Pairs	Nests	Nests with 1+ WE[2]	Successful Nests[3]	Failed Nests[3]	Nests with Unknown Fate	Parasitized Nests[4]
PAHR	North	12	14	14	10 (71)	4 (29)	0	0
	Total	*12*	*14*	*14*	*10 (71)*	*4 (29)*	*0*	*0*
MESQ	Dumb Luck Bridge	1	1	0	--	--	--	--
	West	3	5	5	0 (0)	5 (100)	0	4 (80)
	Total	*4*	*6*	*5*	*0 (0)*	*5 (100)*	*0*	*4 (80)*
MOME	Virgin River #1 North	1	1	1	1 (100)	0	0	0
	Virgin River #1 South	13	16	12	4 (33)	8 (67)	0	1 (8)
	Total	*14*	*17*	*13*	*5 (38)*	*8 (62)*	*0*	*1 (8)*
MUDD	Overton WMA	5	6	4	1 (25)	3 (75)	0	0
	Total	*5*	*6*	*4*	*1 (25)*	*3 (75)*	*0*	*0*
BIWI	Site #3	2	3	2	0	2 (100)	0	0
	Total	*2*	*3*	*2*	*0*	*2 (100)*	*0*	*0*
Overall Total		**37**	**46**	**38**	**16 (42)**	**22 (58)**	**0**	**5 (15)**

[1] PAHR = Pahranagat NWR, MESQ = Mesquite, MOME = Mormon Mesa, MUDD = Muddy River, BIWI = Bill Williams River NWR.

[2] WE = willow flycatcher egg.

[3] Only nests with at least one flycatcher egg were used in tallies and percentage calculations. Percentages are given in parentheses.

[4] Parasitized nests include all nests that contained at least one flycatcher egg and one cowbird egg, regardless of nest fate. Percentages include only nests with at least one flycatcher egg and for which contents could be determined.

Table 4.2. Willow Flycatcher Percent Apparent Nest Success Recorded at Reclamation Study Areas from 1996 to 2012*

Year	Pahranagat	Littlefield	Mesquite[1]	Mormon Mesa[2]	Muddy River	Grand Canyon	Topock	Bill Williams
1996	Nm[3]	Nm[3]	Nm[3]	Nm[3]	Nm[3]	Nc[5]	Nc[5]	Nm[3]
1997	Nm[3]	Nd[4]	67 (3)	42 (12)	Nc[5]	Nc[5]	Nc[5]	Nd[4]
1998	47 (19)	Nd[4]	0 (7)	70 (10)	Nm[3]	Nc[5]	53 (15)	Nd[4]
1999	60 (15)	Nm[3]	Nd[4]	45 (11)	Nm[3]	Nc[5]	38 (16)	100 (1)
2000	63 (16)	Nd[4]	50 (8)	38 (13)	100 (1)	Nc[5]	36 (11)	100 (1)
2001	50 (18)	Nd[4]	53 (17)	54 (13)	Nc[5]	Nc[5]	36 (14)	50 (4)
2002	33 (12)	Nd[4]	59 (17)	0 (9)	Nd[4]	Nd[4]	50 (6)	78 (9)
2003	91 (11)	Nd[4]	44 (18)	0 (10)	Nd[4]	Nd[4]	78 (9)	100 (2)
2004	76 (17)	50 (2)	24 (17)	50 (6)	Nd[4]	Bc[6]	45 (38)	Nd[4]
2005	58 (19)	Nd[4]	42 (12)	17 (6)	38 (8)	Nd[4]	24 (34)	100 (2)
2006	60 (15)	Nd[4]	55 (20)	50 (8)	44 (9)	0 (3)	23 (17)[7]	20 (5)
2007	67 (12)	Nd[4]	57 (14)	27 (11)	0 (6)	0 (1)	75 (8)	25 (8)
2008	80 (10)	Nd[4]	82 (11)	62 (13)	25 (8)	Nd[4]	13 (8)[8]	40 (5)[8]
2009	47 (17)[8]	0 (1)	21 (14)[8]	53 (17)	0 (8)	Nm[3]	50 (2)	33 (6)
2010	59 (17)	50 (2)	31 (13)	42 (12)	100 (3)	Nm[3]	50 (2)	18 (11)
2011	100 (7)	Nd[4]	29 (7)	39 (18)[8]	0 (5)[8]	Nm[3]	0 (1)	40 (5)
2012	71 (14)	Nd[4]	0 (5)	38 (13)	25 (4)	Nm[3]	Nd[4]	0 (2)

* Data from 1997 to 2002 are from Braden and McKernan (unpubl. data); these numbers have been verified with the raw data and may differ from those presented in earlier annual reports. Data from 2003 to 2007 are from McLeod et al. 2008a; data from 2008 to 2012 are in McLeod and Koronkiewicz 2009 and 2010; McLeod and Pellegrini 2010 and 2011, and this document, respectively. Total number of nests containing at least one flycatcher egg is indicated in parentheses.

[1] Study area includes the Hafen Lane, Mesquite East, Mesquite West, and Bunker Farm sites.

[2] Study area includes the Virgin River Delta at Lake Mead.

[3] Nm = study area not monitored.

[4] Nd = study area surveyed, no breeding documented.

[5] Nc = breeding confirmed, nest success not calculated.

[6] Bc = breeding confirmed, undetermined if nestlings from a single nest fledged.

[7] An additional three nests (18%) were suspected to have fledged but fledglings were not visually confirmed.

[8] Fate of one nest was unknown.

Nest Failure

Depredation was the major cause of nest failure for all study areas combined, accounting for 43% (13 of 30) of all failed nests (Table 4.3) and 59% (13 of 22) of nests that failed after flycatcher eggs were laid. Eight nesting attempts (27% of all failed nests) were abandoned prior to willow flycatcher eggs being laid, eight nests (27%) were deserted, and one nest (3%) failed due to parasitism by Brown-headed Cowbirds.

Table 4.3. Summary of Causes of Willow Flycatcher Nest Failure at Reclamation Study Areas, 2012*

Study Area[1]	Total # Nests	All Failed Nests	Abandoned	Deserted	Depredated	Parasitized	Addled
PAHR	14	4	0	1 (7)[2]	3(21)	0	0
MESQ	6	6	1 (17)[3]	1 (17)[4]	3 (50)	1 (17)	0
MOME	17	12	4 (33)	4(33)[5]	4 (33)	0	0
MUDD	6	5	2 (40)[3]	1 (20)[6]	2 (40)	0	0

Table 4.3. Summary of Causes of Willow Flycatcher Nest Failure at Reclamation Study Areas, 2012* (Continued)

Study Area[1]	Total # Nests	All Failed Nests	Abandoned	Deserted	Depredated	Parasitized	Addled
BIWI	3	3	1 (33)[3]	1 (33)[7]	1 (33)	0	0
Total	**46**	**30**	**8 (27)**	**8 (27)**	**13 (43)**	**1 (3)**	**0**

* All nesting attempts (those with and without flycatcher eggs) are included. Percentage of failed nests is shown in parentheses for each cause of failure.

[1] PAHR = Pahranagat NWR, MESQ = Mesquite, MOME = Mormon Mesa, MUDD = Muddy River, BIWI = Bill Williams River NWR.

[2] Deserted during incubation with three flycatcher eggs.

[3] One nest abandoned after cowbird parasitism.

[4] Deserted after 19 days incubation.

[5] Deserted during laying with one flycatcher egg.

[6] Deserted after partial depredation.

[7] Deserted after 14 days incubation.

Brood Parasitism

Five of 34[7] nests (15%) with flycatcher eggs and known contents were brood parasitized by Brown-headed Cowbirds (Table 4.4). Brood parasitism ranged from 0 to 80% and was highest at Mesquite (see Table 4.1). For nests containing flycatcher eggs, parasitism caused nest failure at one nest at which the parasitism event coincided with the disappearance of all flycatcher eggs. None of the other four parasitized nests fledged a flycatcher; two nests were depredated during incubation, one was depredated with flycatcher nestlings, and one was deserted after 19 days incubation. In 2012, nests that contained flycatcher eggs and were brood parasitized were not less likely to fledge flycatcher young than nests that were not parasitized (one-sided Fisher's exact test, $P = 0.065$).

Table 4.4. Fates of Willow Flycatcher Nests Parasitized by Brown-headed Cowbirds at Reclamation Study Areas, 2012*

Study Area[1]	Nest ID Code	Outcome[2]
MESQ	28A	Depredated during incubation
	30A	Depredated during incubation
	131A	Parasitized during incubation; two WE disappeared and one CE appeared; nest abandoned
	131B	Parasitized twice during incubation; first CE addled; deserted after 19 days incubation with one WE and two CE
	186A	Abandoned with one CE
MOME	4A	Depredated during nestling period; CE addled and did not hatch
MUDD	31A	Abandoned with one CE
BIWI	12B	Abandoned with two CE

* All nesting attempts are included.

[1] MESQ = Mesquite, MOME = Mormon Mesa, MUDD = Muddy River, BIWI = Bill Williams River NWR.

[2] WE = willow flycatcher egg, CE = cowbird egg.

[7] Table 4.1 shows a total of 38 nests known to contain at least one flycatcher egg. When calculating brood parasitism rates, however, four nests whose contents could not be determined (i.e., nests that were too high to check contents to determine presence/absence of cowbird eggs or nesting attempts that were discovered late in the nesting cycle) were excluded from calculations.

Cowbird Egg Addling

We attempted to addle cowbird eggs at three of the five parasitized nests that contained flycatcher eggs. Of the two remaining parasitized nests, one nest was depredated before the following visit when the cowbird egg would have been addled, and the parasitism event caused nest failure at the other nest. None of the cowbird eggs we addled hatched. One nest was depredated after three days of incubation. Two nests were incubated long enough (≥10 days) for any viable cowbird eggs to have hatched; one nest was depredated with flycatcher nestlings, and the other was abandoned after 19 days incubation.

Over the three years (2010–2012) of the egg addling program, the hatch rate of cowbird eggs was 11%, which is significantly less (Fisher's exact test, $P < 0.001$) than the 74% hatch rate observed in 2003–2009. The productivity of parasitized nests with known fate that were incubated long enough for flycatcher eggs to hatch has not increased under the addling program (0.63 young per nest in 2010–2012, vs. 0.67 young per nest in 2003–2009); however, sample size in 2010–2012 is small (n=8) and strongly influenced by a few instances of addled clutches and depredation events during the nestling period.

Mayfield Nest Success and Nest Productivity

Mayfield survival probability (MSP) ranged from 0.003 at Mesquite to 0.709 at Pahranagat and was 0.396 for all sites combined (Table 4.5). At all sites, 35 nestlings were confirmed to have fledged from 38 nests of known outcome (mean number of fledglings/nest = 0.92, SE = 0.20). Fecundity across study areas ranged from 0.00 to 1.92 young per female and averaged 0.95 (SE = 0.20) (Table 4.6).

Table 4.5. Daily Survival Rates and Mayfield Survival Probabilities (MSP) for Willow Flycatcher Nest Stages at Reclamation Study Areas, 2012*

Study Area	Nest Stage[1]	Nest Losses/ Observation Days	Daily Survival Rate	Mayfield Survival Probability
Pahranagat	1	0/22	1.000	1.000
	2	4/152	0.974	0.709
	3	0/129.5	1.000	1.000
	MSP all stages = 0.709			
Mesquite	1	0/3	1.000	1.000
	2	4/40	0.900	0.258
	3	1/3.5	0.714	0.010
	MSP all stages = 0.003			
Mormon Mesa	1	4/22	0.818	0.654
	2	0/118	1.000	1.000
	3	4/103.5	0.961	0.581
	MSP all stages = 0.380			
Muddy River	1	0/4	1.000	1.000
	2	3/14.5	0.793	0.051
	3	0/12	1.000	1.000
	MSP all stages = 0.051			
Bill Williams	1	0/4	1.000	1.000
	2	2/26	0.923	0.357
	3	--	--	--
	MSP all stages = N/A[2]			

Table 4.5. Daily Survival Rates and Mayfield Survival Probabilities (MSP) for Willow Flycatcher Nest Stages at Reclamation Study Areas, 2012* (Continued)

Study Area	Nest Stage[1]	Nest Losses/ Observation Days	Daily Survival Rate	Mayfield Survival Probability
Total	**1**	**4/55**	**0.927**	**0.852**
	2	**13/350.5**	**0.963**	**0.615**
	3	**5/248.5**	**0.980**	**0.756**
	MSP all stages = 0.396			

[*] Mayfield survival probability was calculated using 2.12-day egg laying, 12.87-day incubation, and 13.76-day nestling stages.

[1] 1 = egg laying, 2 = incubation, 3 = nestling.

[2] MSP cannot be calculated for all stages because of lack of data.

Table 4.6. Willow Flycatcher Nest Productivity (Young Fledged per Nest) and Fecundity (Young Fledged per Female) at Reclamation Study Areas, 2012*

Study Area	Young Fledged	# Nests	Productivity Mean (SE)	# Females	Fecundity Mean (SE)
Pahranagat	23	14	1.64 (0.32)	12	1.92 (0.31)
Mesquite	0	5	0.00 (0.00)	4	0.00 (0.00)
Mormon Mesa	9	13	0.69 (0.31)	14	0.64 (0.29)
Muddy River	3	4	0.75 (0.75)	5	0.60 (0.60)
Bill Williams	0	2	0.00 (0.00)	2	0.00 (0.00)
Total	**35**	**38**	**0.92 (0.20)**	**37**	**0.95 (0.20)**

* Productivity calculations include nests that contained flycatcher eggs and had a known outcome. Fecundity calculations include all females.

NDOW Study Areas

Nest Monitoring

We documented 34 willow flycatcher nesting attempts at Key Pittman and Warm Springs; 29 of these nests were known to contain flycatcher eggs and were used in calculating nest success and productivity. No pairs were detected at River Ranch in 2012. Eleven (38%) nests were successful and fledged young, and 18 (62%) failed. Nest success was 41% at Key Pittman and 0% at Warm Springs (Table 4.7).

Seventeen nesting females, all of which were known to have produced at least one egg, were followed through all of their nesting attempts. One additional female was documented for which no nesting attempt was found. Of the 17 nesting females, 5 had one nesting attempt, 7 had two nesting attempts, and 5 had three nesting attempts. Of the 12 females with multiple nesting attempts, 9 renested after failed nests, 2 renested after successful nests, and one renested after both successful and failed nests.

Nest Failure

Depredation was the major cause of nest failure, accounting for 65% (15 of 23) of all failed nests (Table 4.8) and 72% (13 of 18) of nests that failed after flycatcher eggs were laid. Five nesting attempts (22% of all failed nests) were abandoned prior to willow flycatcher eggs being laid, and two nests (9%) were deserted. One nest (4%) was incubated in excess of 20 days and no flycatcher eggs hatched.

Table 4.7. Summary of Willow Flycatcher Nest Monitoring Results at NDOW Study Areas, 2012

Study Area[1]	Site	Pairs	Nests	Nests with 1+ WE[2]	Successful Nests[3]	Failed Nests[3]	Nests with Unknown Fate[3]	Parasitized Nests[4]
KEPI	Patch 1	1	2	2	1 (50)	1 (50)	0	0
	Patch 2	1	2	2	1 (50)	1 (50)	0	0
	Patch 3	1	1	1	1 (100)	0	0	0
	Patch 5	1	1	1	0	1 (100)	0	0
	Patch 6	1	3	2	2 (100)	0	0	1 (50)
	Patch 7	2	4	3	0	3 (100)	0	2 (67)
	Patch 9	3	4	3	1 (33)	2 (67)	0	0
	Patch 10	2	5	4	2 (50)	2 (50)	0	1 (33)
	Patch 10.5	1	2	2	0	2 (100)	0	1 (50)
	Patch 11	1	3	3	1 (33)	2 (67)	0	0
	Patch 12	3	5	4	2 (50)	2 (50)	0	0
	Total	*17*	*32*	*27*	*11 (41)*	*16 (59)*	*0*	*5 (20)*
WMSP	Muddy Mac	1	2	2	0	2 (100)	0	0
	Total	*1*	*2*	*2*	*0*	*2 (100)*	*0*	*0*
Overall Total		**18**	**34**	**29**	**11 (38)**	**18 (62)**	**0**	**5 (19)**

[1] KEPI = Key Pittman WMA, WMSP = Warm Springs Natural Area.

[2] WE = willow flycatcher egg.

[3] Only nests with at least one flycatcher egg were used in percentage calculations. Percentages are given in parentheses.

[4] Parasitized nests include all nests that contained at least one flycatcher egg and one cowbird egg, regardless of nest fate. Percentages include only nests with at least one flycatcher egg and for which contents could be determined.

Table 4.8. Summary of Causes of Willow Flycatcher Nest Failure at NDOW Study Areas, 2012*

Study Area[1]	Total # Nests	All Failed Nests	Abandoned	Deserted	Depredated	Parasitized	Addled
KEPI	32	21	5 (24)[2]	2 (10)[3]	13 (62)	0	1 (5)
WMSP	2	2	0	0	2 (100)	0	0
Total	**34**	**23**	**5 (22)**	**2 (9)**	**15 (65)**	**0**	**1 (4)**

* All nesting attempts (those with and without flycatcher eggs) are included. Percentage of failed nests is shown in parentheses for each cause of failure.

[1] KEPI = Key Pittman WMA, WMSP = Warm Springs Natural Area.

[2] One nest abandoned with one cowbird egg.

[3] One nest deserted after parasitism; other nest deserted during incubation.

Brood Parasitism

Five of 27[8] nests (19%) with flycatcher eggs and known contents were brood parasitized by Brown-headed Cowbirds (Table 4.9). Brood parasitism was 20% at Key Pittman and 0% at Warm Springs (see Table 4.7). One parasitized nest successfully fledged a flycatcher. Of the four failed nests, one was deserted during laying with one flycatcher egg and one cowbird egg, and one was deserted after at least nine days of incubation. At one nest, the last flycatcher egg was depredated after 17 days incubation and the female continued to incubate the remaining cowbird egg, which had been addled. The fourth nest was incubated for 25 days with flycatcher eggs and a cowbird egg, which had been addled. In 2012, nests that

[8] Table 4.7 shows 29 nests known to contain at least one flycatcher egg. When calculating brood parasitism rates, however, two nests whose contents could not be determined (i.e., nests that were too high to check contents to determine presence/absence of cowbird eggs or nesting attempts that were discovered late in the nesting cycle) were excluded from calculations.

contained flycatcher eggs and were brood parasitized were not less likely to fledge flycatcher young than nests that were not parasitized (one-sided Fisher's exact test, $P = 0.447$).

Table 4.9. Fates of Willow Flycatcher Nests Parasitized by Brown-headed Cowbirds at NDOW Study Areas, 2012*

Study Area[1]	Nest ID Code	Outcome[2]
KEPI	19A	Abandoned with one CE
	25A	Deserted during laying with one WE and one CE
	40A	Deserted during incubation
	62B	Fledged one flycatcher. CE appeared halfway through incubation and was removed after the flycatcher hatched
	74C	One WE disappeared after 9 days of incubation; second WE disappeared after 17 days incubation; female incubated remaining egg (CE) for 2 more days and abandoned the nest with one CE
	87B	Incubated for 25 days; CE addled and no WE hatched

* All nesting attempts are included.

[1] KEPI = Key Pittman WMA.

[2] WE = willow flycatcher egg, CE = cowbird egg.

Cowbird Egg Addling

Five nests with flycatcher eggs at Key Pittman were parasitized; one nest was immediately deserted. We addled cowbird eggs at three of the remaining four nests; at the fourth nest, the cowbird egg appeared after at least 5 days of incubation and was removed after the flycatcher egg hatched. None of the cowbird eggs we addled hatched. At two nests, the cowbird egg was not incubated long enough to hatch; one of these nests was deserted during incubation several days after the parasitism event, and the other nest was parasitized after 10 days of incubation and deserted 7 days later. At the final nest, the parasitism event occurred 2 days into incubation and the female continued to incubate for another 15 days, at which point the last flycatcher egg disappeared.

Mayfield Nest Success and Productivity

Mayfield survival probability (MSP) was 0.375 at Key Pittman, 0.010 at Warm Springs, and 0.347 for both sites combined (Table 4.10). At all sites, 22 nestlings were confirmed to have fledged from 29 nests (mean number of fledglings/nest = 0.76, SE = 0.22). Fecundity (young fledged per female) was 1.29 at Key Pittman, 0.00 at Warm Springs, and 1.22 (SE = 0.33) at both study areas combined (Table 4.11).

Table 4.10. Daily Survival Rates and Mayfield Survival Probabilities (MSP) for Willow Flycatcher Nest Stages at NDOW Study Areas, 2012*

Study Area	Nest Stage[1]	Nest Losses/ Observation Days	Daily Survival Rate	Mayfield Survival Probability
Key Pittman	1	1/34	0.971	0.939
	2	12/244.5	0.951	0.523
	3	3/154.5	0.981	0.764
	MSP all stages = 0.375			

Table 4.10. Daily Survival Rates and Mayfield Survival Probabilities (MSP) for Willow Flycatcher Nest Stages at NDOW Study Areas, 2012* (Continued)

Study Area	Nest Stage[1]	Nest Losses/ Observation Days	Daily Survival Rate	Mayfield Survival Probability
Warm Springs	1	0/2	1.000	1.000
	2	1/21	0.952	0.534
	3	1/4	0.750	0.019
	MSP all stages = 0.010			
Total	**1**	**1/36**	**0.972**	**0.942**
	2	**13/265.5**	**0.951**	**0.524**
	3	**4/158.5**	**0.975**	**0.703**
	MSP all stages = 0.347			

* Mayfield survival probability was calculated using 2.12-day egg laying, 12.87-day incubation, and 13.76-day nestling stages.

[1] 1 = egg laying, 2 = incubation, 3 = nestling.

Table 4.11. Willow Flycatcher Nest Productivity (Young Fledged per Nest) and Fecundity (Young Fledged per Female) at NDOW Study Areas, 2012*

Study Area	Young Fledged	# Nests	Productivity Mean (SE)	# Females	Fecundity Mean (SE)
Key Pittman	22	27	0.81 (0.23)	17	1.29 (0.34)
Warm Springs	0	2	0.00 (0.00)	1	0.00
Total	**22**	**29**	**0.76 (0.22)**	**18**	**1.22 (0.33)**

* Productivity calculations include nests that contained flycatcher eggs and had a known outcome. Fecundity calculations include all females.

DISCUSSION

Reclamation Study Areas

Number of Breeding Flycatchers

In 2012, willow flycatcher nesting was documented at five Reclamation study areas (Pahranagat, Mesquite, Mormon Mesa, Muddy River, and Bill Williams). For the second year in a row, no flycatchers were documented at Littlefield, which held breeding flycatchers in 2009 and 2010 but was affected in December 2010 by floods that scoured the understory, deposited sediment, and shifted the course of Beaver Dam Wash away from the riparian vegetation. Given that southwestern riparian ecosystems experience dynamic change and are not ecologically static (Periman and Kelly 2000), willow flycatcher occupancy and nesting are likely to be affected by changes in habitat suitability, with breeding flycatchers detected at a given site in one year and not in another.

The number of flycatcher pairs recorded at Mormon Mesa and Muddy River was comparable to that recorded over the last several years. Only two breeding pairs were detected at Bill Williams. Although this is the lowest number recorded since 2004, when no breeding flycatchers were detected, the number of pairs at Bill Williams has fluctuated between three and seven over the last 10 years. Future years of monitoring are required to determine if the low number of breeding flycatchers detected in 2012 represents a temporary drop in the population. The number of pairs at Mesquite continued to decline, with only four pairs recorded in 2012, compared to seven pairs in both 2011 and 2010, and 11–15 pairs in the previous four years. The main breeding site at Mesquite was dry in 2009 and nesting success was poor that year (McLeod and Koronkiewicz 2010). Flycatchers appeared to respond to the poor conditions by

returning to other breeding sites in 2010 rather than returning to Mesquite (McLeod and Pellegrini 2011), and the number of breeding flycatchers at Mesquite was consequently reduced. The main breeding site at Mesquite was wet at the beginning of the 2011 breeding season but became completely dry by the middle of the season (McLeod and Pellegrini 2012). Water was present intermittently in 2012 and did not reach the same areal extent as in previous years, and qualitative habitat observations indicated that canopy cover in portions of the site was reduced in comparison to previous years (see Chapter 2). Site fidelity to Mesquite of returning adult flycatchers was again low in 2012 (see Chapter 3), further suggesting poor habitat quality.

In 2011, Pahranagat had six breeding pairs, the lowest number recorded since 2003 (range 8–15 pairs). The number of flycatchers at Pahranagat rebounded in 2012 to 12 pairs, suggesting that the dip in flycatcher numbers observed in 2011 was a temporary decline. Lake levels were also at their highest since dam repairs in 2010. Despite this, the amount of surface water within the main breeding site at Pahranagat was much reduced in 2008–2012 compared to prior years, and we continued to observe a shift in the spatial distribution of nests within the main breeding site at Pahranagat, with nest locations moving away from the interior of the site, which was formerly inundated, and toward the periphery of the site, which is still in close proximity to surface water.

For the first time since flycatcher studies began in 1996, no breeding flycatchers were detected at Topock Marsh, and we detected only two resident flycatchers. The number of resident flycatchers at Topock has been declining steadily since 2004. Low water levels in Topock Marsh and a decline in the amount of inundated riparian vegetation likely contributed to the decline in flycatcher populations (see Discussion in Chapter 2).

Nest Success

Nest success alone is an incomplete measure of the production of young. Successful nests produce from one to four young, and variations in nest productivity are not reflected in nest success rates. In addition, although every failed nest attempt lowers percent nest success and MSP, success of a subsequent nesting attempt may result in the same number of young produced as if the initial nesting attempt had been successful. Thus, nest productivity (young produced per nesting attempt) and fecundity (young produced per female) in conjunction with nest success provide additional information on the success of a given breeding season. From 2003–2011, average productivity and fecundity at Pahranagat were the highest recorded at any Reclamation study area. In 2012, nest success (71%), productivity (1.64 young per nest), and fecundity (1.92 young per female) at Pahranagat were again the highest recorded at any Reclamation study area, demonstrating that Pahranagat continues to be a highly productive site for willow flycatchers.

For the first time in any year from 2003 to 2012, no flycatcher nests were successful at Mesquite. Surface water was present intermittently in 2012, and dry conditions may be related to poor flycatcher reproduction (Moore and Ahlers 2008). In addition to there being fewer flycatcher pairs at Bill Williams in 2012 than in most prior years, nest success at Bill Williams was zero for the first time in any year that nesting has been recorded. However, sample sizes at Bill Williams are too low to attribute much significance to the rates observed in any given year, and further years of monitoring are necessary to determine whether the low reproductive success observed in 2012 is part of a larger trend. Muddy River, which also has small sample sizes, continued to exhibit annual fluctuations in reproductive metrics. Fecundity at Muddy River was 0.6 in 2012, but has varied from 0 (in 2007, 2009, and 2011) to 1.75 (in 2010). Habitat conditions within the main breeding area at Muddy River were also the driest on record in any year since monitoring began in 2005. Nest success results again illustrate that the demographic patterns of passerine populations often vary year to year, and sometimes to a very large degree (Wiens 1989a). The variable patterns of nest success observed at the study areas over many years demonstrate the need for long-term data.

Although percent nest success at Mormon Mesa was unchanged in 2010–2012, fecundity in 2012 was approximately half that recorded in any year from 2008 to 2011. Average clutch size at Mormon Mesa in 2012 was 1.6 eggs per nest, the lowest recorded in any year since 2003 (range 1.9–2.9, median 2.4). Tamarisk within the Mormon Mesa study area was completely defoliated by tamarisk beetles in late May, when flycatchers were initiating their first nest attempts, and did not partially refoliate until early July. This unusually early defoliation may have allowed flycatchers to select nest sites that were least affected by defoliation, and qualitative observations suggest that nest locations at Mormon Mesa were more closely tied to stands of native vegetation in 2012 than in previous years. However, overall habitat quality likely affected reproductive success.

Nest Failure

As in 2003–2011, depredation was the major cause of willow flycatcher nest failure for all study areas combined, accounting for 43% of all failed nests in 2012. These results are consistent with those reported at the Reclamation study areas from 1998 to 2002 (Braden and McKernan unpubl. data) and at sites across Arizona from 1996 to 2008 (Graber et al. 2007, Ellis et al. 2008, Graber and Koronkiewicz 2009), which indicate depredation as accounting for the majority of all willow flycatcher nest failures. Factors influencing the increases and decreases in nest depredation at the monitored study areas are inherently complex and at this time remain undetermined. For open-cup nesting passerines, nest depredation rates can vary year to year, and sometimes substantially, with depredation of eggs and young ultimately linked to landscape characteristics and fluctuations in predator densities, abundance, and richness (Wiens 1989b, Robinson 1992, Howlett and Stutchbury 1996).

We observed several instances of nest desertion at Mormon Mesa, with desertion causing as many nest failures as depredation. While nest desertion is not uncommon, it often follows a partial depredation event. All four instances of nest desertion at Mormon Mesa in 2012 occurred during egg laying, and the nest was deserted with one flycatcher egg and no evidence of depredation events or other disturbance to the nest. Mormon Mesa was defoliated by tamarisk beetles by late May in 2012, and nest desertion may be suggestive of poor habitat quality.

Brood Parasitism

Brood parasitism by Brown-headed Cowbirds across all Reclamation study areas ranged from 0 to 80% and averaged 15% (see Table 4.1). These results are consistent with those reported at the study areas from 1998 to 2010 (Braden and McKernan unpubl. data; McLeod et al. 2008a; McLeod and Koronkiewicz 2009, 2010; McLeod and Pellegrini 2011, 2012), but these parasitism rates are higher than those reported at other monitored sites across Arizona in 1996–2006, which were less than 10% at most sites in most years (Graber et al. 2007, Ellis et al. 2008).

We observed multiple occasions in which the disappearance of flycatcher eggs coincided with the parasitism event. In this case, cowbirds were suspected of ejecting the eggs. Female Brown-headed Cowbirds are known to physically attack willow flycatcher nestlings (Woodward and Stoleson 2002), remove single eggs, and occasionally destroy entire broods after laying is complete or after hatching (Lowther 1993 as cited in Woodward and Stoleson 2002). In addition, cowbirds were photographed removing eggs from artificial nests during a camera study completed in 2008–2010 by Northern Arizona University (NAU), and cowbirds were documented on video depredating flycatcher nests during both the incubation and nestling phases. In the Virgin Valley, only cowbirds were documented depredating flycatcher nests. The NAU camera study documented other avian predators at both artificial and flycatcher nests in other areas, with diversity of predators correlated to the diversity of the local avian community. While it is possible that other species, such as Yellow-breasted Chats, are also responsible

for some depredation events, it is likely that many depredation events on eggs and nestlings are attributable to cowbirds.

Parasitism does not invariably cause nest failure, but the success rate (19%) for parasitized nests at all study areas in 2003–2012 was less than half that of unparasitized nests (49%). Similar results were recorded for willow flycatchers in Oregon, with parasitism resulting in a 50% decrease in success rates compared to unparasitized nests (Sedgwick and Iko 1999) and at other sites in Arizona, where in 1996–2005, 20% of parasitized nests fledged flycatcher young vs. 57% of unparasitized nests (Ellis et al. 2008). Parasitized nests that did succeed in fledging flycatcher young at all study areas in 2003–2012 produced on average fewer young (1.3 young/nest) than did unparasitized nests (2.2 young/nest; $F_{1,273} = 22.74$, $P < 0.001$). Cowbirds may eject flycatcher eggs during the parasitism event, thus reducing clutch size, and cowbird young also cause interspecific nestling competition, as evidenced by the presence of severely underdeveloped nestlings in some parasitized nests. For all nests monitored from 2003 to 2012, 42% of nests that fledged a cowbird also fledged flycatcher young. This is a higher rate of success than that observed in Southwestern Willow Flycatchers at Kern River, California (9%; Whitfield and Sogge 1999), but comparable to that observed at other Arizona sites (40%; Ellis et al. 2008).

Female flycatchers may desert their nests after parasitism events and thus expend energy renesting and laying additional eggs. Given that adult flycatchers exhibit high site fidelity to breeding areas (Braden and McKernan unpubl. data; McLeod et al. 2008a; McLeod and Koronkiewicz 2009, 2010; McLeod and Pellegrini 2011, 2012; this document) and renest most often after failed nests (Sedgwick 2000), females returning to sites with high brood parasitism may have reduced lifetime fecundity because they are expending energy on multiple failed nesting attempts over many years. An analysis of lifetime fecundity of females will be included in the summary report in 2012. In addition, willow flycatchers that fledge late in the season have been shown to have a lower survival rate than those that fledge early in the season (Paxton et al. 2007, McLeod et al. 2008a), suggesting additional hidden effects of parasitism and subsequent renesting on flycatcher demography.

Cowbird trapping and removal studies were initiated at Pahranagat, Mesquite, and Topock Marsh in 2003 and continued through 2007. Results of these studies showed that cowbird trapping appeared to lower parasitism rates in comparison to the pre-trapping period of 1998–2002 only at Pahranagat, with no parasitism detected during trapping years (McLeod et al. 2008a). No cowbird trapping was completed in 2008–2011, but even in the absence of cowbird trapping, no parasitism events were detected at Pahranagat in 2008, 2009, 2011, or 2012. One parasitism event was noted in 2010, and the nest was abandoned before flycatcher eggs were laid. This nest was located on the very edge of the site, adjacent to open, upland habitat, possibly increasing parasitism probability. These observations suggest that cowbird trapping may have lingering effects beyond the years in which trapping is completed, but it seems unlikely that lingering effects could continue for five years after the cessation of trapping. Without quantifiable data on the abundance of cowbirds in the Pahranagat study area, it is impossible to determine whether trapping affected local cowbird abundance and how long those effects may have lasted.

Cowbird Egg Addling

We did not include NDOW study areas in our quantitative analysis of the effects of egg addling because we do not have nest monitoring data from before 2010, when the addling program began, with which to compare. Addling cowbird eggs markedly reduced the cowbird hatch rate at Reclamation study areas, and no female flycatcher at any study area deserted her nest in response to egg addling. Although the addling program has not increased nest productivity, small sample sizes in 2010–2012 and the proportionally larger effect of instances of depredation and addled flycatcher clutches may obscure any positive effects of addling cowbird eggs. It is clear from nest monitoring data collected in 2003–2009 that parasitized flycatcher nests in which the cowbird egg(s) never hatched fared better than nests that had a cowbird

nestling. Apparent nest success of parasitized nests that hatched at least one flycatcher but no cowbirds (64%) did not differ significantly from nests with both flycatcher and cowbird nestlings (52%, Fisher's exact test, $P = 0.73$). However, parasitized nests that hatched at least one flycatcher and no cowbirds produced an average of 1.40 flycatchers per nest, compared to 0.57 flycatchers per nest in nests with a cowbird nestling ($t = 2.79$, $df = 13.47$, $P = 0.015$). Additionally, the percentage of flycatcher nestlings that survived to banding age (8 days) in nests that did not hatch cowbird eggs (95%) was significantly higher (Fisher's exact test, $P = 0.004$) than the proportion (58%) in nests with cowbird nestlings. Because parasitized nests in which the cowbird eggs fail to hatch produce, on average, more flycatcher fledglings than nests with a cowbird nestling, we recommend that the addling program be continued. Field personnel should also continue to practice egg addling with button quail eggs at the beginning of the season to maximize the effectiveness of shaking eggs in preventing hatching.

NDOW Study Areas

Some measures of nesting (number of breeding pairs, Mayfield nest success) were similar at Key Pittman in 2010, 2011, and 2012. Productivity (1.23, 1.03, and 0.81 in 2010, 2011, and 2012, respectively) and fecundity (2.06, 1.88, and 1.29 in 2010, 2011, and 2012, respectively) have declined each year, but there were no statistically significant differences in either fecundity or productivity between years. Part of the decline in flycatcher production may be the result of a decline in average clutch size (3.01, 2.90, and 2.76 in 2010, 2011, and 2012, respectively). Future monitoring at Key Pittman is needed to determine whether these declines represent a temporary reduction in reproductive output or are part of a larger trend.

As in 2011, there was one breeding flycatcher pair at Warm Springs in the one patch of suitable habitat that was unaffected by a fire during the breeding season of 2010. No breeding flycatchers were detected at River Ranch. None of the four nests at River Ranch was successful in 2011, and of the seven banded, resident flycatchers detected at River Ranch in 2011, six were detected at Pahranagat or Key Pittman either later in 2011 or during the 2012 breeding season. Low nest success in 2011 and low site fidelity are indicative of poor habitat quality at River Ranch.

Chapter 5

MANAGEMENT AND STUDY DESIGN RECOMMENDATIONS

For ease of reference this chapter summarizes all study design and management recommendations discussed in previous chapters.

BROADCAST SURVEYS AND SITE ASSESSMENT

Pahranagat South was affected prior to the start of the 2010 survey season by a fire that removed the understory and damaged the overstory trees. We visited this site at the beginning of the 2012 season to assess the vegetation. The understory contains Indian hemp and some small patches of coyote willow 3 m in height. While suitable understory components are now present, they are not currently of sufficient size to resemble typical occupied willow flycatcher habitat. We recommend reassessing this site in future years.

Littlefield Poles was affected in December 2010 by a flood that heavily scoured much of the surrounding area. Stand density and vegetation height were negatively impacted by the flood, and sediment deposition moved the flow of Beaver Dam Wash away from the site. We reassessed the site during the 2012 breeding season. The site still has low canopy closure and no surface water within 40 m of the vegetation, and thus it does not currently resemble typical occupied flycatcher breeding habitat. We recommend reassessing the site at the beginning of future breeding seasons to determine whether the vegetation and hydrology have recovered to the point where breeding flycatchers might be supported.

We reassessed Pioneer Road at Littlefield during the 2012 field season. Vegetation appeared to have matured slightly since our last visit, but soils were still dry. This site could provide suitable habitat if saturated soils were present. We recommend reassessing the site if flood events occur that have the potential to alter the hydrology within the site.

We assessed several new sites in the area of Mesquite, Nevada. Some of these sites could provide suitable flycatcher habitat if saturated soils were present or if the size or extent of native vegetation increased. We recommend reassessing Backyard, Ball Park, Up the Creek, and Electric Avenue Pond at the beginning of future breeding seasons to determine if the hydrology has changed or vegetation has matured. Two other sites, Left Foot and Boomerang, contain vegetation that is too short or sparse to be considered suitable habitat, and we do not recommend visiting these sites in the future.

We reassessed Bunker Marsh North at the start of the 2012 season. The site was completely dry, and the vegetation consists primarily of tamarisk, which is unsuitable for flycatchers when it is defoliated. We do not recommend visiting this site in future years.

Virgin River #1 South at Mormon Mesa consists of two disjunct areas. We visited the southern section at the beginning of the breeding season and discontinued surveys in this portion of the site because no surface water was present. We recommend discontinuing surveys in the southern portion of this site until another flood event occurs that has the potential to alter the hydrology within the site.

Virgin River #2 at Mormon Mesa received extensive sedimentation ranging in depth from 15 to 60 cm as a result of the December 2010 flood. The Virgin River flows along the eastern edge of the site, but a high bank prevents water from entering the site. Many of the Goodding willow within the site are dead or dying, and canopy closure within portions of the site was dramatically reduced by tamarisk defoliation

during the 2012 season. We recommend discontinuing surveys at this site except for the stand of Goodding willow at the northern end of the site, which should be evaluated at the beginning of future breeding seasons.

We assessed one new site, Bluff, at Mormon Mesa. This site contains clumps of 3-m-tall tamarisk interspersed with arrowweed and was completely dry during our visit. We do not recommend visiting this site in the future.

We visited lower Grand Canyon in July 2012 and assessed several former survey sites. The Iceberg Canyon site and a patch of willows to the southeast of the Iceberg Canyon site have the best potential to develop into suitable flycatcher habitat, and we recommend visiting this area in future years if it remains accessible. If lake levels continue to drop, potentially suitable patches of vegetation may also develop along newly exposed sediments between Bradley Bay and Iceberg Canyon, and we recommend visits to this stretch of river in future years to assess the development of the vegetation.

At Bill Williams River NWR, we visited a new area, Guinness, to the east of Site #3. It is dominated by a patchy overstory of Goodding willow 10–15 m in height, with an understory of 5–6-m-tall tamarisk. A stream bisecting the site held water in May but was reduced to isolated pools in June and July. We recommend adding Guinness to the biennial survey schedule and reassessing the site if a flood event occurs that has the potential to alter its hydrology.

We reassessed Black Rail at Bill Williams NWR. Vegetation at this site is multi-layered and has areas with canopy closure up to 90%. Standing water was present throughout the site in May, but only damp soils remained by June. We recommend adding this site to the annual survey schedule.

HABITAT IMPROVEMENT

Water levels in the southern portion of Overton WMA at Muddy River have been slowly receding since 2010, and no new beaver activity was noted in 2011 or 2012. In 2012, no standing water was present in the southern breeding area downstream of a diversion that channels water to a ditch along the road, and only a little saturated soil was noted within the southern breeding area at the beginning of the season. However, water was still present in the ditch along the road throughout the season. We recommend assessing the area of the diversion, where water formerly flowed into the southern end of the site, to determine if modifications to the stream channel would allow flow to be restored.

COWBIRD CONTROL

In 2010–2012, we addled cowbird eggs in easily accessible flycatcher nests, and this reduced the hatch rate of the cowbird eggs and did not cause desertion of any nests by the flycatchers. It is clear from nest monitoring data collected in 2003–2009 that parasitized flycatcher nests in which the cowbird egg(s) never hatched produced, on average, more flycatcher fledglings than nests that had a cowbird nestling. We recommend this addling program be continued in the future.

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Appendix A

FIELD DATA FORMS

Willow Flycatcher (WIFL) Survey and Detection Form (revised April 2010)

Site Name_____ State_____ County _____
USGS Quad Name _____ Elevation _____ (meters)
Creek, River, Wetland, or Lake Name_____
Is copy of USGS map marked with survey area and WIFL sightings attached (as required)? Yes___ No____

Survey Coordinates: Start: E_____ N_____ UTM Datum_____(See instructions)
Stop: E_____ N_____ UTM Zone _____
If survey coordinates changed between visits, enter coordinates for each survey in comments section on back of this page.

***** Fill in additional site information on back of this page *****

Survey # Observer(s) (Full Name)	Date (m/d/y) Survey time	Number of Adult WIFLs	Estimated Number of Pairs	Estimated Number of Territories	Nest(s) Found? Y or N If Yes, number of nests	Comments (e.g., bird behavior; evidence of pairs or breeding; potential threats [livestock, cowbirds, *Diorhabda* spp.]). If *Diorhabda* found, contact USFWS and State WIFL coordinator	GPS Coordinates for WIFL Detections (this is an optional column for documenting individuals, pairs, or groups of birds found on each survey). Include additional sheets if necessary.			
Survey # 1 Observer(s)	Date						# Birds	Sex	UTM E	UTM N
	Start									
	Stop									
	Total hrs									
Survey # 2 Observer(s)	Date						# Birds	Sex	UTM E	UTM N
	Start									
	Stop									
	Total hrs									
Survey # 3 Observer(s)	Date						# Birds	Sex	UTM E	UTM N
	Start									
	Stop									
	Total hrs									
Survey # 4 Observer(s)	Date						# Birds	Sex	UTM E	UTM N
	Start									
	Stop									
	Total hrs ___									
Survey # 5 Observer(s)	Date						# Birds	Sex	UTM E	UTM N
	Start									
	Stop									
	Total hrs									
Overall Site Summary Totals do not equal the sum of each column. Include only resident adults. Do not include migrants, nestlings, and fledglings. Be careful not to double count individuals. Total Survey Hrs_____		Total Adult Residents	Total Pairs	Total Territories	Total Nests	Were any Willow Flycatchers color-banded? Yes___ No ___ If yes, report color combination(s) in the comments section on back of form and report to USFWS.				

Reporting Individual _____ Date Report Completed_____ _____
US Fish and Wildlife Service Permit #_____State Wildlife Agency Permit #_____
Submit form to USFWS and State Wildlife Agency by September 1st. Retain a copy for your records.

Fill in the following information completely. Submit form by September 1st. Retain a copy for your records.

Reporting Individual _____ Phone # _____
Affiliation _____ E-mail _____
Site Name _____ Date Report Completed _____
Was this site surveyed in a previous year? Yes___ No ___ Unknown ____
Did you verify that this site name is consistent with that used in previous years? Yes ____ No _____ Not Applicable ___
If site name is different, what name(s) was used in the past? _____
If site was surveyed last year, did you survey the same general area this year? Yes ____ No ____ If no, summarize below.
Did you survey the same general area during each visit to this site this year? Yes ____ No ____ If no, summarize below.

Management Authority for Survey Area: Federal____ Municipal/County ____ State ____ Tribal ____ Private ____
Name of Management Entity or Owner (e.g., Tonto National Forest) _____

Length of area surveyed: _____ (km)

Vegetation Characteristics: Check (only one) category that best describes the predominant tree/shrub foliar layer at this site:

_____ Native broadleaf plants (entirely or almost entirely, > 90% native)

_____ Mixed native and exotic plants (mostly native, 50 - 90% native)

_____ Mixed native and exotic plants (mostly exotic, 50 - 90% exotic)

_____ Exotic/introduced plants (entirely or almost entirely, > 90% exotic)

Identify the 2-3 predominant tree/shrub species in order of dominance. Use scientific names.

_____

Average height of canopy (Do not include a range): _____ (meters)

Attach the following: 1) copy of USGS quad/topographical map (REQUIRED) of survey area, outlining survey site and location of WIFL detections; 2) sketch or aerial photo showing site location, patch shape, survey route, location of any detected WIFLs or their nests; 3) photos of the interior of the patch, exterior of the patch, and overall site. Describe any unique habitat features in Comments.

Comments (such as start and end coordinates of survey area if changed among surveys, supplemental visits to sites, unique habitat features. Attach additional sheets if necessary.

_____
_____
_____
_____
_____
_____

Territory Summary Table. Provide the following information for each verified territory at your site.

Territory Number	All Dates Detected	UTM E	UTM N	Pair Confirmed? Y or N	Nest Found? Y or N	Description of How You Confirmed Territory and Breeding Status (e.g., vocalization type, pair interactions, nesting attempts, behavior)

Attach additional sheets if necessary

SWFL General Site Description

[Complete at least 3 times during season: early (10–25 May), mid-season (10–25 June), and late season (10–25 July)]

General Info

Study Area: _____ **Survey Site:** _____ **Date:** _____

Observer(s): _____ **early**_____ **mid**_____ **late** _____ **other**_____

Vegetation

Vegetation at site: >90% native 50–90% native 50–90% exotic >90% exotic

Canopy closure: <25% 25–50% 50–70% 70–90% >90%

Overstory height (m): _____ **Dominant overstory species:** TASP SAGO SAEX POFR Other _____

Understory height (m): _____ **Dominant understory species:** TASP SAGO SAEX PLSE Other_____

Other vegetation types present (e.g., cattail)? Yes No

If yes, type of vegetation: _____ **percentage of site:**_____

type of vegetation: _____ **percentage of site:**_____

type of vegetation: _____ **percentage of site:**_____

Hydrology

% of site inundated: _____

Describe type of surface water (e.g., open marsh, surface water within woody vegetation, stream, etc):

_____

Average depth of surface water:

toes (<5cm) ankles (5-15 cm) calves (15-40 cm) knees (40-60 cm)
thighs (60-80 cm) waist (100 cm) too deep to wade (>100 cm)

% of site with saturated soils (do not include inundated areas in percentage!): _____

% of site with damp soils (do not include inundated or saturated areas): _____

If not inundated or saturated, distance (m) to standing water or saturated soil:_____

How was distance determined? Visually estimated in field Measured in field using GPS

Measured from aerial photograph Other _____

Describe type of nearest surface water: _____

Narrative and Pictorial Description

Does this description cover the entire site? Y N **If not, which portion is described?**_____

_____

On the reverse, sketch and label the locations of the major vegetation types you observed. Delineate marshes, open areas, and other habitat that may be unsuitable for flycatchers. If water was present, show its location.

Give a narrative description of the site, including adjacent habitats:

_____
_____
_____
_____
_____
_____
_____
_____

Additional comments:_____
_____
_____

STUDY AREA: _____ **SITE**: _____ **BANDER**: _____ **DATE**: _____ **TIME**: _____ **TERR/NEST #**: _____

UTM NAD___ **Zone**___ _____ **E** _____ **N** **NBN:** ____ of ____

NOTES:_____

FEDERAL BAND #	COLOR COMBO		STATUS	SEX	AGE	FECAL SAMPLE? (Y or N)	GENETIC SAMPLE? (Y or N)	# PHOTOS TAKEN
	L	R						

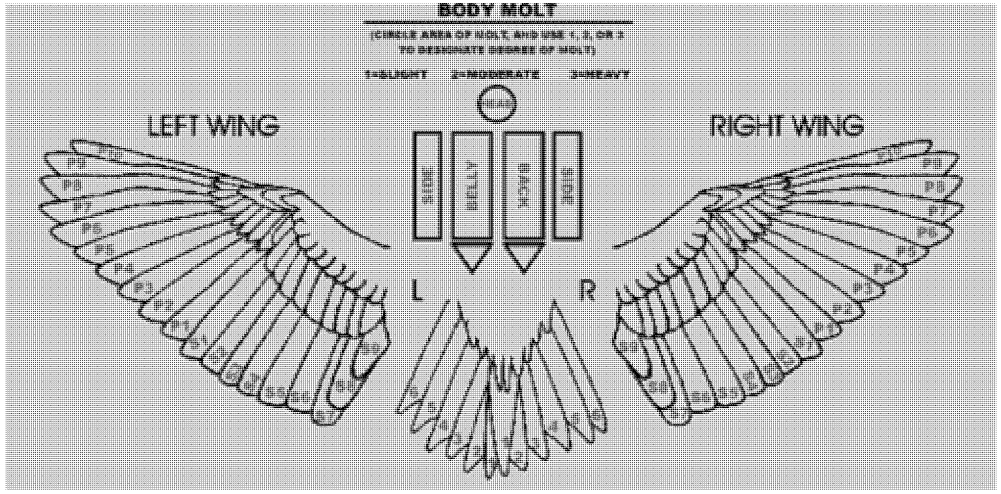
STATUS: NCP = new cap passive, NCT = new cap target, RCP = recap passive, RCT = recap target, NBN = nestling banded
SEX: U = unknown, F = female, M = male
AGE: AHY = after hatch year; SY = second year; L = nestling banded in nest; HY = hatch year/young of the year

Adults								
CP	BP	WING CHORD (mm)	TAIL (mm)	CULMEN LENGTH (mm)	CULMEN WIDTH (mm)	FAT	RETAINED FEATHERS?	ACTIVE MOLT?
							Y or N, if Y use diagram, detail in notes	

Nestlings	
Developmental Age (days)	MASS (g)

CP: 0 = non-breeding, S = partial breeding, M = full breeding
BP: 0 = none, 1 = smooth, 2 = vascularized and filled with fluid, 3 = wrinkled, 4 = molting
FAT: 0 = no fat; 1 = trace of fat in furculum, deeply concave, scattered patches, less than 5 percent filled; 2 = thin layer of fat in furculum, less than a third filled, trace of thin layer of fat in abdomen; 3 = furculum is ½ filled or more; small patches, not covering some areas, on abdomen; 4 = furculum more than 2/3 filled, level with clavicles, slightly mounded on abdomen

If a genetic sample or metric was not taken, explain why in notes



Date:_____ Page ____ of _____

				COLOR COMBO							
OBS	STUDY AREA	TERR	NEST	LEFT LEG	RIGHT LEG	CONF LEVI.	CAP?	# WIFLS	SEX	NBN (__of __)	OBSERVATIONS AND COMMENTS: discuss observations & activities. **If you assign gender, explain!**
											Service Band Number=
											Service Band Number=
											Service Band Number=
											Service Band Number=
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											Service Band Number=

Willow Flycatcher Territory/Nest Record Form

Year _____ Study Area_____ Survey Site_____ Territory/Nest no._____

Territory/Nest Location:
NAD:_____ Zone:_____

Territory UTMs:

Easting:_____

Northing:_____

GPS Accuracy: _____m

Nest UTMs:

Easting:_____

Northing:_____

GPS Accuracy: _____m

Nest Height:_____ m (approx)

Nest Substrate:_____(e.g., TASP=tamarisk, SAGO–Goodding willow, SAEX – coyote willow, etc.)

Distance to standing water or saturated soil:

When nest found: _____(m) Date _____ How determined? _____

UTME_____ UTMN_____ Accuracy _____

Depth of surface water at nest (circle how wet you got when nest was found):

dry damp muddy toes (<5cm) ankles (5-15 cm) calves (15-40 cm)

knees (40-60 cm) thighs (60-80 cm) waist (100 cm) too deep to wade (>100 cm)

At hatch: _____(m) Date _____ How determined? _____

UTME_____ UTMN_____ Accuracy _____

At fledge/fail: _____(m) Date _____ How determined? _____

UTME_____ UTMN_____ Accuracy _____

PLEASE DO NOT FILL OUT ANYTHING BELOW

Bird 1: Color band combination:_____ **Band Number:**_____Female

Bird 2: Color band combination:_____ **Band Number:**_____Male

Willow Flycatcher

Trans dates	B D	(T/F)
		Found
		First egg
		Clutch completion
		Hatching
		Fledged or Failed

Willow Flycatcher

No.	Presumed	Confirmed	
			Eggs
			Nestlings
			Fledglings

Cowbird

Trans dates	B D	(T/F)
		First egg
		Hatching
		Fledged

Cowbird

No.	Complete? (T/F)	
		Eggs
		Nestlings
		Fledgling s

Outcome (Record code & describe)**:**_____**:**_____

_____

_____

_____

Outcome codes:
UN= unknown; **FY**= fledged young, with at least one young seen leaving or in the vicinity of nest; **FP**= fledged young, as determined by parents behaving as if dependent fledgling(s) nearby; **FU**= suspected fledging of at least one young; **FC**= fledged at least one host young with cowbird parasitism; **FD**= Nest partially depredated with confirmed fledging of at least one young; **PO**= predation observed; **PE**= probable predation, nest empty and intact; **PD**= probable predation, damage to nest structure; **AB**= nest abandoned prior to egg(s) being laid; **DE**= deserted with egg(s) or young; **PA**= parasitized, host attempted to raise cowbird young. No host young were fledged from the nest; **WE**= failure due to weather; **AD**= failure, entire clutch addled/infertile; **OT**= failure due to other, or unknown, causes.

Mayfield Success

(WIFL) Period	# Exposure days	Success
Egg Laying		
Incubation		
Nestling		

Mayfield success codes: **S**= successful; **D**= depredated; **U**= status unknown/nest occupied- fate unknown; **M**= mortality other than predation; **A**= abandoned with host egg(s) or young; **Z**= abandoned, no (zero) eggs laid.

Willow Flycatcher Territory/Nest Record Form (continued)

Study Area:_____Survey Site:_____Territory/Nest no.:_____

Date	Time		Obs	Mon Type	Stage	Adult pres.	# WE	# CE	# WN	# CN	#WF	Age Yng	Comments
	In	Out											

LCR SWFL – Vegetation Datasheet

Observers: _____

Study area	Survey site	Plot type	ID#	UTM: E N	Acc. m	Date

Canopy height	Direct measurement m	Using clinometer Top % - Bottom % × Dist m	Ground cover Obs:	N	E	S	W	Canopy closure Obs:	N	S

Species		TASP single	TASP multi	TASP skipped	SAEX single	SAEX multi	SAEX skipped	SAGO single	SAGO multi	SAGO skipped	SNAG single	SNAG multi	SNAG skipped
Stem Count By cm dbh category	<1												
	1–2.5												
	2.6–5.5												
	5.6–8												
	8.1–10.5												
	10.5–15												
	Measured Trees >15 cm dbh												

Species		OTSP1 single	OTSP1 multi	OTSP1 skipped	OTSP2 single	OTSP2 multi	OTSP2 skipped	OTSP3 single	OTSP3 multi	OTSP3 skipped
Stem Count By cm dbh category	<1									
	1–2.5									
	2.6–5.5									
	5.6–8									
	8.1–10.5									
	10.5–15									
	Measured Trees >15 cm dbh									

Other species (write out full name)

OTSP1_____

OTSP2 _____

OTSP3_____

If stem splits below ankle height, measure and tally each stem in "single" column. If, at ankle height or above, stem splits into multiple branches, measure and tally the biggest stem in "multi" column and record how many stems you did not measure in the "skipped" column (in the size category of the stem you measured).

If stem is not at least breast height, do not count

Vertical Foliage Sampling

CENTER PLOT Observer: _____

Height (m)	Hits/Species						
	TASP	SAGO	SAEX	SNAG	OTSP1*: _____	OTSP2*: _____	OTSP3*: _____
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							

Record number of decimeters with hits on pole (within 10-cm radius) per 1-m interval up to 8 m; above 8 m, estimate 0, < 5, or > 5 or hits per meter interval.

***Use same OTSP (1,2,3) as listed on main record.**

Notes:

Vertical Foliage Sampling

Study Area:	Survey Site:	Plot type:	ID#	Date:

NORTH 1m Observer: _____								EAST 1m Observer: _____							
Height (m)	Hits/Species							Height (m)	Hits/Species						
	TASP	SAGO	SAEX	SNAG	OTSP1	OTSP2	OTSP3		TASP	SAGO	SAEX	SNAG	OTSP1	OTSP2	OTSP3
1								1							
2								2							
3								3							
4								4							
5								5							
6								6							
7								7							
8								8							
9								9							
10								10							
11								11							
12								12							
13								13							
14								14							
15								15							
16								16							
17								17							
18								18							
19								19							
20								20							
21								21							
22								22							
23								23							
24								24							
25								25							

Record number of decimeters with hits on pole (within 10 cm radius) per 1-m interval up to 8 m; above 8 m, estimate 0, < 5, or > 5 or hits per meter interval.
***Use same OTSP (1,2,3) as listed on main record.**

SIDE 1

Vertical Foliage Sampling

SOUTH 1m Observer: _____							
Height (m)	Hits/Species						
	TASP	SAGO	SAEX	SNAG	OTSP1	OTSP2	OTSP3
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							

WEST 1m Observer: _____							
Height (m)	Hits/Species						
	TASP	SAGO	SAEX	SNAG	OTSP1	OTSP2	OTSP3
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							

Record number of decimeters with hits on pole (within 10 cm radius) per 1-m interval up to 8 m; above 8 m, estimate 0, < 5, or > 5 or hits per meter interval.
***Use same OTSP (1,2,3) as listed on main record.**

SIDE 2

Vertical Foliage Sampling

Study Area:	Survey Site:	Plot type:	ID#	Date:

NORTH 5m Observer: _____								EAST 5m Observer: _____							
Height (m)	Hits/Species							Height (m)	Hits/Species						
	TASP	SAGO	SAEX	SNAG	OTSP1	OTSP2	OTSP3		TASP	SAGO	SAEX	SNAG	OTSP1	OTSP2	OTSP3
1								1							
2								2							
3								3							
4								4							
5								5							
6								6							
7								7							
8								8							
9								9							
10								10							
11								11							
12								12							
13								13							
14								14							
15								15							
16								16							
17								17							
18								18							
19								19							
20								20							
21								21							
22								22							
23								23							
24								24							
25								25							

Record number of decimeters with hits on pole (within 10 cm radius) per 1-m interval up to 8 m; above 8 m, estimate 0, < 5, or > 5 or hits per meter interval.
***Use same OTSP (1,2,3) as listed on main record.**

SIDE 1

Vertical Foliage Sampling

SOUTH 5m Observer: _____								WEST 5m Observer: _____							
Height (m)	Hits/Species							Height (m)	Hits/Species						
	TASP	SAGO	SAEX	SNAG	OTSP1	OTSP2	OTSP3		TASP	SAGO	SAEX	SNAG	OTSP1	OTSP2	OTSP3
1								1							
2								2							
3								3							
4								4							
5								5							
6								6							
7								7							
8								8							
9								9							
10								10							
11								11							
12								12							
13								13							
14								14							
15								15							
16								16							
17								17							
18								18							
19								19							
20								20							
21								21							
22								22							
23								23							
24								24							
25								25							

Record number of decimeters with hits on pole (within 10 cm radius) per 1-m interval up to 8 m; above 8 m, estimate 0, < 5, or > 5 or hits per meter interval.

***Use same OTSP (1,2,3) as listed on main record.**

SIDE 2

Habitat Monitoring Sites

Study Area _____ **Survey Site** _____ **LOCATION ID** _____–_____–_____
(Study area) – (Survey site) – (Number)

UTM coordinates: E 0_ _ _ _ _ _ _ **N** _ _ _ _ _ _ _ _ **Accuracy**: _____ m

T/RH Downloads

Date:_____ Time:_____ Observer(s):_____ Was red LED blinking at download? Y or N

Logger 6-digit serial number (e.g., #630863):_____ Did you check red LED after (re)launch? Y or N

Did any events occur that might have interfered with accuracy of data gathered by this logger (e.g., blown out of tree, etc.)?
No Yes If yes, explain:

Was logger downloaded on-site? Y or N If N, date and time of download: Date: _____ Time: _____

Did you replace the existing logger? Y or N If Y, serial number of new logger: _____

Comments:

Date:_____ Time:_____ Observer(s):_____ Was red LED blinking at download? Y or N

Logger 6-digit serial number (e.g., #630863):_____ Did you check red LED after (re)launch? Y or N

Did any events occur that might have interfered with accuracy of data gathered by this logger (e.g., blown out of tree, etc.)?
No Yes If yes, explain:

Was logger downloaded on-site? Y or N If N, date and time of download: Date: _____ Time: _____

Did you replace the existing logger? Y or N If Y, serial number of new logger: _____

Comments:

Soil Moisture (SM)

Soil moisture data collected on the following dates (enter SM data directly into database):

Date: _____ Obs: _____	Date: _____ Obs: _____	Date: _____ Obs: _____
Date: _____ Obs: _____	Date: _____ Obs: _____	Date: _____ Obs: _____
Date: _____ Obs: _____	Date: _____ Obs: _____	Date: _____ Obs: _____
Date: _____ Obs: _____	Date: _____ Obs: _____	Date: _____ Obs: _____

Location ID codes: Study area codes – Topock Marsh = TM, Topock Gorge = TG, Ehrenberg = EH, Cibola = CI, Imperial = IM, Mittry = MI, Yuma = YU. Survey site codes – In Between = IB, Blankenship = BK, Havasu NF = HV, Ehrenberg = EH, Three Fingers Lake = TF, Cibola Lake = CL, Walker Lake = WL, Paradise = PV, Hoge Ranch = HR, Rattlesnake = RS, Clear Lake = LK, Ferguson Lake = FL, Ferguson Wash = FW, Great Blue Heron = GB, Mittry West = MW, Gila Confluence North = GC

Microclimate at Hydro Monitoring Sites – Topock

Study Area _TOPO___ Survey Site _____ LOCATION ID: TM –HM–_____
(Location ID)

UTM coordinates: E 0_ _ _ _ _ _ _ N _ _ _ _ _ _ _ _ GPS Accuracy: _____ m

Temperature/Relative Humidity (T/RH)

Set-up: Date:_____ Time:_____ Observer(s)_____

Logger 6-digit serial number (e.g., #630863):_____ Was red LED checked at set-up? Y or N

What randomization sequence was used? Sequence #: _____
Column 1: _____ Column 2: _____ Column 3:_____

Est. actual height of logger _____ m

Download: Date:_____ Time:_____ Observer(s):_____

Was red LED blinking at download? Y or N Did you check red LED after (re)launch? Y or N

Logger 6-digit serial number (do NOT copy from above; read the number on the logger!):_____

Did any events occur that might have interfered with accuracy of data gathered by this logger (e.g., blown out of tree, etc.)?
No Yes If yes, explain:

Was logger downloaded on-site? Y or N If N, date and time of download: Date: _____ Time: _____

Did you replace the existing logger? Y or N If Y, serial number of new logger: _____

Comments:

Download: Date:_____ Time:_____ Observer(s):_____

Was red LED blinking at download? Y or N Did you check red LED after (re)launch? Y or N

Logger 6-digit serial number (do NOT copy from above; read the number on the logger!):_____

Did any events occur that might have interfered with accuracy of data gathered by this logger (e.g., blown out of tree, etc.)?
No Yes If yes, explain:

Was logger downloaded on-site? Y or N If N, date and time of download: Date: _____ Time: _____

Did you replace the existing logger? Y or N If Y, serial number of new logger: _____

Comments:

Soil Moisture (SM)

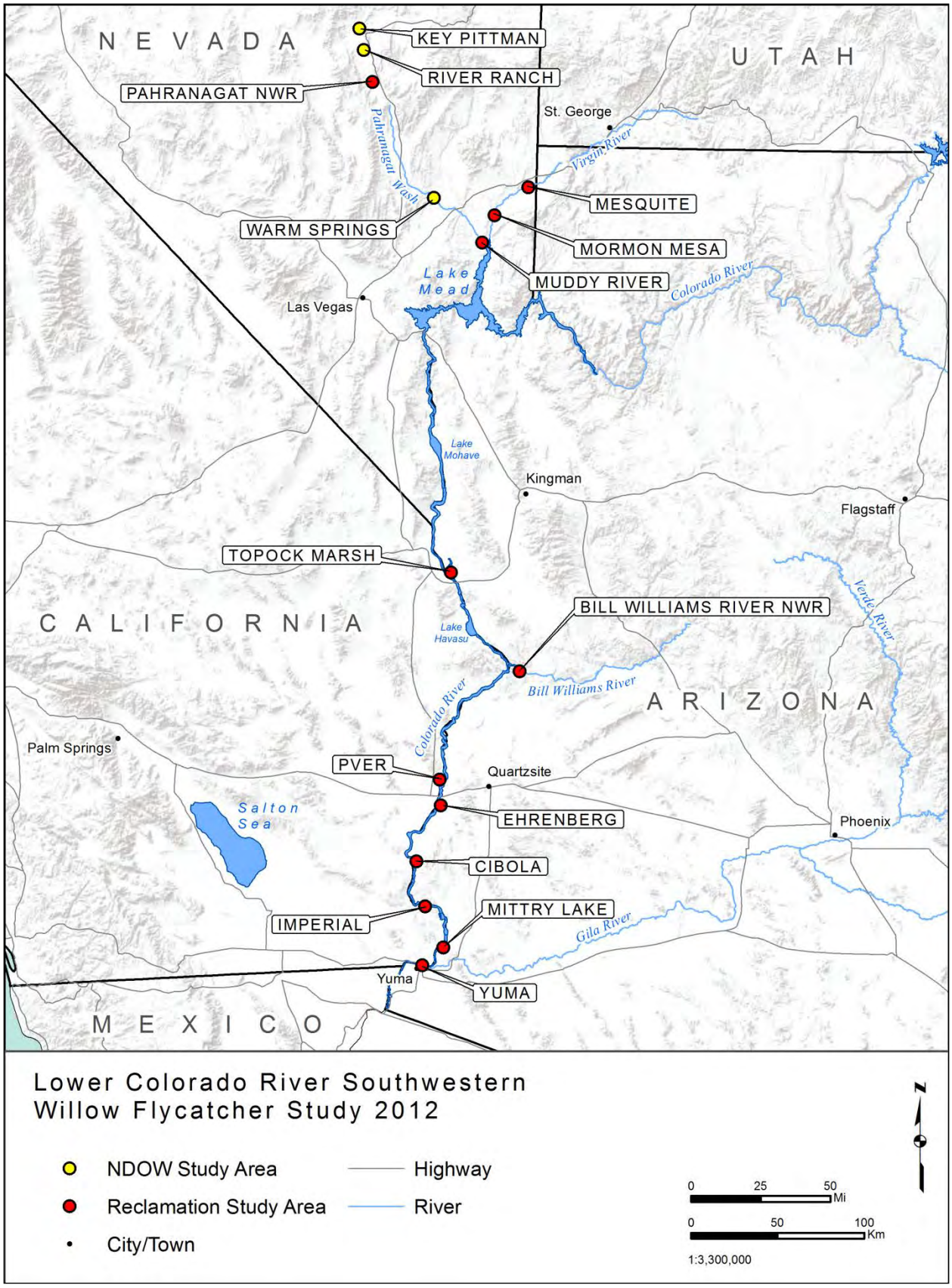
Date **soil sample** collected: _____

Soil moisture data collected on the following dates (enter SM data directly into database):

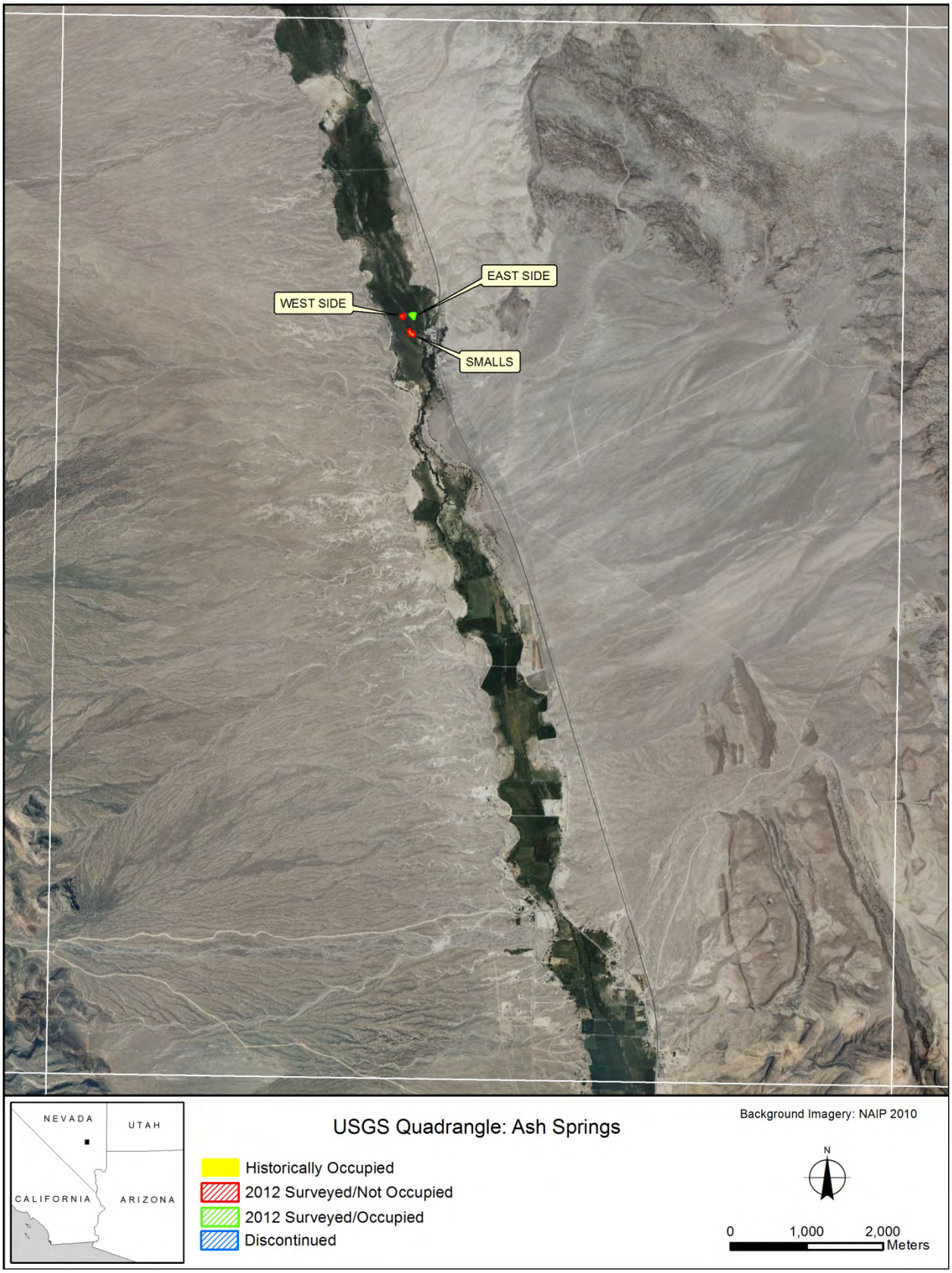
Date: _____	Obs: _____	Date: _____	Obs: _____	Date: _____	Obs: _____
Date: _____	Obs: _____	Date: _____	Obs: _____	Date: _____	Obs: _____
Date: _____	Obs: _____	Date: _____	Obs: _____	Date: _____	Obs: _____
Date: _____	Obs: _____	Date: _____	Obs: _____	Date: _____	Obs: _____
Date: _____	Obs: _____	Date: _____	Obs: _____	Date: _____	Obs: _____
Date: _____	Obs: _____	Date: _____	Obs: _____	Date: _____	Obs: _____
Date: _____	Obs: _____	Date: _____	Obs: _____	Date: _____	Obs: _____

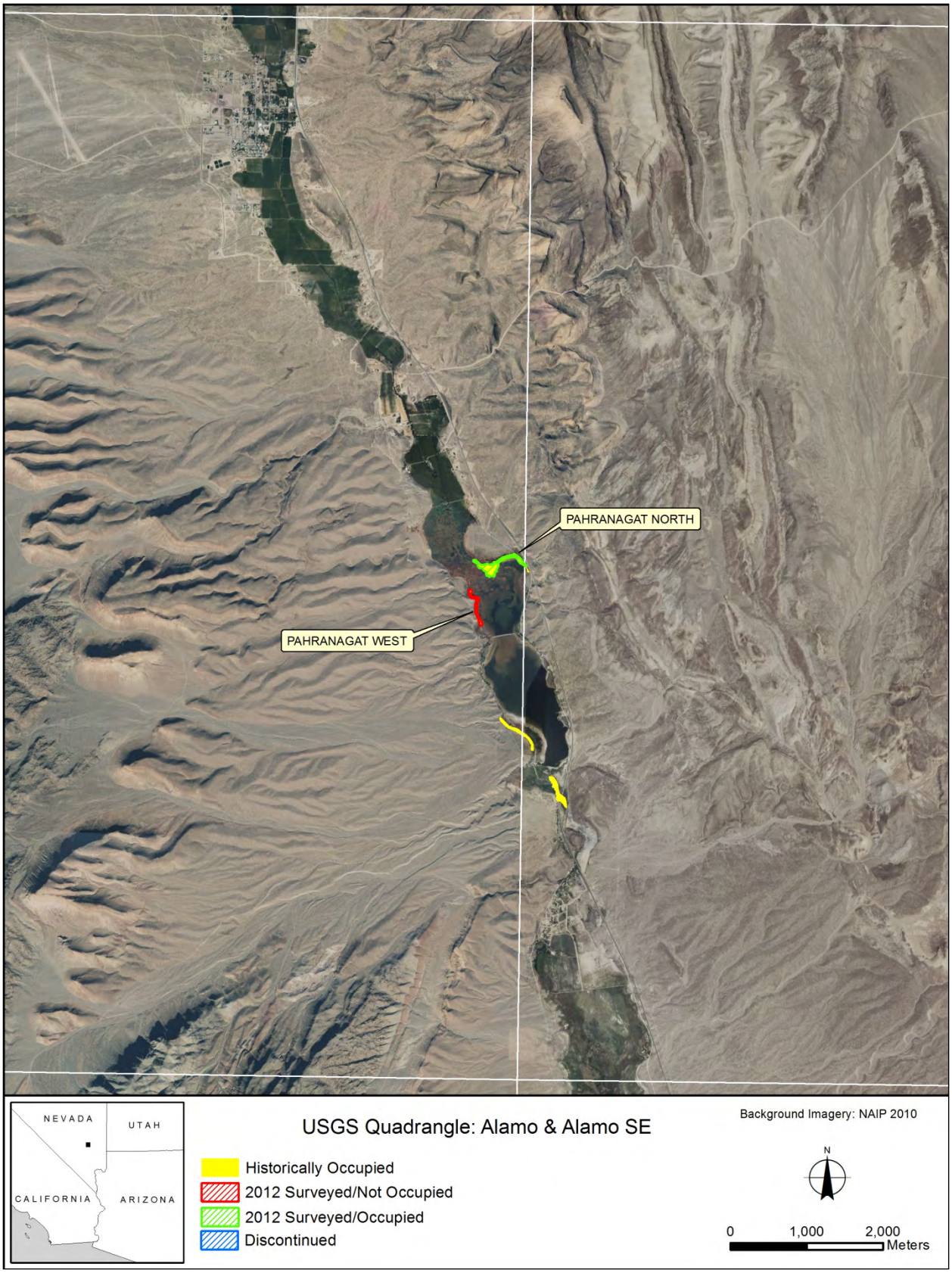
Appendix B

ORTHOPHOTOS SHOWING STUDY SITES

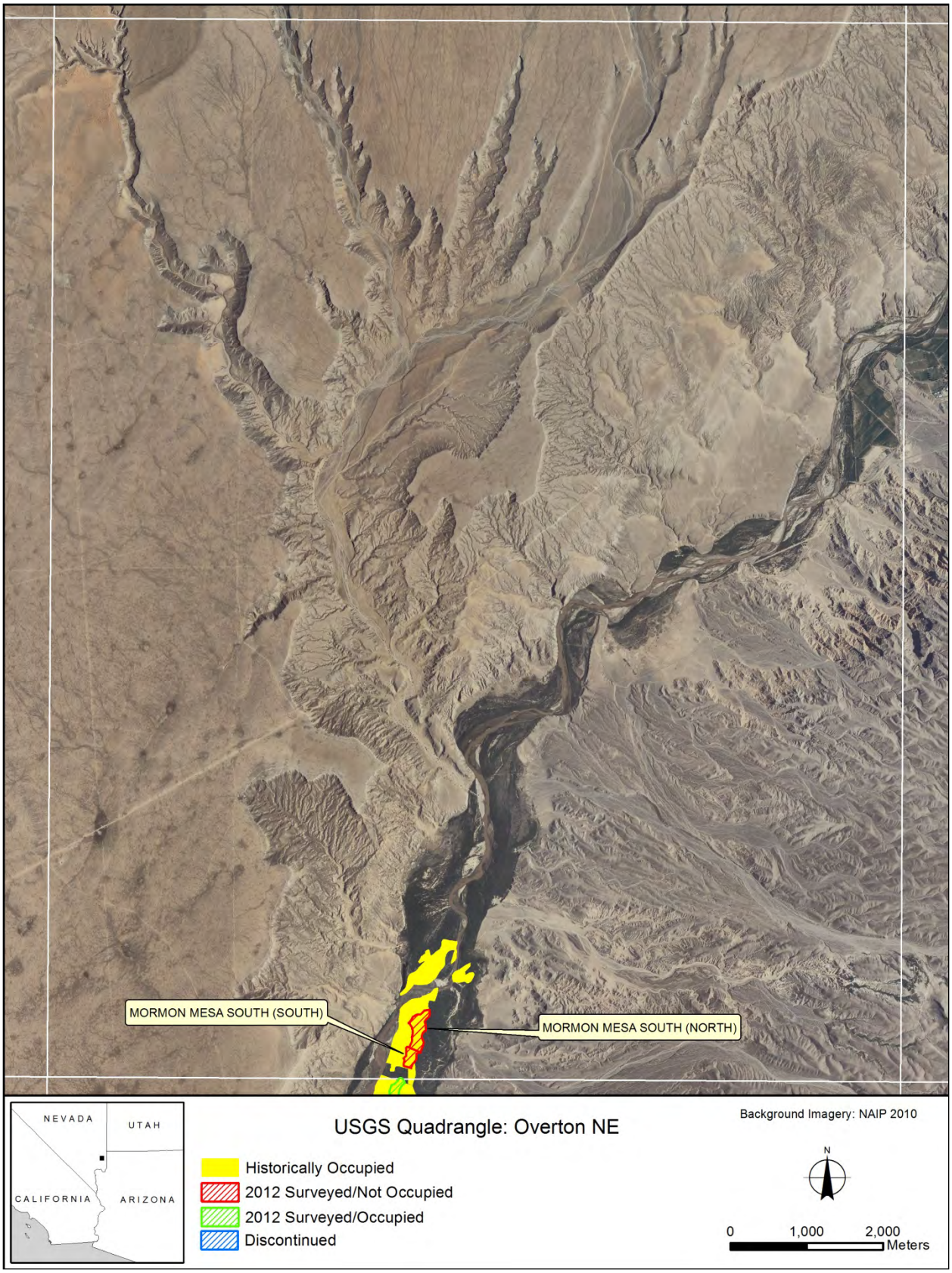

NEVADA
UTAH
CALIFORNIA
ARIZONA
MEXICO
KEY PITTMAN
RIVER RANCH
PAHRANAGAT NWR
Pahranagat Wash
WARM SPRINGS
St. George
Virgin River
MESQUITE
MORMON MESA
MUDDY RIVER
Lake Mead
Colorado River
Las Vegas
Lake Mohave
Kingman
Flagstaff
TOPOCK MARSH
BILL WILLIAMS RIVER NWR
Verde River
Lake Havasu
Bill Williams River
Palm Springs
PVER
Quartzsite
Salton Sea
EHRENBERG
Phoenix
CIBOLA
IMPERIAL
MITTRY LAKE
Gila River
Yuma
YUMA
Lower Colorado River Southwestern
Willow Flycatcher Study 2012
NDOW Study Area
Reclamation Study Area
City/Town
Highway
River
0 25 50 Mi
0 50 100 Km
1:3,300,000
N

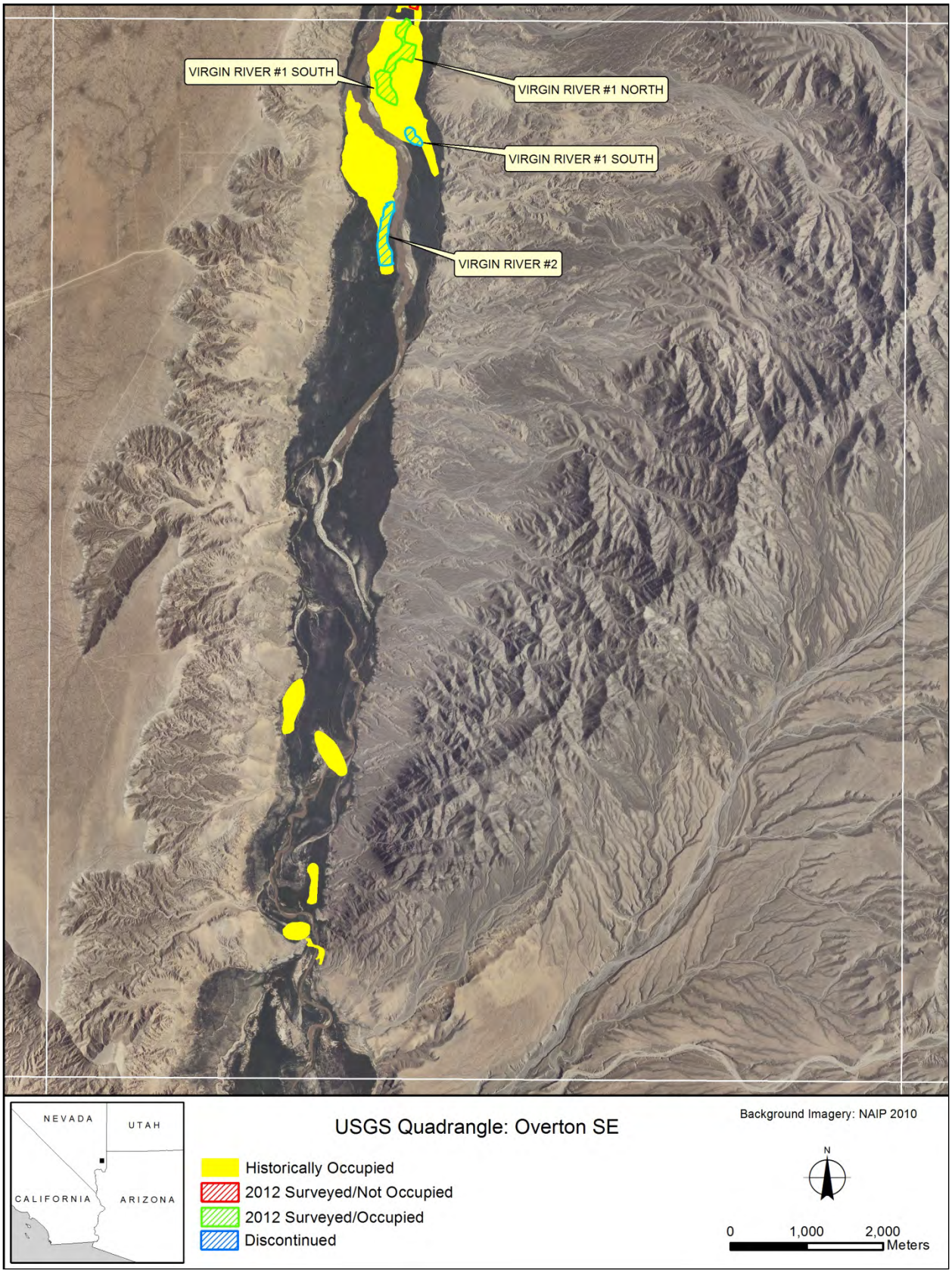
KEY PITTMAN PATCH 1 - 12
NEVADA
UTAH
CALIFORNIA
ARIZONA
USGS Quadrangle: Hiko
Historically Occupied
2012 Surveyed/Not Occupied
2012 Surveyed/Occupied
Discontinued
Background Imagery: NAIP 2010
N
0
1,000
2,000
Meters


EAST SIDE
WEST SIDE
SMALLS
NEVADA
UTAH
CALIFORNIA
ARIZONA
USGS Quadrangle: Ash Springs
Historically Occupied
2012 Surveyed/Not Occupied
2012 Surveyed/Occupied
Discontinued
Background Imagery: NAIP 2010
N
0
1,000
2,000
Meters


PAHRANAGAT NORTH
PAHRANAGAT WEST
NEVADA
UTAH
CALIFORNIA
ARIZONA
USGS Quadrangle: Alamo & Alamo SE
Historically Occupied
2012 Surveyed/Not Occupied
2012 Surveyed/Occupied
Discontinued
Background Imagery: NAIP 2010
N
0
1,000
2,000
Meters

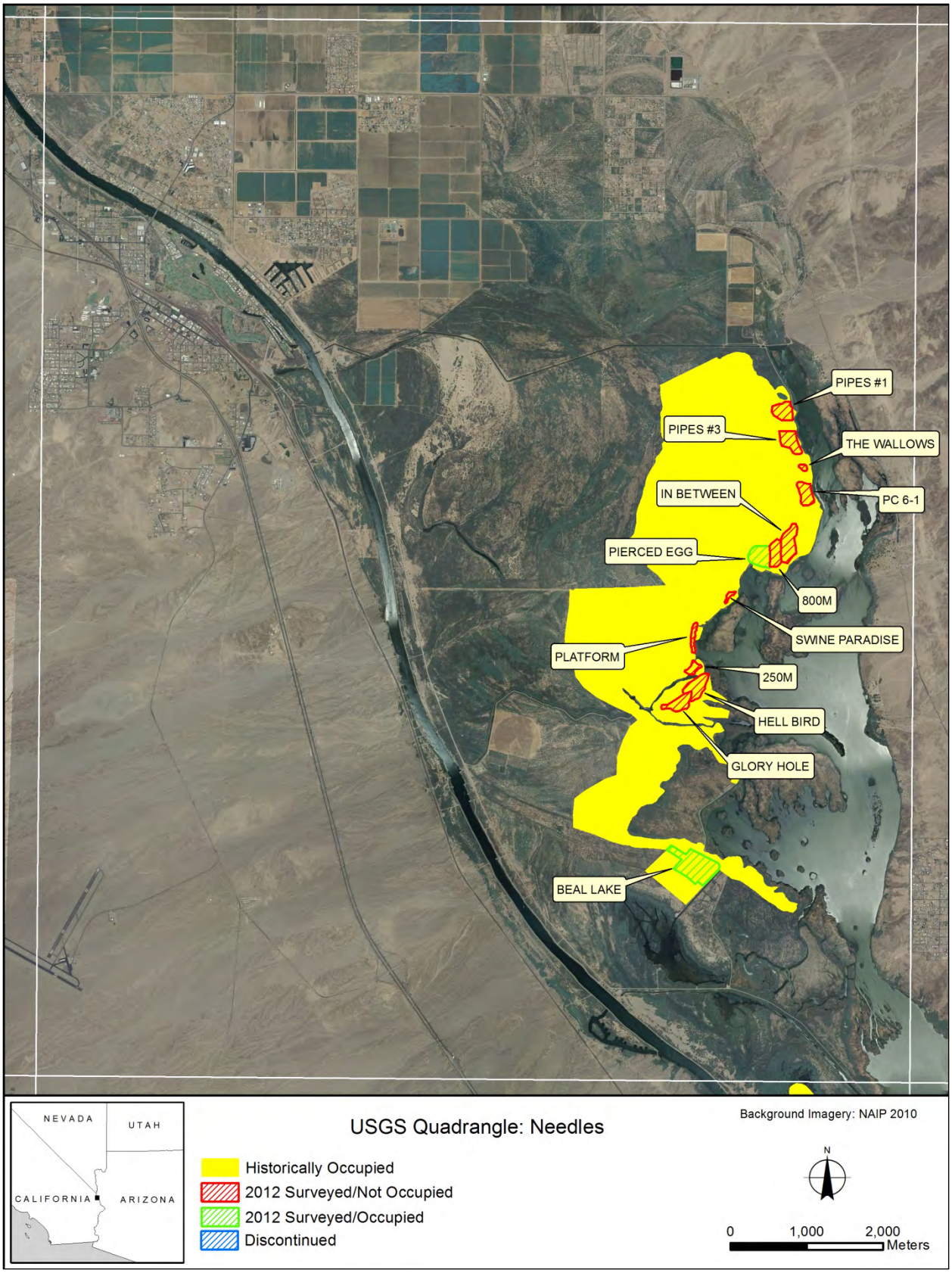
MESQUITE WEST
HAFEN LANE
DUMB LUCK BRIDGE
NEVADA
UTAH
CALIFORNIA
ARIZONA
USGS Quadrangle: Mesquite
Historically Occupied
2012 Surveyed/Not Occupied
2012 Surveyed/Occupied
Discontinued
Background Imagery: NAIP 2010
N
0
1,000
2,000
Meters


MORMON MESA SOUTH (SOUTH)
MORMON MESA SOUTH (NORTH)
NEVADA
UTAH
CALIFORNIA
ARIZONA
USGS Quadrangle: Overton NE
Historically Occupied
2012 Surveyed/Not Occupied
2012 Surveyed/Occupied
Discontinued
Background Imagery: NAIP 2010
N
0
1,000
2,000
Meters

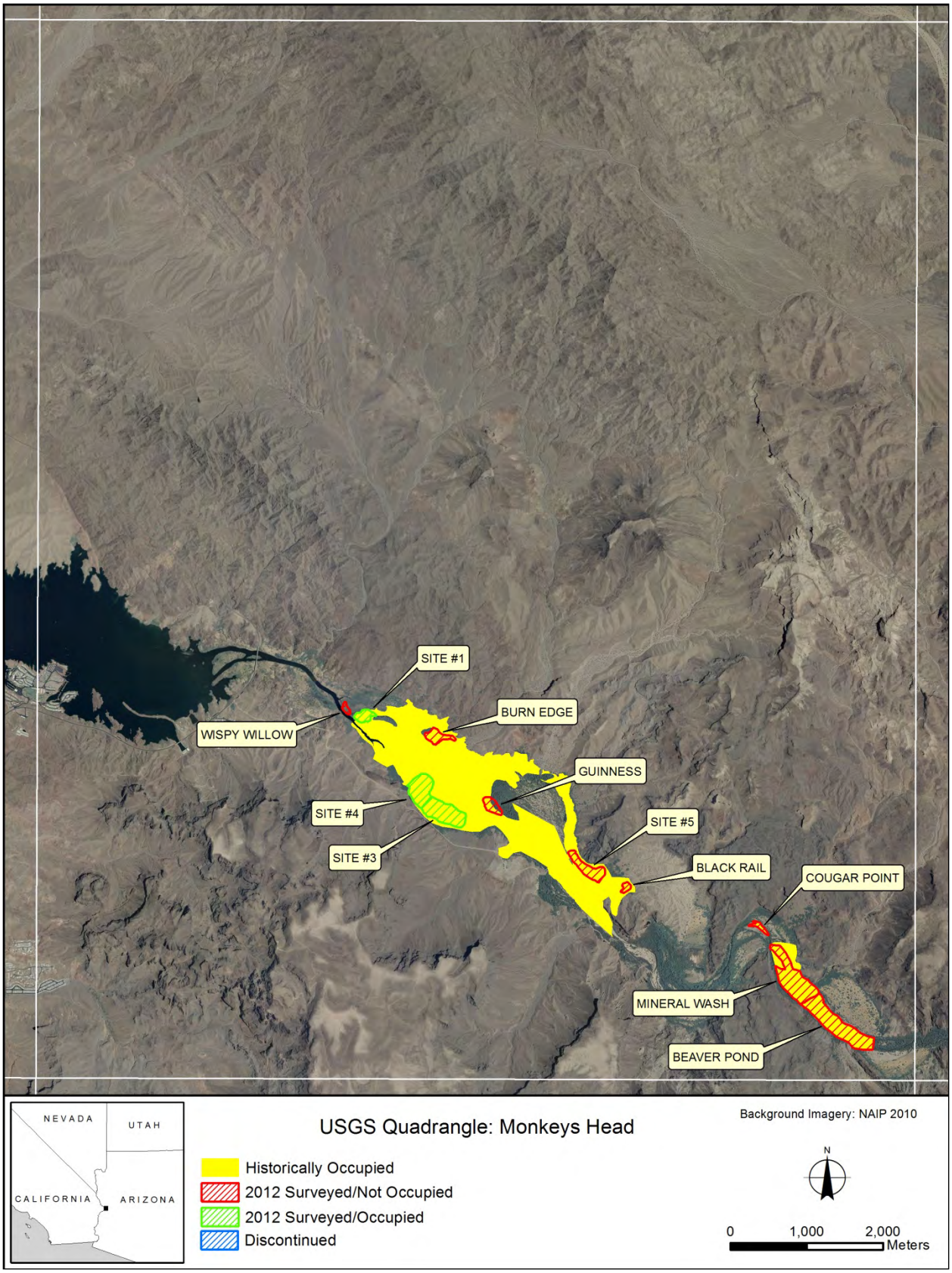

VIRGIN RIVER #1 SOUTH
VIRGIN RIVER #1 NORTH
VIRGIN RIVER #1 SOUTH
VIRGIN RIVER #2
NEVADA
UTAH
CALIFORNIA
ARIZONA
USGS Quadrangle: Overton SE
Historically Occupied
2012 Surveyed/Not Occupied
2012 Surveyed/Occupied
Discontinued
Background Imagery: NAIP 2010
N
0
1,000
2,000
Meters

OVERTON WMA POND
OVERTON WMA
NEVADA
UTAH
CALIFORNIA
ARIZONA
USGS Quadrangle: Overton
Historically Occupied
2012 Surveyed/Not Occupied
2012 Surveyed/Occupied
Discontinued
Background Imagery: NAIP 2010
N
0
1,000
2,000
Meters

MUDDY MAC
NEVADA
UTAH
CALIFORNIA
ARIZONA
USGS Quadrangle: Moapa West
Historically Occupied
2012 Surveyed/Not Occupied
2012 Surveyed/Occupied
Discontinued
Background Imagery: NAIP 2010
N
0
1,000
2,000
Meters

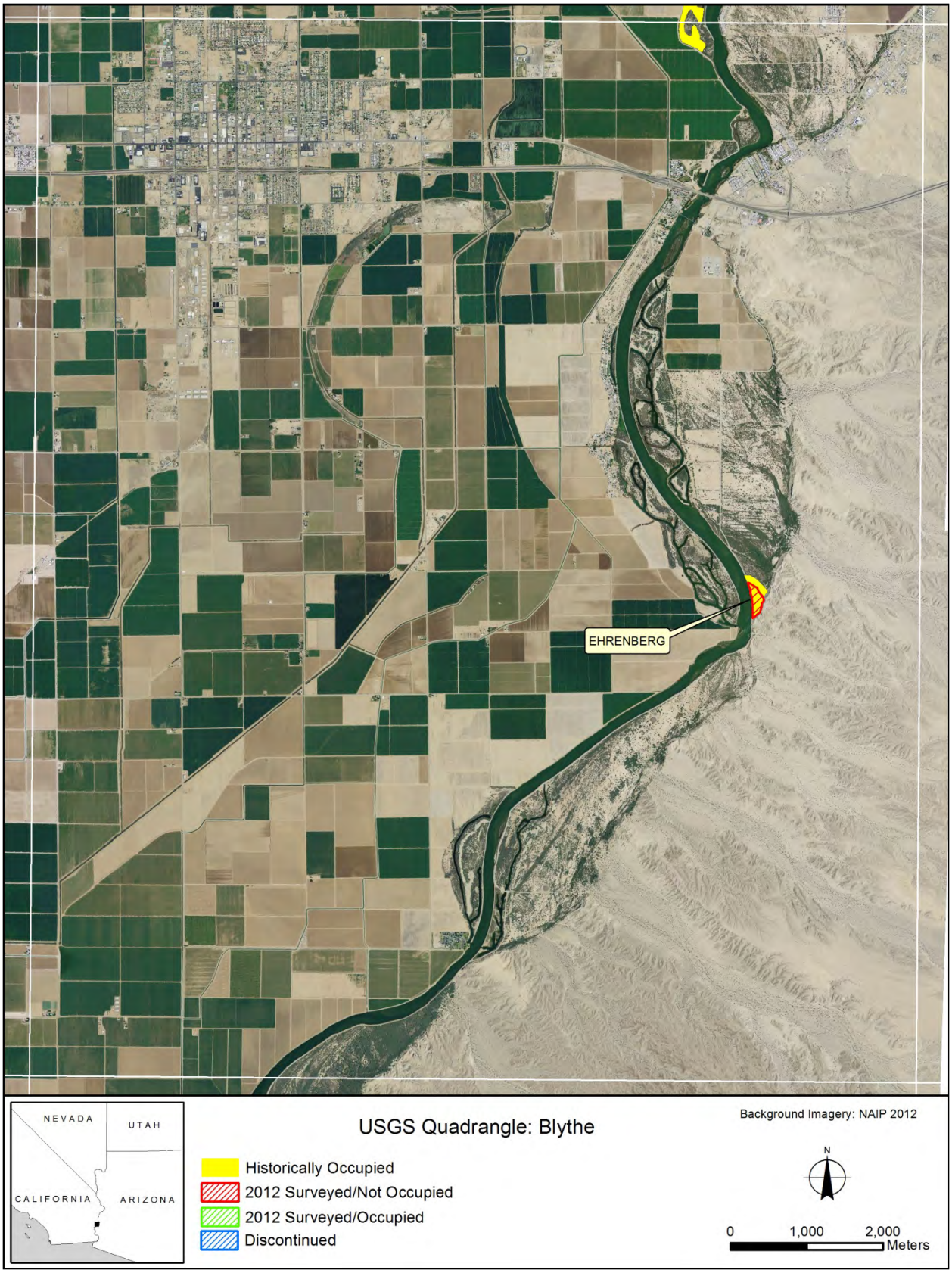

PIPES #1
PIPES #3
THE WALLOWS
IN BETWEEN
PC 6-1
PIERCED EGG
800M
SWINE PARADISE
PLATFORM
250M
HELL BIRD
GLORY HOLE
BEAL LAKE
NEVADA
UTAH
CALIFORNIA
ARIZONA
USGS Quadrangle: Needles
Historically Occupied
2012 Surveyed/Not Occupied
2012 Surveyed/Occupied
Discontinued
Background Imagery: NAIP 2010
N
0
1,000
2,000
Meters

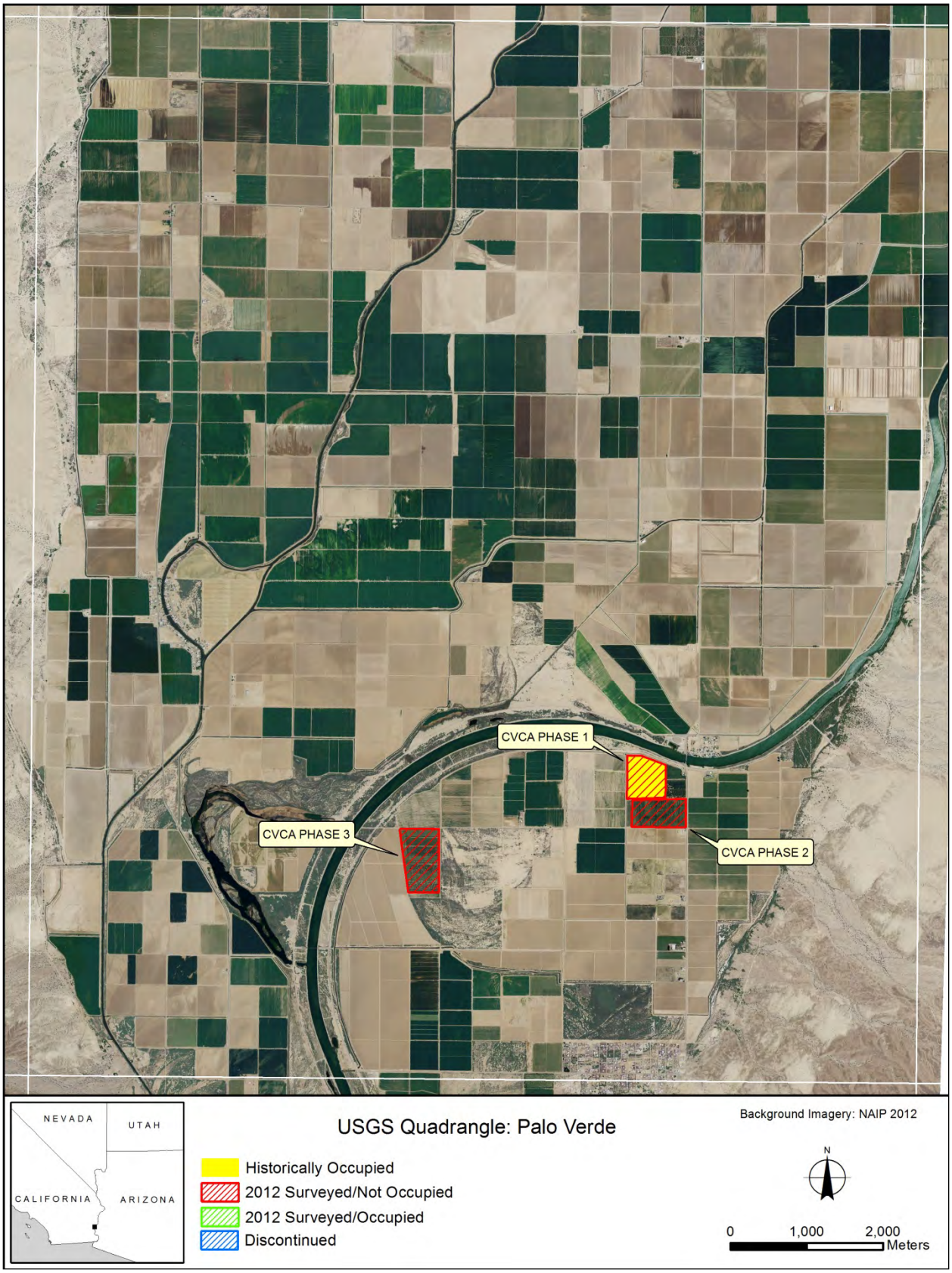
LOST LAKE
NEVADA
UTAH
CALIFORNIA
ARIZONA
USGS Quadrangle: Whale Mountain
Historically Occupied
2012 Surveyed/Not Occupied
2012 Surveyed/Occupied
Discontinued
Background Imagery: NAIP 2012
N
0
1,000
2,000
Meters

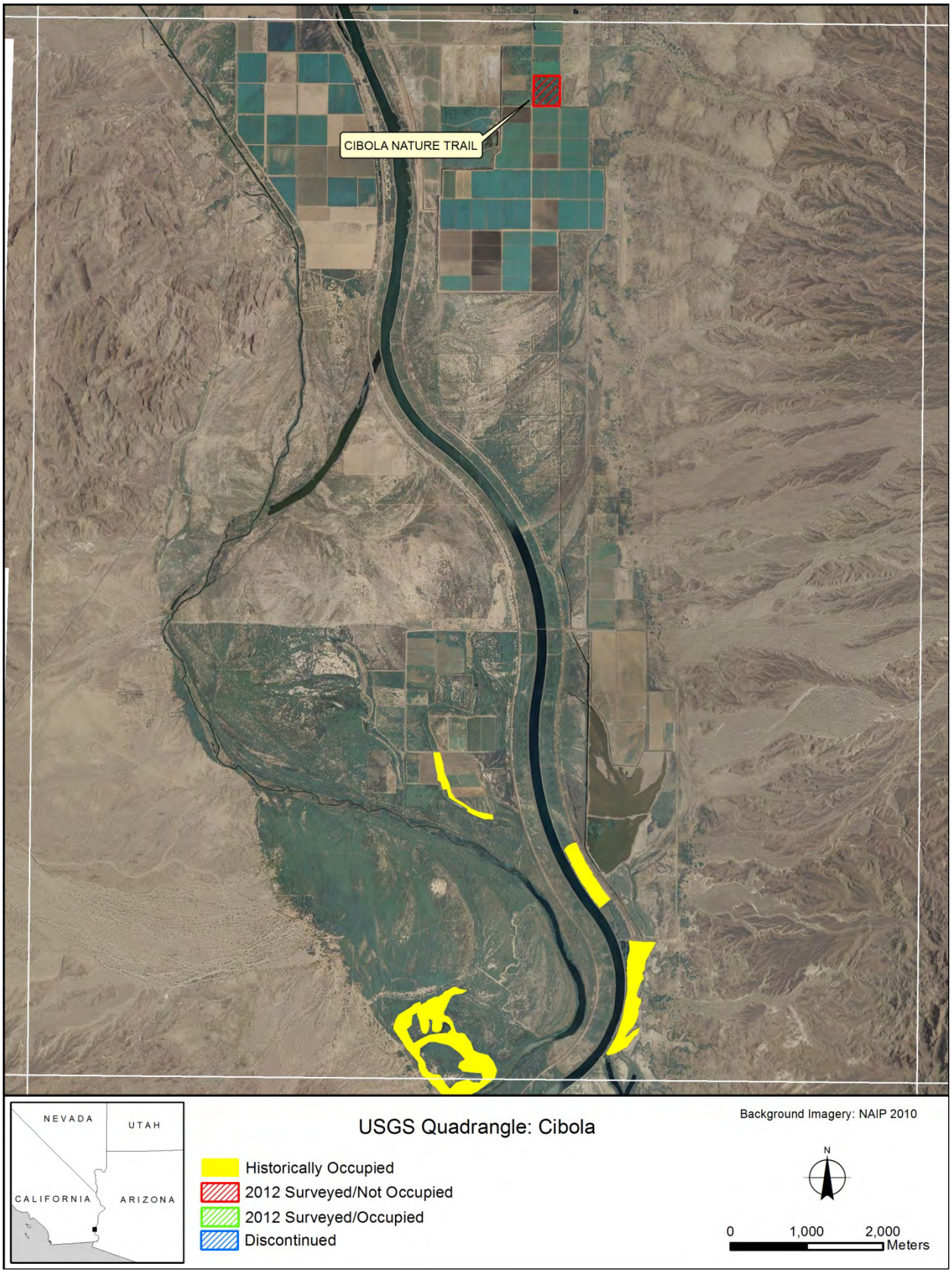

SITE #1
BURN EDGE
WISPY WILLOW
GUINNESS
SITE #4
SITE #5
SITE #3
BLACK RAIL
COUGAR POINT
MINERAL WASH
BEAVER POND
NEVADA
UTAH
CALIFORNIA
ARIZONA
USGS Quadrangle: Monkeys Head
Historically Occupied
2012 Surveyed/Not Occupied
2012 Surveyed/Occupied
Discontinued
Background Imagery: NAIP 2010
N
0
1,000
2,000
Meters

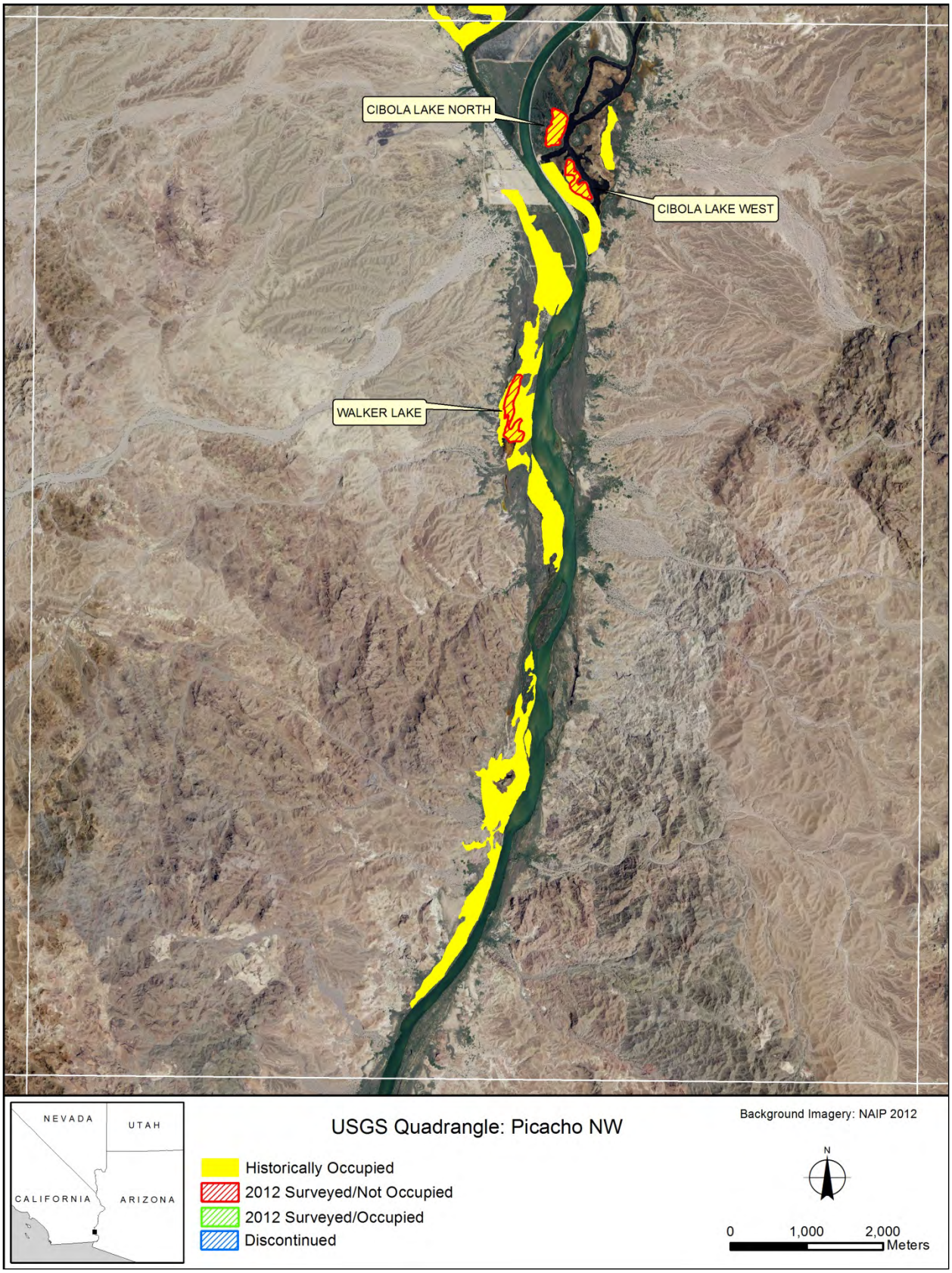
NT
UPSTREAM FROM SITE #8
PLANET RANCH ROAD
NEVADA
UTAH
CALIFORNIA
ARIZONA
USGS Quadrangle: Castaneda Hills SW
Historically Occupied
2012 Surveyed/Not Occupied
2012 Surveyed/Occupied
Discontinued
Background Imagery: NAIP 2010
N
0
1,000
2,000
Meters

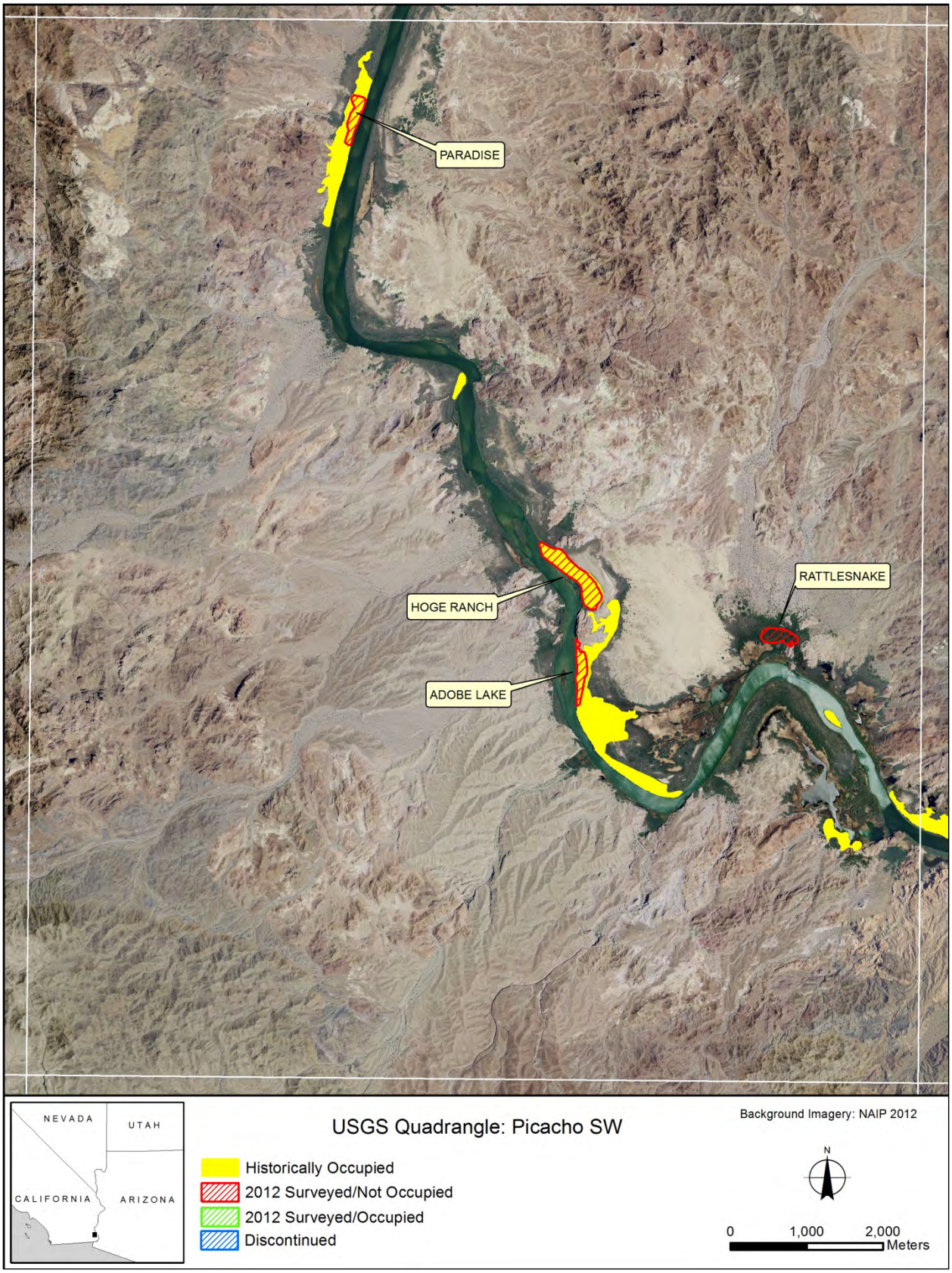
PVER PHASE 2
PVER PHASE 3
NEVADA
UTAH
CALIFORNIA
ARIZONA
USGS Quadrangle: Blythe NE
Historically Occupied
2012 Surveyed/Not Occupied
2012 Surveyed/Occupied
Discontinued
Background Imagery: NAIP 2012
N
0
1,000
2,000
Meters

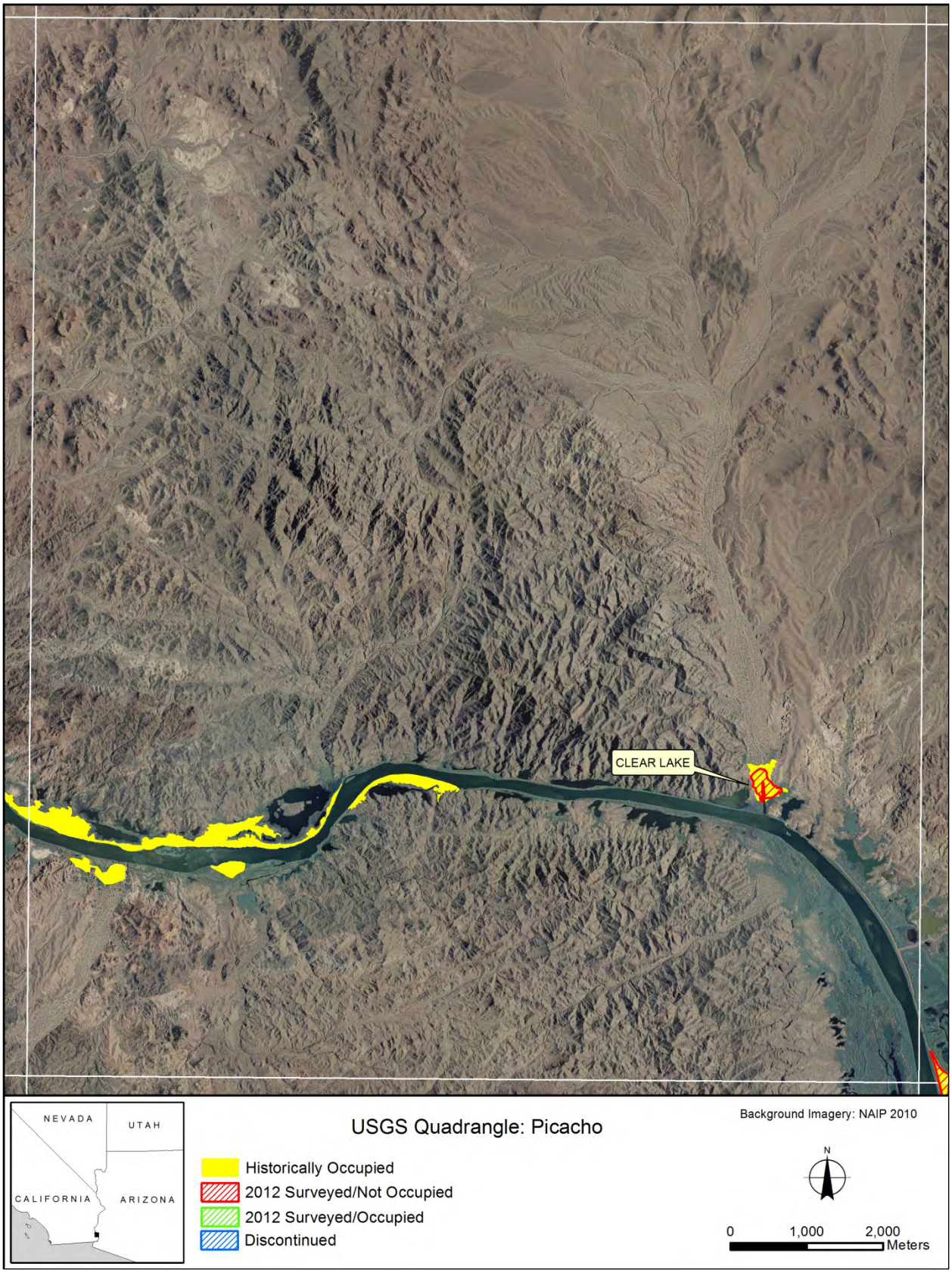

EHRENBERG
NEVADA
UTAH
CALIFORNIA
ARIZONA
USGS Quadrangle: Blythe
Historically Occupied
2012 Surveyed/Not Occupied
2012 Surveyed/Occupied
Discontinued
Background Imagery: NAIP 2012
N
0
1,000
2,000
Meters

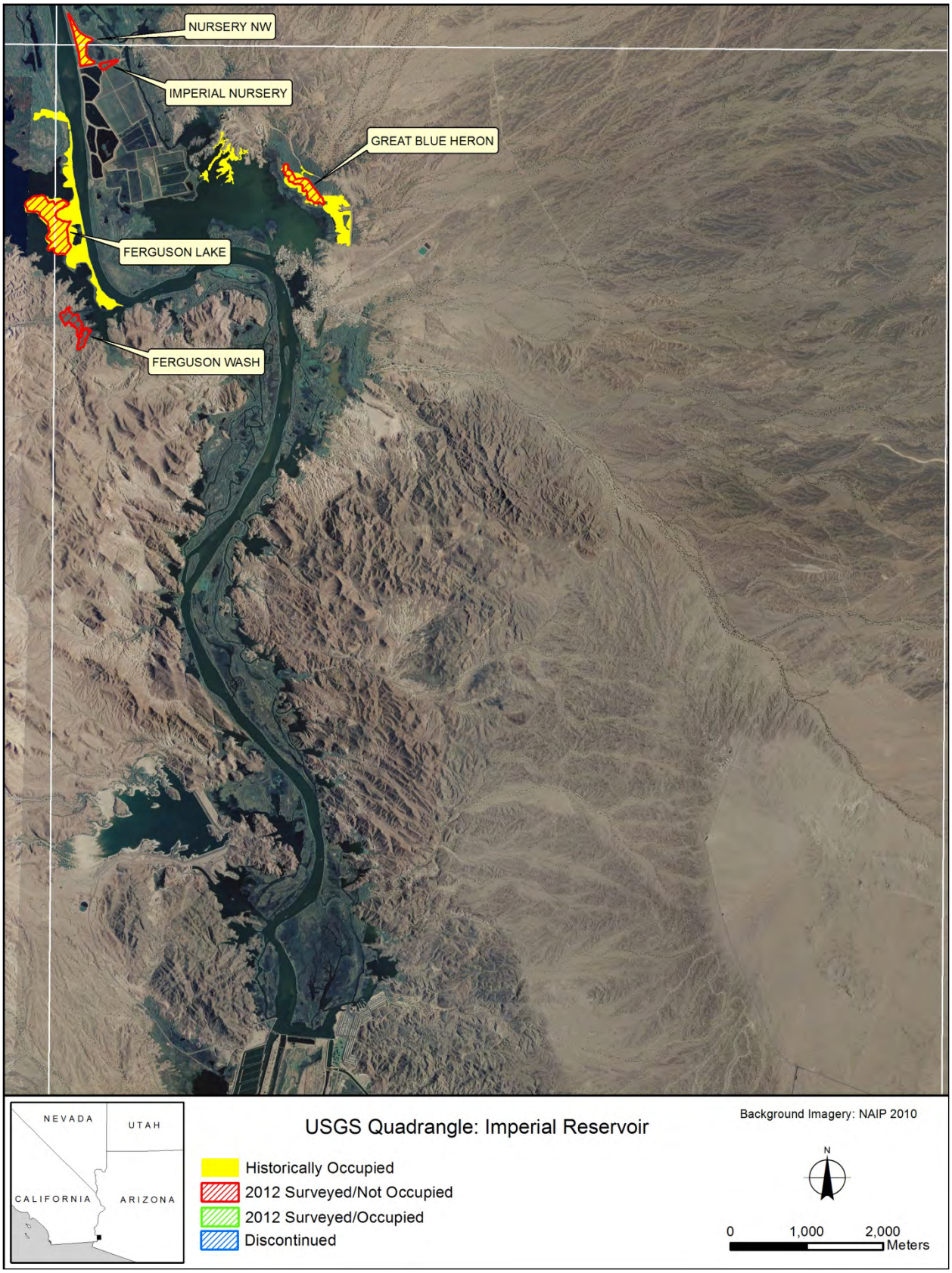

CVCA PHASE 1
CVCA PHASE 2
CVCA PHASE 3
NEVADA
UTAH
CALIFORNIA
ARIZONA
USGS Quadrangle: Palo Verde
Historically Occupied
2012 Surveyed/Not Occupied
2012 Surveyed/Occupied
Discontinued
Background Imagery: NAIP 2012
N
0
1,000
2,000
Meters

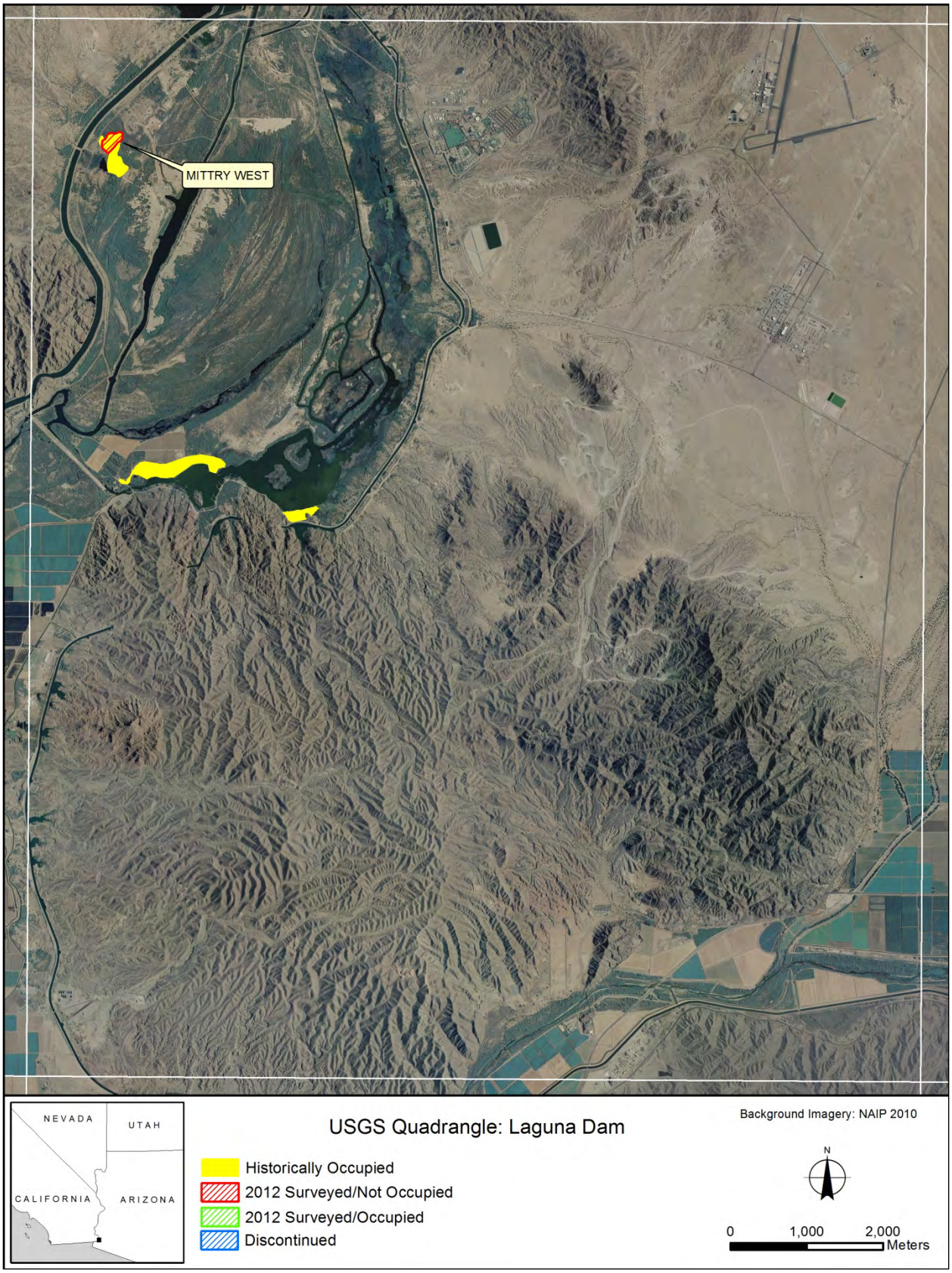

CIBOLA NATURE TRAIL
NEVADA
UTAH
CALIFORNIA
ARIZONA
USGS Quadrangle: Cibola
Historically Occupied
2012 Surveyed/Not Occupied
2012 Surveyed/Occupied
Discontinued
Background Imagery: NAIP 2010
N
0
1,000
2,000
Meters

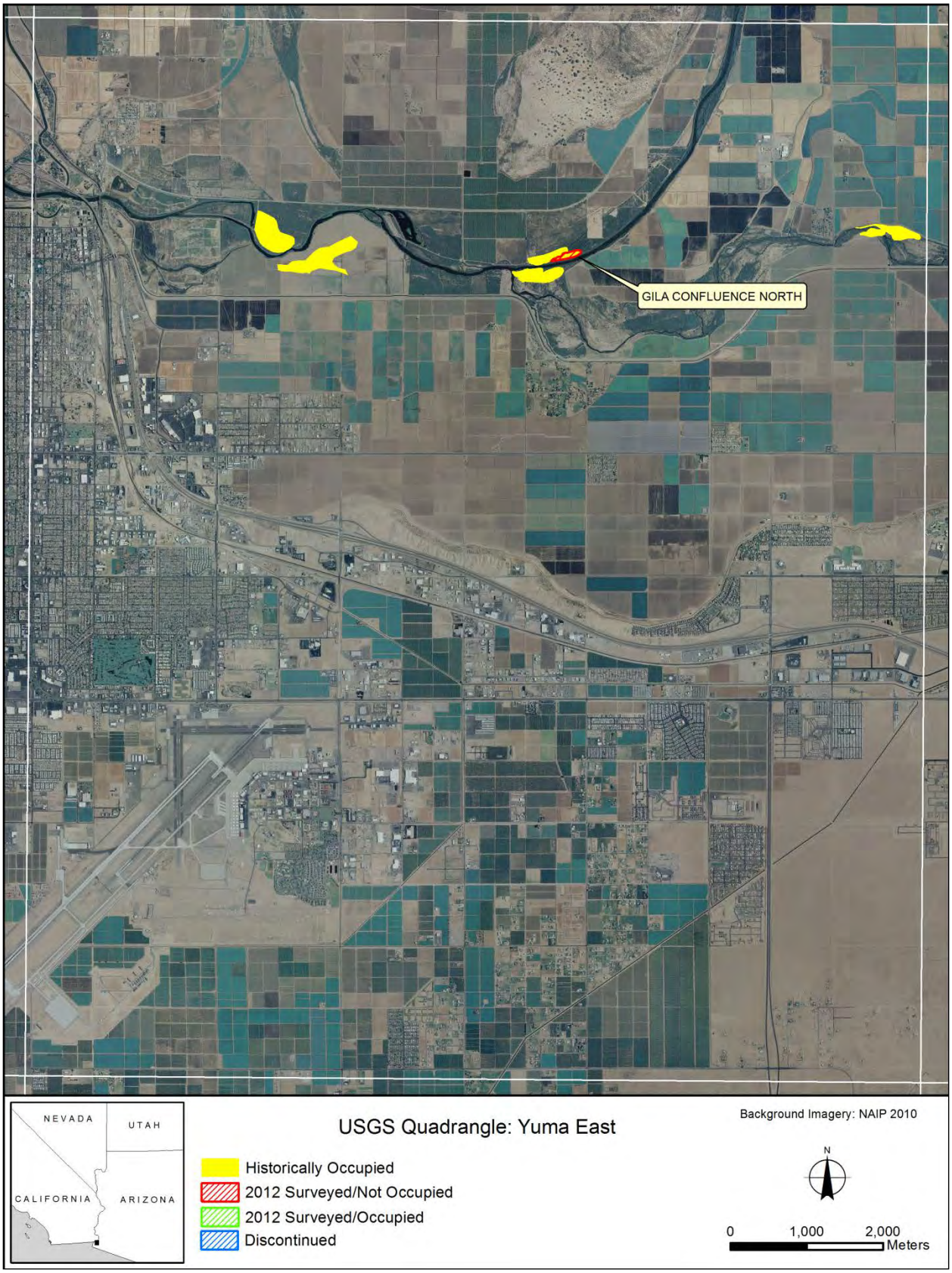

CIBOLA LAKE NORTH
CIBOLA LAKE WEST
WALKER LAKE
NEVADA
UTAH
CALIFORNIA
ARIZONA
USGS Quadrangle: Picacho NW
Historically Occupied
2012 Surveyed/Not Occupied
2012 Surveyed/Occupied
Discontinued
Background Imagery: NAIP 2012
N
0
1,000
2,000
Meters


PARADISE
HOGE RANCH
ADOBE LAKE
RATTLESNAKE
NEVADA
UTAH
CALIFORNIA
ARIZONA
USGS Quadrangle: Picacho SW
Historically Occupied
2012 Surveyed/Not Occupied
2012 Surveyed/Occupied
Discontinued
Background Imagery: NAIP 2012
N
0
1,000
2,000
Meters


CLEAR LAKE
NEVADA
UTAH
CALIFORNIA
ARIZONA
USGS Quadrangle: Picacho
Historically Occupied
2012 Surveyed/Not Occupied
2012 Surveyed/Occupied
Discontinued
Background Imagery: NAIP 2010
N
0
1,000
2,000
Meters


NURSERY NW
IMPERIAL NURSERY
GREAT BLUE HERON
FERGUSON LAKE
FERGUSON WASH
NEVADA
UTAH
CALIFORNIA
ARIZONA
USGS Quadrangle: Imperial Reservoir
Historically Occupied
2012 Surveyed/Not Occupied
2012 Surveyed/Occupied
Discontinued
Background Imagery: NAIP 2010
N
0
1,000
2,000
Meters


MITTRY WEST
NEVADA
UTAH
CALIFORNIA
ARIZONA
USGS Quadrangle: Laguna Dam
Historically Occupied
2012 Surveyed/Not Occupied
2012 Surveyed/Occupied
Discontinued
Background Imagery: NAIP 2010
N
0
1,000
2,000
Meters


GILA CONFLUENCE NORTH
NEVADA
UTAH
CALIFORNIA
ARIZONA
USGS Quadrangle: Yuma East
Historically Occupied
2012 Surveyed/Not Occupied
2012 Surveyed/Occupied
Discontinued
Background Imagery: NAIP 2010
N
0
1,000
2,000
Meters

Appendix C

SOUTHWESTERN WILLOW FLYCATCHER SURVEY RESULTS, 2012

Table C.1. Southwestern Willow Flycatcher Survey and Monitoring Results by Site along the Lower Colorado River and Tributaries, 2012*

River Drainage	Study Area[1]	State	Survey Site[2]	Area (ha)	# Surveys	Survey Hours	Resident Adults	Territories	Pairs	Nests	Unknown Status[3]	
											Before June 15	After June 15
Pahranagat Valley	KEPI[4]	NV	Patch 0	0.04	0	---	1	1	0	0	0	0
		NV	Patch 1	0.1	0	---	2	1	1	2	0	0
		NV	Patch 2	0.1	0	---	3	2	1	2	0	0
		NV	Patch 3	0.1	0	---	2	1	1	1	0	0
		NV	Patch 4	0.1	0	---	1	1	0	0	0	0
		NV	Patch 4.5	0.02	0	---	1	1	0	0	0	1
		NV	Patch 5	0.1	0	---	2	1	1	1	0	0
		NV	Patch 6	0.2	0	---	2	1	1	3	0	0
		NV	Patch 7	0.1	0	---	4	2	2	4	0	0
		NV	Patch 8	0.1	0	---	1	1	0	0	0	0
		NV	Patch 9	0.3	0	---	6	3	3	4	0	1[5]
		NV	Patch 10	0.1	0	---	3	2[6]	2	5	0	0
		NV	Patch 10.5	0.02	0	---	3	2	1	2	0	0
		NV	Patch 11	0.1	0	---	2	1	1	3	0	0
		NV	Patch 12	0.1	0	---	6	3	3	5	0	1
		TOTAL		**1.41**	**0**	**---**	**39**	**23**	**17**	**32**	**0**	**3**
Pahranagat Valley	RIRA	NV	West Side	0.3	5	1.1	0	0	0	0	0	0
		NV	East Side	0.4	4	1.8	0	0	0	0	0	1
		NV	Smalls	0.5	5	1.1	0	0	0	0	0	0
		TOTAL		**1.2**	**---**	**4.0**	**0**	**0**	**0**	**0**	**0**	**1**
Pahranagat Valley	PAHR	NV	North	4.6	5	1.8	22	14[7]	12	14	0	0
		NV	West	1.5	5	3.0	0	0	0	0	0	0
		TOTAL		**6.1**	**---**	**4.8**	**22**	**14**	**12**	**14**	**0**	**0**
Virgin River	MESQ	NV	Hafen Lane	5.2	5	17.3	0	0	0	0	1	0
		NV	Dumb Luck Bridge[8]	1.2	2	2.3	2[9]	1	1	1	0	0
		NV	West	10.6	5	16.8	6	4[6]	3	5	1	3[5]
		NV	Left Foot[10]	1.1	3	2.6	0	0	0	0	3	0
		TOTAL		**18.1**	**---**	**39.0**	**8**	**5**	**4**	**6**	**5**	**3**

Table C.1. Southwestern Willow Flycatcher Survey and Monitoring Results by Site along the Lower Colorado River and Tributaries, 2012* (Continued)

River Drainage	Study Area[1]	State	Survey Site[2]	Area (ha)	# Surveys	Survey Hours	Resident Adults	Territories	Pairs	Nests	Unknown Status[3]	
											Before June 15	After June 15
Virgin River	MOME	NV	Mormon Mesa South (North)	8.4	5	10.7	0	0	0	0	1	0
		NV	Mormon Mesa South (South)	3.4	5	8.9	0	0	0	0	0	0
		NV	Virgin River #1 (North)	10.4	5	21.4	2	1	1	1	0	0
		NV	Virgin River #1 (South)	11.1	6	16.8	22[9]	15[11]	13	16	0	2
		NV	Virgin River #2[12]	11.2	3	11.4	0	0	0	0	0	0
		TOTAL		**44.5**	**---**	**69.2**	**24**	**16**	**14**	**17**	**1**	**2**
Muddy River	MUDD	NV	Overton WMA Pond	0.7	5	6.2	1	1	0	0	5	0
		NV	Overton WMA	9.2	5	19.0	12	9[6,13]	5	6	1	0
		TOTAL		**9.8**	**---**	**25.2**	**13**	**10**	**5**	**6**	**6**	**0**
Muddy River	WMSP[4]	NV	Muddy Mac	0.5	2	2.0	2	1	1	2	1	0
Colorado River	TOPO	AZ	Pipes #1	5.2	5	6.8	0	0	0	0	0	0
		AZ	Pipes #3	5.7	5	7.1	1[14]	1	0	0	1	0
		AZ	The Wallows	0.7	5	2.0	0	0	0	0	2	0
		AZ	PC6-1	4.8	5	6.0	0	0	0	0	0	0
		AZ	In Between	7.7	5	7.4	0	0	0	0	0	0
		AZ	800M	4.7	5	6.1	0	0	0	0	0	0
		AZ	Pierced Egg	6.7	5	9.0	0	0	0	0	1	1
		AZ	Swine Paradise	0.7	5	1.5	0	0	0	0	2	0
		AZ	Platform	1.9	5	2.5	0	0	0	0	0	0
		AZ	250M	1.9	5	2.0	0	0	0	0	0	0
		AZ	Hell Bird	6.3	5	6.1	0	0	0	0	2	0
		AZ	Glory Hole	5.0	5	6.0	1	1	0	0	0	0
		AZ	Beal Lake	18.0	5	9.5	1[14]	1	0	0	3	0
		AZ	Lost Lake	3.3	5	2.7	0	0	0	0	0	0
		AZ	Marshside[15]	---	0	---	0	0	0	0	2	0
		TOTAL		**72.6**	**---**	**74.7**	**2**	**3**	**0**	**0**	**13**	**1**

Table C.1. Southwestern Willow Flycatcher Survey and Monitoring Results by Site along the Lower Colorado River and Tributaries, 2012* (Continued)

River Drainage	Study Area[1]	State	Survey Site[2]	Area (ha)	# Surveys	Survey Hours	Resident Adults	Territories	Pairs	Nests	Unknown Status[3]	
											Before June 15	After June 15
Bill Williams River	BIWI	AZ	Wispy Willow	0.9	5	4.5	0	0	0	0	11	0
		AZ	Site #1	3.0	4	2.1	1	1	0	0	7	3
		AZ	Burn Edge	4.1	5	3.2	0	0	0	0	1	0
		AZ	Site #4	9.9	5	8.7	0	0	0	0	1	1
		AZ	Site #3	13.0	5	15.8	3	2[6]	2	3	0	0
		AZ	Guinness	3.4	5	3.2	0	0	0	0	1	0
		AZ	Site #5	6.8	5	7.5	0	0	0	0	0	0
		AZ	Black Rail	1.2	5	3.0	0	0	0	0	0	0
		AZ	Cougar Point	1.3	5	3.4	0	0	0	0	0	0
		AZ	Mineral Wash	18.8	5	7.0	0	0	0	0	0	0
		AZ	Beaver Pond	21.7	5	7.9	0	0	0	0	0	0
		AZ	Upstream from Site #8	1.5	4	1.75	0	0	0	0	0	0
		AZ	Planet Ranch Road[16]	3.3	4	2.8	0	0	0	0	0	0
		TOTAL		**88.9**	**---**	**70.8**	**4**	**3**	**2**	**3**	**21**	**4**
Colorado River	PVER	CA	PVER Phase 2	21.4	5	8.75	0	0	0	0	5	0
		CA	PVER Phase 3	21.4	5	9.9	0	0	0	0	5	0
		TOTAL		**42.8**	**---**	**18.6**	**0**	**0**	**0**	**0**	**10**	**0**
Colorado River	EHRE	AZ	Ehrenberg	4.7	5	4.1	0	0	0	0	0	0
Colorado River	CIBO	AZ	CVCA Phase 1	26.2	5	11.5	0	0	0	0	17	0
		AZ	CVCA Phase 2	25.5	5	10.1	0	0	0	0	10	0
		AZ	CVCA Phase 3	38.4	5	9.9	0	0	0	0	1	0
		AZ	Cibola Nature Trail	13.7	5	3.9	0	0	0	0	4	0
		AZ	Cibola Lake #1 (North)	8.9	5	8.4	0	0	0	0	1	0
		AZ	Cibola Lake #3 (West)	6.8	5	6.5	0	0	0	0	4	0
		CA	Walker Lake	11.4	5	6.3	0	0	0	0	0	0
		TOTAL		**130.9**	**---**	**56.6**	**0**	**0**	**0**	**0**	**37**	**0**

Table C.1. Southwestern Willow Flycatcher Survey and Monitoring Results by Site along the Lower Colorado River and Tributaries, 2012* (Continued)

River Drainage	Study Area[1]	State	Survey Site[2]	Area (ha)	# Surveys	Survey Hours	Resident Adults	Territories	Pairs	Nests	Unknown Status[3]	
											Before June 15	After June 15
Colorado River	IMPE	CA	Paradise	7.8	5	6.6	0	0	0	0	5	0
		AZ	Hoge Ranch	20.7	5	6.3	0	0	0	0	5	0
		AZ	Adobe Lake	7.5	5	1.0	0	0	0	0	0	0
		AZ	Rattlesnake	7.6	5	7.1	0	0	0	0	0	0
		AZ	Clear Lake	8.3	5	10.3	0	0	0	0	8	0
		AZ	Nursery NW	7.0	5	4.4	0	0	0	0	8	0
		AZ	Imperial Nursery	1.4	5	1.2	0	0	0	0	0	0
		CA	Ferguson Lake	21.1	5	10.3	0	0	0	0	44	0
		CA	Ferguson Wash	6.8	5	3.8	0	0	0	0	13	0
		AZ	Great Blue Heron	7.0	5	15.0	0	0	0	0	0	0
		TOTAL		**95.2**	**---**	**66.0**	**0**	**0**	**0**	**0**	**83**	**0**
Colorado River	MITT	CA	Mittry West	4.4	5	7.5	0	0	0	0	3	0
Colorado River	YUMA	AZ	Gila Confluence North	2.2	5	8.2	0	0	0	0	8	0

* This table includes only sites where regular surveys were scheduled and territory monitoring was conducted. Sites where habitat reconnaissance and opportunistic surveys were conducted are not included. Several individuals were detected briefly at the beginning of the season before establishing a territory in a different site, and are only reported where they were resident. See Chapter 3 for movement details.

[1] Study areas consist of 1-18 survey sites that are grouped geographically. KEPI = Key Pittman Wildlife Management Area, RIRA = River Ranch, PAHR = Pahranagat National Wildlife Refuge (NWR), MESQ = Mesquite, MOME = Mormon Mesa, MUDD = Muddy River, WMSP = Warm Springs Natural Area, TOPO = Topock Marsh, BIWI = Bill Williams River NWR, PVER = Palo Verde Ecological Reserve, EHRE = Ehrenberg, CIBO = Cibola, IMPE = Imperial, MITT = Mittry Lake, YUMA = Yuma.

[2] Survey site is equivalent to the Arizona Department of Game and Fish definition of site.

[3] Total number of individuals recorded that could not be classified as resident or migrant because of brief appearance.

[4] All sites occupied; no formal surveys.

[5] This male was detected from 19–21 Jun in Mesquite West, then 4 Jul in Key Pittman Patch 9.

[6] One male was polygynous with two females.

[7] Four males were each polygynous with two females.

[8] This site was discovered in early June with breeding birds.

[9] One male was detected from 15–21 May in Mormon Mesa Virgin River #1 South, then moved and bred at Mesquite Dumb Luck Bridge, then moved back to Mormon Mesa Virgin River #1 South where he held a second territory from 8–20 Jul.

[10] Reconnaissance site; not added to formal survey list due to poor habitat quality.

[11] One male was polygynous with four females and two males were each polygynous with two females.

[12] Surveys discontinued because of poor quality habitat.

[13] One male held a territory in the southern area of Overton WMA until 24 May and then moved within the site approximately 800 m north and bred. Both territories are counted.

[14] This male held a territory in Topock Marsh Pipes #3 until 18 May, then moved and established a second territory in Topock Marsh Beal Lake from 23 May–9 Jul.

[15] Not an official survey site. Incidental detections recorded.

[16] Due to access issues, this site was only surveyed from the property boundary of Bill Williams River NWR, approximately 80 m northwest of the breeding area.

Appendix D

DETECTIONS OF SPECIAL CONCERN SPECIES, 2012

Table D.1. Number of Detections of Each Special Concern Species Recorded at Each Survey Site, 2012

Study Area[1]	Survey Site	Special Concern Species[2]											
		BLRA	CLRA	LEBI	YBCU	ELOW	GIFL	GIWO	VEFL	BEVI	YWAR	SUTA	YBCH
PAHR	North	0	0	0	0	0	0	0	0	0	14	1	6
	West	0	0	0	0	0	0	0	0	0	6	0	5
	South[3]	0	0	0	0	0	0	0	0	0	2	0	0
MESQ	Hafen Lane	0	0	0	0	0	0	0	0	6	54	1	57
	Up the Creek[3]	0	0	0	0	0	0	0	0	2	15	0	20
	Dumb Luck Bridge	0	0	0	0	0	0	0	0	0	12	0	10
	West	0	0	0	0	0	0	0	0	7	103	0	110
	Electric Avenue Pond[3]	0	0	0	0	0	0	0	0	0	4	0	5
	Boomerang[3]	0	0	0	0	0	0	0	0	0	2	0	4
	Left Foot[3]	0	0	0	0	0	0	0	0	0	2	0	2
MOME	Mormon Mesa South	0	0	0	1	0	0	0	0	20	53	0	71
	Virgin River #1	0	0	0	0	0	0	0	0	23	90	0	163
	Virgin River #2	0	0	0	0	0	0	0	0	0	24	0	28
MUDD	Overton WMA Pond	0	0	0	0	0	0	0	0	0	9	0	14
	Overton WMA	0	0	0	0	0	0	0	0	2	59	0	80
TOPO	Pipes #1	0	0	0	0	0	0	0	0	1	5	1	25
	Pipes #3	0	0	0	1	0	0	1	0	0	13	3	27
	The Wallows	0	0	0	0	0	0	1	0	0	2	2	3
	PC6-1	0	0	0	0	0	0	4	0	1	5	1	8
	In Between	0	0	0	0	0	0	1	0	0	8	0	27
	800M	0	0	0	0	0	0	2	0	0	12	0	10
	Pierced Egg	0	0	0	0	0	0	1	0	4	16	1	19
	Swine Paradise	0	0	0	0	0	0	0	0	0	3	4	5
	Platform	0	0	0	0	0	0	0	0	0	7	0	10
	250M	0	0	0	0	0	0	2	0	1	2	0	6
	Hell Bird	0	0	0	0	0	0	8	0	2	12	5	13

Table D.1. Number of Detections of Each Special Concern Species Recorded at Each Survey Site, 2012 (Continued)

Study Area[1]	Survey Site	Special Concern Species[2]											
		BLRA	CLRA	LEBI	YBCU	ELOW	GIFL	GIWO	VEFL	BEVI	YWAR	SUTA	YBCH
TOPO	Glory Hole	0	0	0	0	0	0	3	0	0	9	0	21
	Beal Lake	0	0	0	0	0	0	0	0	39	11	1	32
	Lost Lake	0	1	1	0	0	0	0	0	0	14	0	23
BIWI	Wispy Willow	0	1	0	0	0	0	0	0	3	0	0	10
	Site #1	0	0	1	0	0	0	1	0	11	0	0	8
	Burn Edge	0	0	0	0	0	0	4	0	4	5	0	13
	Site #4	0	0	0	0	0	0	2	0	5	21	1	41
	Site #3	0	0	0	0	0	0	3	0	7	39	2	57
	Guinness	0	0	0	0	0	0	2	0	3	12	0	10
	Site #5	0	0	0	2	0	0	1	0	3	21	2	39
	Black Rail	0	0	0	0	0	0	4	0	16	0	0	16
	Cougar Point	0	0	0	0	0	0	0	0	7	3	2	20
	Mineral Wash	0	0	0	0	0	0	4	0	15	10	2	32
	Beaver Pond	0	0	0	0	0	0	7	0	17	13	8	47
	Upstream from Site #8	2	0	0	0	0	0	2	0	2	0	0	15
	Planet Ranch Road	0	1	0	0	0	0	2	0	9	7	3	19
PVER	PVER Phase 2	0	0	0	2	0	0	0	0	0	12	0	10
	PVER Phase 3	0	0	0	1	0	0	0	0	0	0	0	5
EHRE	Ehrenberg	0	0	0	0	0	0	0	0	5	1	0	18
CIBO	CVCA Phase 1	0	0	0	1	0	0	0	0	0	12	0	6
	CVCA Phase 2	0	0	0	2	0	0	0	0	0	2	0	20
	CVCA Phase 3	0	0	0	0	0	0	0	0	0	5	0	8
	Cibola Nature Trail	0	0	0	1	0	0	0	0	6	2	1	10
	Cibola Lake #1 (North)	0	0	4	0	0	0	8	0	0	0	0	37
	Cibola Lake #3 (West)	0	0	6	0	0	0	1	0	0	0	0	36
	Walker Lake	0	0	0	0	0	0	6	0	0	1	0	23

Table D.1. Number of Detections of Each Special Concern Species Recorded at Each Survey Site, 2012 (Continued)

Study Area[1]	Survey Site	Special Concern Species[2]											
		BLRA	CLRA	LEBI	YBCU	ELOW	GIFL	GIWO	VEFL	BEVI	YWAR	SUTA	YBCH
IMPE	Paradise	0	0	0	0	0	0	7	0	0	2	0	11
	Hoge Ranch	0	0	0	0	0	0	3	0	0	0	0	28
	Adobe Lake	0	0	0	0	0	0	2	0	0	0	0	1
	Rattlesnake	0	0	0	0	0	0	5	0	0	0	3	31
	Clear Lake	0	0	3	0	0	0	1	0	0	0	0	33
	Nursery Northwest	3	0	1	0	0	0	2	0	0	0	0	20
	Imperial Nursery	0	0	0	1	0	0	1	0	0	2	1	3
	Ferguson Lake	1	4	10	0	0	0	9	0	2	1	0	44
	Ferguson Wash	0	0	1	0	0	0	1	0	0	0	0	16
	Great Blue Heron	0	0	1	0	0	0	16	0	0	6	3	72
MITT	Mittry West	0	0	0	0	0	0	7	0	3	0	0	29
YUMA	Gila Confluence North	0	0	0	0	0	0	0	0	0	0	0	2

[1] PAHR = Pahranagat NWR; MESQ = Mesquite; MOME = Mormon Mesa; MUDD = Muddy River; TOPO = Topock Marsh; BIWI = Bill Williams River NWR; PVER = Palo Verde Ecological Reserve; EHRE = Ehrenberg; CIBO = Cibola; IMPE = Imperial; MITT = Mittry Lake; YUMA = Yuma.

[2] BLRA = Black Rail, CLRA = Clapper Rail, LEBI = Least Bittern, YBCU = Yellow Billed Cuckoo, ELOW = Elf Owl, GIFL = Gilded Flicker, GIWO = Gila Woodpecker, VEFL = Vermilion Flycatcher, BEVI = Bell's Vireo, YWAR = Yellow Warbler, SUTA = Summer Tanager, YBCH = Yellow-breasted Chat.

[3] Site surveyed as part of an opportunistic effort.

Appendix E

ALL WILLOW FLYCATCHERS COLOR-BANDED AND/OR RESIGHTED, 2003–2012

Table E.1. Willow Flycatchers Banded and/or Resighted by SWCA along the Virgin and Lower Colorado Rivers in 2003–2012*

Original Federal Band Number	Sex[2]	Age When Banded[3]	Study Area Detected[1]															
			1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
1490-89889	M	J							R		D	D	D	D				
1590-97338	M	A	P				P	P	P	P								
1710-20312	M	J							R		T							
1710-20638	M	A		G	M	M	M	M	M	M	M							
2090-42022	F	J		M					Q									
2110-78841	F	J						T	T	T	T							
2110-78842	M	A						Q	Q	Q								
2110-78855	M	J						T	T									
2110-78861	M	J						T	M[4]	Q								
2110-78863	M	J						T	T	T								
2140-66502	M	J						Q	Q									
2140-66503	F	J						Q		Q								
2140-66517	F	A						Q	Q	Q	D							
2140-66518	M	A						Q	Q									
2140-66561	M	A						P			P	P	P	P				
2140-66564	F	J						P	P									
2140-66566	M	J						P			P							
2140-66568	M	A						P	P		P	P	P	P				
2140-66606	M	J		M		Q	Q		Q									
2140-66621	F	A				P	P	P	P	P								
2140-66627	F	A				P	P	P		P								
2140-66690	F	J					P								S			
2140-66693	M	J					M	Q	Q									
2140-66696	F	J					Q		Q									
2140-66697	M	J					Q			P	P	P	P	P	P			
2140-66709	M	A						Q	Q	Q		Q[5]	M	M	M	M	M	M[6]
2140-66728	M	J					T			T								
2140-66743	M	J			T					T								
2140-66775	M	J				T	M		Q	Q	Q							
2190-76604	M	A					P		P	P	P	P						
2320-31401	M	A							B									
2320-31402	M	A							B									
2320-31403	M	A							Y									
2320-31404	F	A							B									
2320-31405	F	A							B									
2320-31406	U	J							B									
2320-31407	F	J							B	T								
2320-31408	U	J							B									
2320-31409	U	J							B									
2320-31410	U	J							B									
2320-31411	U	J							B									

Table E.1. Willow Flycatchers Banded and/or Resighted by SWCA along the Virgin and Lower Colorado Rivers in 2003–2012* (Continued)

Original Federal Band Number	Sex[2]	Age When Banded[3]	Study Area Detected[1]															
			1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
2320-31412	M	A							B	B								
2320-31413	U	A							Q									
2320-31414	M	A								T	T							
2320-31415	F	A								T								
2320-31416	U	J								T								
2320-31417	U	J								T								
2320-31418	M	A								T	T							
2320-31419	U	J								T								
2320-31420	U	J								T								
2320-31421	U	J								T								
2320-31422	U	J								T								
2320-31423	U	A								T								
2320-31424	M	J								T	T							
2320-31425	U	J								T								
2320-31426	F	A							M									
2320-31427	M	A							M									
2320-31428	M	J							Q	M	Q[7]		M	M				
2320-31429	U	J							Q									
2320-31430	U	J							P									
2320-31431	U	J							Q									
2320-31432	U	J							P									
2320-31433	U	J							Q									
2320-31434	U	J							Q									
2320-31435	U	J							P									
2320-31436	U	J							P									
2320-31437	U	J							P									
2320-31438	M	J							Q	Q								
2320-31439	U	J							Q									
2320-31440	F	J							Q	M								
2320-31441	U	J							M									
2320-31443	U	J							Q									
2320-31444	F	A							Q	Q	Q	Q			M			
2320-31445	F	A							Q	Q	Q	Q	Q	Q	Q	Q		
2320-31446	U	J								P								
2320-31447	U	J								P								
2320-31448	U	J								P								
2320-31449	U	J								P								
2320-31450	U	J								P								
2320-31451	M	A							P	P	P	P						
2320-31452	M	A							P									

Table E.1. Willow Flycatchers Banded and/or Resighted by SWCA along the Virgin and Lower Colorado Rivers in 2003–2012* (Continued)

Original Federal Band Number	Sex[2]	Age When Banded[3]	Study Area Detected[1]															
			1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
2320-31453	M	A							P	P								
2320-31454	M	A							P	P								
2320-31455	M	A							P									
2320-31456	U	J							P									
2320-31457	M	J							P	K								
2320-31458	M	J							P		P							
2320-31459	M	J							P	P								
2320-31460	U	J							P									
2320-31461	U	J							P									
2320-31462	U	J							P									
2320-31463	F	J							P			K	K			K		
2320-31464	U	J							P									
2320-31465	U	J							P									
2320-31466	F	A							P									
2320-31467	M	J							P		P	P						
2320-31468	M	J							P		P	P		K				
2320-31469	U	J							P									
2320-31470	U	J							P									
2320-31471	M	J							Q	Q			M		M			
2320-31472	U	J							Q									
2320-31473	M	J							Q	Q								
2320-31474	U	J							Q									
2320-31475	M	J							P	L								
2320-31476	F	A							Q									
2320-31477	U	J							Q									
2320-31479	F	A							Q	Q								
2320-31480	F	J							Q	Q								
2320-31481	U	J							P									
2320-31482	U	J							P									
2320-31483	U	J								Q								
2320-31484	M	J								P	P			K	K			
2320-31485	F	A								M		M	M	M				
2320-31486	F	J							Q	L	Q	M	M	M				
2320-31487	U	J							Q									
2320-31488	U	J							Q									
2320-31489	U	A								M								
2320-31490	M	A								L	L[8]	Q	Q	Q	Q			
2320-31491	M	A								Q								
2320-31493	M	A								D								
2320-31494	U	A								Q								

Table E.1. Willow Flycatchers Banded and/or Resighted by SWCA along the Virgin and Lower Colorado Rivers in 2003–2012* (Continued)

Original Federal Band Number	Sex[2]	Age When Banded[3]	Study Area Detected[1]															
			1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
2320-31495	M	A								T								
2320-31496	U	J								M								
2320-31497	U	J								M								
2320-31498	F	J								M		G[9]	Q	Q	Q	Q		
2320-31499	M	A								Q								
2320-31500	U	J								Q								
2320-31501	M	A							B									
2320-31502	F	A							T	T								
2320-31503	U	A								I								
2320-31504	U	A								I								
2320-31505	M	A								T								
2320-31506	U	J								T								
2320-31507	U	J								T								
2320-31508	U	J								T								
2320-31510	U	J								T								
2320-31511	U	J								T								
2320-31512	U	J								T								
2320-31513	U	J								T								
2320-31514	U	J								T								
2320-31515	F	A								T	T	T						
2320-31516	F	A								G								
2320-31517	M	A								G	M	M			M			
2320-31518	U	J								T								
2320-31519	U	J								T								
2320-31520	U	J								T								
2320-31521	F	A								T	T							
2320-31522	U	J											Q					
2320-31523	U	J											M					
2320-31524	U	J											P					
2320-31525	U	J											P					
2320-31526	F	A							T	T	T							
2320-31527	F	A							T									
2320-31528	M	A							T									
2320-31529	U	J							T									
2320-31530	U	J							T									
2320-31531	U	J							T									
2320-31532	U	J							T									
2320-31533	U	J							T									
2320-31534	U	J							T									
2320-31535	U	J							T									
2320-31536	U	J							T									

Table E.1. Willow Flycatchers Banded and/or Resighted by SWCA along the Virgin and Lower Colorado Rivers in 2003–2012* (Continued)

Original Federal Band Number	Sex[2]	Age When Banded[3]	Study Area Detected[1]															
			1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
2320-31537	U	J							T									
2320-31538	M	A								T								
2320-31539	M	A								B								
2320-31540	F	A								T								
2320-31541	M	A								T	T							
2320-31542	U	J								T								
2320-31543	U	J								T								
2320-31544	U	J								T								
2320-31545	U	J											P					
2320-31546	U	J											P					
2320-31547	U	J											P					
2320-31548	U	J											P					
2320-31549	U	J											P					
2320-31550	U	J											P					
2320-31551	M	A								Q								
2320-31552	M	A								M								
2320-31553	M	A								M		M						
2320-31554	U	J								T								
2320-31555	U	J								T								
2320-31556	U	J								T								
2320-31557	U	J								T								
2320-31558	U	J								T								
2320-31559	M	A								T	T	T	T					
2320-31560	M	A								T	T	T	T	T				
2320-31561	U	J								T								
2320-31562	M	J								T		T		T	T	T		
2320-31563	U	J								T								
2320-31564	U	J								T								
2320-31565	F	A								T	T							
2320-31566	U	J										T						
2320-31567	M	A								T	T							
2320-31568	F	A								P								
2320-31569	U	J								P								
2320-31570	U	J								P								
2320-31571	U	J								P								
2320-31572	M	A								M								
2320-31573	F	A								Q	Q	Q	Q	Q				
2320-31574	U	J									P							
2320-31575	U	J										Q						
2320-31576	M	A							T	T								

Table E.1. Willow Flycatchers Banded and/or Resighted by SWCA along the Virgin and Lower Colorado Rivers in 2003–2012* (Continued)

Original Federal Band Number	Sex[2]	Age When Banded[3]	Study Area Detected[1]															
			1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
2320-31577	F	A							T	T	T							
2320-31578	U	A							Y									
2320-31579	U	A							Y									
2320-31580	U	A							Y									
2320-31581	U	J							T									
2320-31582	U	J							T									
2320-31583	U	J							T									
2320-31584	F	A							T	T	T	T						
2320-31585	U	J							T									
2320-31586	U	J							T									
2320-31587	U	J							T									
2320-31588	U	J							T									
2320-31589	M	A								P	P	P	P					
2320-31590	M	A								P	P	P	P	P				
2320-31591	M	A								P	P	P	P					
2320-31593	M	A								P	P	P						
2320-31594	M	A								P								
2320-31595	M	A								P	P	P	P	P	P	P	P	P
2320-31596	M	A								P								
2320-31598	M	A								T								
2320-31599	U	A								I								
2320-31600	U	A								I								
2320-31601	U	J								P								
2320-31602	U	J								P								
2320-31603	U	J								P								
2320-31604	M	J								P		K	K					
2320-31605	U	J								P								
2320-31606	U	J								P								
2320-31607	U	J								P								
2320-31608	U	J								P								
2320-31609	U	J								P								
2320-31610	U	J								P								
2320-31611	U	J								Q								
2320-31612	U	J								Q								
2320-31616	F	J								Q		D						
2320-31617	U	J								Q								
2320-31618	F	J								Q	M	M	M					
2320-31619	U	J								M								
2320-31620	U	J								M								
2320-31621	F	A								M								

Table E.1. Willow Flycatchers Banded and/or Resighted by SWCA along the Virgin and Lower Colorado Rivers in 2003–2012* (Continued)

Original Federal Band Number	Sex[2]	Age When Banded[3]	Study Area Detected[1]															
			1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
2320-31622	M	A								Q								
2320-31623	U	J								M								
2320-31624	U	J								M								
2320-31625	F	A								M								
2320-31627	M	A								Q								
2320-31628	U	A								M								
2320-31629	U	J								M								
2320-31630	U	J								Q								
2320-31631	F	J								Q		D	D					
2320-31632	F	A								Q		M	M	M[10]		M	M	M
2320-31633	U	J								Q								
2320-31634	U	J								Q								
2320-31635	M	A								K								
2320-31636	U	J								K								
2320-31637	F	J								K	P							
2320-31638	U	J								K								
2320-31639	U	J											P					
2320-31640	U	J											Q					
2320-31641	U	J											Q					
2320-31642	U	J											Q					
2320-31643	U	J											P					
2320-31644	U	J											M					
2320-31645	U	J											M					
2320-31646	U	J											P					
2320-31647	U	J														M		
2320-31648	U	J														M		
2320-31649	U	J											P					
2320-31650	F	J										T	T					
2320-31651	M	A								M								
2320-31652	M	A								M	Q	Q						
2320-31653	M	A								M	M	M	M					
2320-31654	M	A								Q								
2320-31655	F	A								Q	Q	Q						
2320-31656	F	A								P	P	P						
2320-31657	F	A								P	P	P	P	P	P			
2320-31658	F	A								P								
2320-31659	M	J								Q		D	D	D		D		
2320-31660	F	J								Q			M	S	S	S		
2320-31661	F	A								P	P	P	P	P				
2320-31662	F	A								P								

Table E.1. Willow Flycatchers Banded and/or Resighted by SWCA along the Virgin and Lower Colorado Rivers in 2003–2012* (Continued)

Original Federal Band Number	Sex[2]	Age When Banded[3]	Study Area Detected[1]															
			1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
2320-31663	F	A								P	P	P	P	P				
2320-31664	F	A								P								
2320-31665	U	J								P								
2320-31666	U	J								P								
2320-31667	U	J								P								
2320-31668	F	A								P								
2320-31669	F	A								P								
2320-31670	U	J											Q					
2320-31671	U	J										M						
2320-31672	U	J											P					
2320-31673	U	J										T						
2320-31674	M	J										P		K	K	K		
2320-31675	U	J									T							
2320-31676	U	J									T							
2320-31677	U	J										T						
2320-31678	U	J										P						
2320-31679	U	J											P					
2320-31680	U	J									T							
2320-31681	U	J									T							
2320-31682	U	J									P							
2320-31683	M	J									P		K					
2320-31684	U	J									P							
2320-31685	U	J									P							
2320-31686	M	J									P	P						
2320-31687	U	J									P							
2320-31688	M	J									Q	Q	Q	Q	Q	Q	Q	Q
2320-31689	U	J									Q							
2320-31690	U	J									Q							
2320-31691	U	J									Q							
2320-31692	M	J									P	K						
2320-31693	U	J									P							
2320-31694	M	J									P		K	K				
2320-31695	F	J									P	P						
2320-31696	U	J									Q							
2320-31697	U	J									P							
2320-31698	F	J									P		P	P	P			
2320-31699	U	J									P							
2320-31700	U	J									P							
2360-59701	F	J									Q	Q						
2360-59702	M	J									Q	D	M					

Table E.1. Willow Flycatchers Banded and/or Resighted by SWCA along the Virgin and Lower Colorado Rivers in 2003–2012* (Continued)

Original Federal Band Number	Sex[2]	Age When Banded[3]	Study Area Detected[1]															
			1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
2360-59703	U	J									Q							
2360-59704	U	J									M							
2360-59705	U	J									M							
2360-59706	U	J									K							
2360-59707	F	J									P	P						
2360-59708	F	J									P	P						
2360-59709	U	J									P							
2360-59710	U	J									P							
2360-59711	M	J									K			P	P	P		
2360-59712	M	J									K			P		P	P	
2360-59713	U	J									K							
2360-59714	U	J									Q							
2360-59715	U	J									Q							
2360-59716	U	J									Q							
2360-59717	M	A								Q								
2360-59718	U	J									P							
2360-59719	U	J									T							
2360-59720	U	J									T							
2360-59721	U	J								P								
2360-59722	U	J									T							
2360-59723	U	J								P								
2360-59724	F	J								P		P						
2360-59725	U	J									B							
2360-59727	M	J									B		B					
2360-59728	U	J									B							
2360-59729	U	J									T							
2360-59730	U	J									T							
2360-59731	U	J									T							
2360-59732	U	J									T							
2360-59733	U	J									T							
2360-59734	U	J									T							
2360-59735	U	J										P						
2360-59736	U	J										P						
2360-59737	U	J										D						
2360-59738	U	J										D						
2360-59739	U	J										Q						
2360-59740	U	J									P							
2360-59741	U	J									Q							
2360-59742	U	J									Q							
2360-59743	F	J											P	K				

Table E.1. Willow Flycatchers Banded and/or Resighted by SWCA along the Virgin and Lower Colorado Rivers in 2003–2012* (Continued)

Original Federal Band Number	Sex[2]	Age When Banded[3]	Study Area Detected[1]															
			1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
2360-59744	U	J										T						
2360-59745	U	J										P						
2360-59746	U	J								G								
2360-59747	U	J										D						
2360-59748	U	J										D						
2360-59749	M	J										D	D[11]	M				
2360-59750	F	J										M	Q					
2360-59751	M	J										M	Q	Q	Q			
2360-59752	M	J										Q		Q	M			
2360-59753	U	J										Q						
2360-59754	M	J										Q	Q	Q	Q	P	P	
2360-59755	U	J										Q						
2360-59756	U	J										P						
2360-59757	U	J								K								
2360-59758	U	J										P						
2360-59759	U	J										P						
2360-59760	U	J								L								
2360-59761	U	J								L								
2360-59762	U	J								Q								
2360-59763	U	J								Q								
2360-59764	U	J											P					
2360-59765	U	J											P					
2360-59766	U	J								Q								
2360-59767	U	J								K								
2360-59768	U	J										T						
2360-59769	U	J										M						
2360-59770	U	J								K								
2360-59771	U	J								G								
2360-59772	F	A								K								
2360-59773	U	J											Q					
2360-59775	U	J											Q					
2360-59776	U	J											Q					
2360-59777	F	J											Q				M	M
2360-59778	U	J											Q					
2360-59779	U	J											K					
2360-59780	U	J											K					
2360-59781	U	J											K					
2360-59782	F	J											K			M		
2360-59785	U	J									D							
2360-59786	U	J									D							

Table E.1. Willow Flycatchers Banded and/or Resighted by SWCA along the Virgin and Lower Colorado Rivers in 2003–2012* (Continued)

Original Federal Band Number	Sex[2]	Age When Banded[3]	Study Area Detected[1]															
			1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
2360-59787	U	J									D							
2360-59788	F	J									D	D	M	M	M	M	M	M
2360-59789	U	J										Q						
2360-59790	U	J										Q						
2360-59791	U	J										P						
2360-59792	U	J										P						
2360-59793	U	J										P						
2360-59794	U	J										P						
2360-59795	U	J										P						
2360-59796	U	J										P						
2360-59797	M	J										P	P					
2360-59798	U	J										P						
2360-59799	M	J										M	D	M		M		
2360-59800	U	J								G								
2370-39901	U	A								P								
2370-39902	U	J								P								
2370-39904	U	J								P								
2370-39911	M	A									P							
2370-39912	M	A									Q		Q					
2370-39913	M	A									G							
2370-39914	U	J									P							
2370-39915	M	A									P	P	P	P[12]	P	P		
2370-39916	M	A										T	T	T				
2370-39917	U	A										Y						
2370-39918	U	A										Y						
2370-39919	U	A										Y						
2370-39920	U	A										Y						
2370-39921	U	A										Y						
2370-39922	U	A										Y						
2370-39923	U	A										Y						
2370-39924	U	A										Y						
2370-39925	U	A										Y						
2370-39926	U	A										Y						
2370-39927	U	A										Y						
2370-39928	U	A										Y						
2370-39929	M	A										G	G					
2370-39930	M	J													M	Q	D[13]	
2370-39932	F	A									B	B	B					
2370-39933	U	A									Y							
2370-39934	U	A									Y							

Table E.1. Willow Flycatchers Banded and/or Resighted by SWCA along the Virgin and Lower Colorado Rivers in 2003–2012* (Continued)

Original Federal Band Number	Sex[2]	Age When Banded[3]	Study Area Detected[1]															
			1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
2370-39935	U	A									Y							
2370-39937	M	A										Q	Q	Q				
2370-39938	M	A										M	M	M	M	M	M	M
2370-39939	F	A										Q	Q					
2370-39940	M	A										M	M	M	Q			
2370-39941	M	J										Q	L[14]					
2370-39942	U	J										D						
2370-39943	U	J										D						
2370-39944	U	J										D						
2370-39945	U	J										P						
2370-39946	M	J										P	P					
2370-39947	U	J										P						
2370-39948	F	A										M						
2370-39949	U	J										Q						
2370-39950	U	J										Q						
2370-39951	M	A									P	P	P	P				
2370-39953	M	A									P	P	P	P				
2370-39954	M	A									Q	Q	Q	Q				
2370-39956	F	A									D	D	D			M	M	M
2370-39957	F	A									Q	Q						
2370-39958	F	A									P							
2370-39959	M	A									P		A					
2370-39960	M	A									K							
2370-39961	M	A									P							
2370-39962	F	A									P							
2370-39964	F	A									P	P	P					
2370-39965	U	A									D							
2370-39966	M	J									D		M					
2370-39967	M	A										M	D[15]	Q	Q			
2370-39968	M	A															D	
2370-39969	F	A													B			
2370-39970	U	J															M	
2370-39971	U	A									P							
2370-39972	U	A									I							
2370-39973	U	A									Y							
2370-39974	U	A									I							
2370-39975	M	A									D	M						
2370-39976	M	A									D							
2370-39977	U	J									P							
2370-39978	F	A									P							

Table E.1. Willow Flycatchers Banded and/or Resighted by SWCA along the Virgin and Lower Colorado Rivers in 2003–2012* (Continued)

Original Federal Band Number	Sex[2]	Age When Banded[3]	Study Area Detected[1]															
			1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
2370-39979	U	J									P							
2370-39980	M	J									P	K	K	K	K			
2370-39981	U	J									P							
2370-39982	U	A										Y						
2370-39983	U	A										Y						
2370-39984	U	A										Y						
2370-39985	U	A										Y						
2370-39986	M	A										G						
2370-39987	M	A										G						
2370-39988	M	A										G	M	M	M	M		
2370-39989	M	A										G						
2370-39990	F	A										G						
2370-39992	M	A										T						
2370-39993	U	A										Y						
2370-39994	U	A										Y						
2370-39995	U	A										Y						
2370-39996	U	A										Y						
2370-39997	U	A										Y						
2370-39998	U	A										Y						
2370-39999	M	A														Q		
2370-40000	M	A														D	D	D
2370-40001	U	J														P		
2370-40002	U	J														P		
2370-40003	M	A										T						
2370-40004	F	A										B			B			
2370-40005	U	J														S		
2370-40007	U	J														S		
2370-40008	U	J														D		
2370-40009	U	J														D		
2370-40010	M	J														D	K	K
2370-40011	F	A														Q		
2370-40012	M	A									Q	Q	Q					
2370-40013	M	A									P	P						
2370-40014	F	A									P	P	P					
2370-40016	U	J									P							
2370-40017	M	A									M	M						
2370-40019	U	J									P							
2370-40020	U	J									P							
2370-40021	M	A									P	P						
2370-40022	M	A														K		
2370-40023	U	J													M			

Table E.1. Willow Flycatchers Banded and/or Resighted by SWCA along the Virgin and Lower Colorado Rivers in 2003–2012* (Continued)

Original Federal Band Number	Sex[2]	Age When Banded[3]	Study Area Detected[1]															
			1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
2370-40024	M	J													K	K	K	K
2370-40025	U	J													K			
2370-40026	U	J													P			
2370-40027	F	J													P	E	K	
2370-40029	M	J													M		D	
2370-40030	U	J													M			
2370-40031	M	J													K	K	K	
2370-40032	M	A									B							
2370-40033	U	A									Y							
2370-40034	U	A									Y							
2370-40035	U	A									Y							
2370-40036	M	A										G[16]						
2370-40037	F	A										G	M		M	M	M	M
2370-40038	M	A										G						
2370-40039	U	A										Y						
2370-40040	U	A										Y						
2370-40041	U	A										Y						
2370-40042	U	A										Y						
2370-40043	U	A										Y						
2370-40044	U	A										Y						
2370-40045	U	A										Y						
2370-40046	M	A										G	G[17]	M	M	M	M	M
2370-40047	F	A										P	P	P	P	P	P	P
2370-40048	U	J													T			
2370-40049	U	J													T			
2370-40050	U	J													T			
2370-40051	U	J														K		
2370-40052	M	A									B	B	B	B				
2370-40053	M	A									B							
2370-40054	M	A									B							
2370-40055	F	A									T							
2370-40056	M	A									T							
2370-40057	M	A										D						
2370-40058	M	A										M	B					
2370-40059	F	A										D	D	D				
2370-40060	M	A										P		P	P	P	P	
2370-40061	F	A										P						
2370-40062	F	A										P	P					
2370-40063	U	J										Q						
2370-40064	U	J										P						
2370-40065	U	J										Q						

Table E.1. Willow Flycatchers Banded and/or Resighted by SWCA along the Virgin and Lower Colorado Rivers in 2003–2012* (Continued)

Original Federal Band Number	Sex[2]	Age When Banded[3]	Study Area Detected[1]															
			1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
2370-40066	F	A										Q	Q	Q	Q			
2370-40067	U	J										Q						
2370-40068	U	J										Q						
2370-40069	U	J										M						
2370-40070	U	J										M						
2370-40071	U	J										P						
2370-40072	U	J													M			Q
2370-40073	F	A													P	P		
2370-40074	U	J													P			
2370-40075	U	J													P			
2370-40076	U	J													P			
2370-40078	U	J															K	
2370-40079	U	J															K	
2370-40080	U	J										Q						
2370-40081	M	A										K						
2370-40082	F	A										K						
2370-40083	U	J										Q						
2370-40084	U	J										Q						
2370-40085	U	J											Q					
2370-40086	U	J											Q	M	M			
2370-40087	F	A											Q	Q	Q	Q	Q	
2370-40088	M	A														D	D	D
2370-40089	U	J														M		
2370-40090	U	J														M		
2370-40091	F	J														M	D	
2370-40093	U	J														M		
2370-40096	U	J												K				
2370-40097	M	J												K		K	K	
2370-40098	U	J												K				
2370-40099	U	J													S			
2370-40100	U	J										K						
2370-40101	U	J										K						
2370-40102	U	J										K						
2370-40103	U	J										Q						
2370-40104	U	J										Q						
2370-40105	U	J										Q						
2370-40106	U	J										Q						
2370-40107	U	J										Q						
2370-40108	U	J										Q						
2370-40110	U	J											T					

Table E.1. Willow Flycatchers Banded and/or Resighted by SWCA along the Virgin and Lower Colorado Rivers in 2003–2012* (Continued)

Original Federal Band Number	Sex[2]	Age When Banded[3]	Study Area Detected[1]															
			1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
2370-40111	U	J											T					
2370-40112	M	J											T			T		
2370-40113	U	J											B					
2370-40114	M	J											T		T			
2370-40115	U	J											T					
2370-40116	U	J											T					
2370-40117	U	J											T					
2370-40118	U	J											T					
2370-40119	U	J											T					
2370-40120	U	J											T					
2370-40121	U	J											T					
2370-40122	U	J											T					
2370-40123	U	J											T					
2370-40124	M	J											T		M			
2370-40125	U	J											T					
2370-40126	M	A											G					
2370-40127	M	A											G					
2370-40129	M	A											G					
2370-40130	F	A													B			
2370-40132	F	A											T					
2370-40133	F	A											B					
2370-40134	U	A											B					
2370-40135	F	A											B					
2370-40136	F	A											T					
2370-40137	M	A											B					
2370-40138	M	A											T					
2370-40139	M	A											T	T				
2370-40140	F	A													P			
2370-40141	M	A													K	K	K	
2370-40142	U	J													M			
2370-40143	U	J													Q			
2370-40144	M	J													M	T		
2370-40145	U	J													M			
2370-40146	U	J													S			
2370-40147	F	J												S	D			
2370-40148	F	J												S	S	S	S	
2370-40149	U	J												S				
2370-40150	U	J													M			
2370-40151	F	J													M	M		
2370-40152	U	J													M			

Table E.1. Willow Flycatchers Banded and/or Resighted by SWCA along the Virgin and Lower Colorado Rivers in 2003–2012* (Continued)

Original Federal Band Number	Sex[2]	Age When Banded[3]	Study Area Detected[1]															
			1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
2370-40153	U	J													S			
2370-40154	U	J													S			
2370-40155	M	A													L			P
2370-40156	M	A													B			
2370-40157	M	A											P		P	P		
2370-40158	M	J											B		T			
2370-40159	U	J											B					
2370-40160	F	A											G					
2370-40161	M	A											M	M	M			
2370-40162	U	J													B			
2370-40163	U	J													B			
2370-40164	U	J											Q					
2370-40165	M	A													B			
2370-40166	U	A											P					
2370-40167	U	J											P					
2370-40168	F	A											P	P	P			
2370-40169	U	J											M					
2370-40170	F	A											Q	Q				
2370-40171	F	A											D					
2370-40173	M	A											M	M	M	M		
2370-40174	U	J													M			
2370-40175	M	J													M	Q	Q	D
2370-40176	M	A													M			
2370-40177	U	J														T		
2370-40179	U	J														K		
2370-40180	M	A													B			
2370-40181	M	A													T			
2370-40182	U	J													B			
2370-40183	F	A											M					
2370-40184	M	A											D					
2370-40185	M	A											P					
2370-40186	M	A											D					
2370-40187	M	A											K					
2370-40188	U	J											Q					
2370-40190	M	J											P				K	K
2370-40191	F	A											M	M	M			
2370-40192	F	A											D			B		
2370-40193	F	A											Q	Q	Q	D		
2370-40194	F	A											P	P	P	P		
2370-40195	F	A											P	P	P			

Table E.1. Willow Flycatchers Banded and/or Resighted by SWCA along the Virgin and Lower Colorado Rivers in 2003–2012* (Continued)

Original Federal Band Number	Sex[2]	Age When Banded[3]	Study Area Detected[1]															
			1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
2370-40197	M	A											M	Q	Q	M	M	M
2370-40199	U	J											P					
2390-92348	F	J		T						T								
2390-92350	M	A				M	Q		Q	Q								
2390-92365	M	J				D			Q	Q	Q							
2390-92410	M	A					Q		Q									
2390-92420	M	J					Q	Q	Q									
2390-92421	M	J					Q	Q	Q	Q	M	M						
2390-92427	F	J					M		Q									
2390-92433	M	J					Q		Q	Q								
2390-92434	M	J					Q	Q		Q	Q	Q	Q	Q	Q	M	M	
2390-92451	F	J			M	M		Q		Q								
2390-92470	F	J					Q			Q								
2390-92475	M	J					M	Q	Q	Q	Q	Q	Q	Q				
2430-61006	U	A											Y					
2430-61007	U	A											Y					
2430-61008	U	A											Y					
2430-61009	U	A											Y					
2430-61010	U	A											Y					
2430-61011	U	A											Y					
2430-61012	U	A											Y					
2430-61013	U	A											Y					
2430-61014	U	A											Y					
2430-61015	U	A											Y					
2430-61016	U	A											Y					
2430-61017	U	A											Y					
2430-61018	U	A											Y					
2430-61019	U	A											Y					
2430-61020	U	A											Y					
2430-61021	U	A											Y					
2430-61023	U	A											Y					
2430-61024	U	A											Y					
2430-61025	U	A											Y					
2430-61026	U	A											Y					
2430-61027	U	A											Y					
2430-61028	U	A											Y					
2430-61029	U	A											Y					
2430-61030	U	A											Y					
2430-61031	U	A											Y					
2430-61032	U	A											Y					

Table E.1. Willow Flycatchers Banded and/or Resighted by SWCA along the Virgin and Lower Colorado Rivers in 2003–2012* (Continued)

Original Federal Band Number	Sex[2]	Age When Banded[3]	Study Area Detected[1]															
			1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
2430-61033	U	A											Y					
2430-61034	U	A											Y					
2430-61035	U	A											Y					
2430-61036	U	A											Y					
2430-61037	U	A											Y					
2430-61038	U	A											Y					
2430-61039	U	A											Y					
2430-61040	U	A											Y					
2430-61041	U	A											Y					
2430-61042	U	A											Y					
2430-61043	U	A											Y					
2430-61044	U	A											Y					
2430-61045	U	A											Y					
2430-61046	U	A											Y					
2430-61047	U	A											Y					
2430-61048	U	A											Y					
2430-61049	U	A											Y					
2430-61050	U	A											Y					
2430-61051	U	A											Y					
2430-61052	U	A											Y					
2430-61053	U	A											Y					
2430-61054	U	A											Y					
2430-61055	U	A											Y					
2430-61056	U	A											Y					
2430-61058	U	A											Y					
2430-61059	U	A											Y					
2430-61060	U	A											Y					
2430-61061	U	A											Y					
2430-61062	U	A											Y					
2430-61063	U	A											Y					
2430-61064	U	A											Y					
2430-61065	U	A											Y					
2430-61067	U	A											Y					
2430-61068	U	A											Y					
2430-61069	U	A											Y					
2430-61070	U	A											Y					
2430-61071	U	A											Y					
2430-61072	M	A												G			T	
2430-61073	M	A												B				
2430-61074	U	J												B				

Table E.1. Willow Flycatchers Banded and/or Resighted by SWCA along the Virgin and Lower Colorado Rivers in 2003–2012* (Continued)

Original Federal Band Number	Sex[2]	Age When Banded[3]	Study Area Detected[1]															
			1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
2430-61075	U	J												B				
2430-61076	U	J												B				
2430-61077	U	J												M				
2430-61078	U	J												Q				
2430-61079	F	A												M				
2430-61080	M	A												P	P	P	P	P
2430-61081	U	J												M				
2430-61082	U	J												Q				
2430-61083	M	A												P	P	P	P	P
2430-61084	M	J												Q		D		
2430-61085	M	A													D	D	D	D
2430-61086	U	J													M			
2430-61087	F	A													P	P	P	P
2430-61088	M	A														N	D	E
2430-61089	U	J														M		
2430-61090	U	J														M		
2430-61091	U	J														S		
2430-61092	F	A														S		
2430-61093	M	A														S	S	
2430-61094	U	J														D		
2430-61095	M	A														M		
2430-61096	F	A														L		
2430-61097	U	J														P		
2430-61098	M	J														P	E[18]	
2430-61099	M	J														K	E[19]	K
2430-61100	F	A														K	K	K
2430-61101	U	J												K				
2430-61102	U	J												K				
2430-61103	M	A												D				
2430-61104	M	A												M				
2430-61105	M	A												Q				
2430-61106	M	J												P		M	M	
2430-61107	U	J												P				
2430-61108	U	J												P				
2430-61109	F	A												K				
2430-61110	U	J												K				
2430-61111	U	J												P				
2430-61112	U	J												P				
2430-61113	U	J												P				
2430-61114	M	J												P		K	K	

Table E.1. Willow Flycatchers Banded and/or Resighted by SWCA along the Virgin and Lower Colorado Rivers in 2003–2012* (Continued)

Original Federal Band Number	Sex[2]	Age When Banded[3]	Study Area Detected[1]															
			1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
2430-61115	U	J												P				
2430-61116	F	A												M	M			
2430-61117	U	J												P				
2430-61118	M	J												P	M	M	K	
2430-61119	U	J												P				
2430-61120	F	J												P	P	P	P	P
2430-61121	U	J												Q				
2430-61122	U	J												P				
2430-61123	F	J												P		P		
2430-61124	F	J												P		K		
2430-61125	M	A												K				
2430-61126	U	J												S				
2430-61127	M	A												P	P			
2430-61128	U	J												M				
2430-61129	U	J												Q				
2430-61130	U	J												Q				
2430-61131	U	J												M				
2430-61132	U	J												M				
2430-61133	U	J												M				
2430-61134	M	A												T		N	N	N
2430-61135	M	A												T	T	T		
2430-61136	M	A												B	B	B	B	
2430-61137	F	A												B	B	B	B	B
2430-61138	F	A												B				
2430-61139	F	A												T				
2430-61140	U	J												B				
2430-61141	U	J												B				
2430-61142	U	J												B				
2430-61143	U	J												T				
2430-61144	U	J												T				
2430-61145	U	J												T				
2430-61151	U	J														K		
2430-61152	U	J														P		
2430-61153	F	A													M			
2430-61154	F	J													Q	S	S	S
2430-61155	U	J													Q			
2430-61156	U	J													K			
2430-61157	U	J													K			
2430-61158	M	A													K	K	K	K
2430-61159	M	J													M		K	K
2430-61160	U	J													M			

Table E.1. Willow Flycatchers Banded and/or Resighted by SWCA along the Virgin and Lower Colorado Rivers in 2003–2012* (Continued)

Original Federal Band Number	Sex[2]	Age When Banded[3]	Study Area Detected[1]															
			1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
2430-61161	U	J													D			
2430-61162	M	A													S			
2430-61163	F	A														K		
2430-61165	M	J												Q	Q	M		
2430-61167	M	A												M	M	M	M	
2430-61168	U	J												M				
2430-61169	U	J												M				
2430-61170	U	J												M				
2430-61171	U	J												M				
2430-61172	F	J												M	M			
2430-61173	U	J												M	M			
2430-61174	F	J												M		Q		
2430-61175	U	J												Q				
2430-61176	M	J												Q		P	P	P
2430-61177	U	J												Q				
2430-61178	M	A												K				
2430-61179	M	A												K	P	P	P	P
2430-61180	M	A												K		K	K	K
2430-61181	F	A												K	K			
2430-61182	M	A												K				
2430-61183	M	A												K				
2430-61184	U	J												Q				
2430-61185	F	J												Q	M			
2430-61186	U	J												Q				
2430-61187	M	J												Q	L	L		
2430-61188	U	J												Q				
2430-61189	M	J												Q		M		
2430-61190	U	J												Q				
2430-61191	M	J												M	D			
2430-61192	U	J												M				
2430-61193	U	J												M				
2430-61194	U	J												Q	Q			
2430-61195	U	J												Q				
2430-61196	U	J												Q				
2430-61197	M	J												P		K	K	K
2430-61198	U	J												P	Q			
2430-61199	U	J												P				
2430-61200	U	J												P				
2430-61202	U	J												M				
2430-61203	U	J												M				

Table E.1. Willow Flycatchers Banded and/or Resighted by SWCA along the Virgin and Lower Colorado Rivers in 2003–2012* (Continued)

Original Federal Band Number	Sex[2]	Age When Banded[3]	Study Area Detected[1]															
			1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
2430-61204	U	J												M				
2430-61205	U	J												M				
2430-61206	M	J												M		M		
2430-61207	F	J												M	D	D		
2430-61208	U	J												D				
2430-61209	M	A												V	D			
2430-61210	U	A												K				
2430-61211	U	J												S				
2430-61212	U	J												M				
2430-61213	U	J														K		
2430-61214	M	A															K	
2430-61215	U	J															P	
2430-61216	U	J															Q	
2430-61217	U	J															Q	
2430-61218	F	J															P	P
2430-61219	U	J															M	
2430-61220	F	J															P	P
2430-61221	U	J														P		
2430-61223	U	J												D				
2430-61224	U	J												D				
2430-61225	U	J												D				
2430-61226	U	J														P		
2430-61227	U	J														P		
2430-61228	U	J														K		
2430-61229	U	J														K		
2430-61230	F	A														S	S	S
2430-61231	U	J														S		M
2430-61232	U	J														L		
2430-61233	U	J														L		
2430-61234	F	A														Q	Q	
2430-61235	U	J														Q		
2430-61236	U	J														K		
2430-61237	U	J															B	
2430-61257	M	A																P
2430-61258	U	J																K
2430-61259	M	A																M
2430-61260	M	A																D
2430-61261	M	A																D
2430-61262	U	J																K
2430-61263	U	J																K
2430-61264	U	J																K

Table E.1. Willow Flycatchers Banded and/or Resighted by SWCA along the Virgin and Lower Colorado Rivers in 2003–2012* (Continued)

Original Federal Band Number	Sex[2]	Age When Banded[3]	Study Area Detected[1]															
			1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
2430-61265	U	J																M
2430-61266	U	J																M
2430-61267	F	A																P
2430-61271	U	J													P			
2430-61276	U	J														Q		
2430-61277	F	J													P	P		
2430-61278	U	J													P			
2430-61279	F	J													P	K	K	K
2430-61280	U	J														M		
2430-61281	M	A																M
2430-61282	M	A																M
2430-61285	U	J													M			
2430-61286	M	A																M
2430-61287	U	J																K
2430-61288	U	J																K
2430-61289	U	J																K
2430-61290	U	J																P
2430-61291	U	J																P
2430-61292	U	J																P
2430-61293	U	J																P
2430-61294	U	J																P
2430-61295	U	J																K
2430-61296	U	J																D
2430-61297	U	J																D
2430-61298	F	A																M
2430-61299	U	J																M
2430-61300	U	J																P
2540-58101	U	J														K		
2540-58102	U	J														K		
2540-58103	U	J														K		
2540-58104	U	J														K		
2540-58105	U	J														Q		
2540-58106	U	J														Q		
2540-58107	U	J														Q		
2540-58108	U	A															T	
2540-58109	M	A															P[20]	
2540-58110	F	A															P	
2540-58111	F	A															P	P
2540-58112	U	J															Q	
2540-58113	U	J															M	

Table E.1. Willow Flycatchers Banded and/or Resighted by SWCA along the Virgin and Lower Colorado Rivers in 2003–2012* (Continued)

Original Federal Band Number	Sex[2]	Age When Banded[3]	Study Area Detected[1]															
			1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
2540-58114	F	J															P	P
2540-58115	U	J															B	
2540-58116	M	J														B		T
2540-58117	U	J														B		
2540-58118	U	J														K		
2540-58119	U	J														K		
2540-58120	F	A															B	
2540-58132	M	A													S	S	S	S
2540-58141	U	J													M			
2540-58142	U	J													M			
2540-58143	M	A													D			
2540-58144	U	J													K			
2540-58145	U	J													K			
2540-58146	M	A													B			
2540-58147	U	J														B		
2540-58148	U	J														Q		
2540-58149	U	J														Q		
2540-58150	U	J														Q		
2540-58151	U	J														Q		
2540-58152	F	A															Q	
2540-58154	M	J													M	T	D[21]	M
2540-58155	U	J													M			
2540-58156	F	A														K	K	K
2540-58157	U	J														K	E	
2540-58158	M	J														K	K	K
2540-58159	F	J														K	K	K
2540-58160	M	J														S		S
2540-58161	U	J														L		
2540-58162	U	J														K		
2540-58163	U	J														K		
2540-58164	U	J														K		
2540-58165	F	J														K	K	
2540-58166	U	J														K		
2540-58172	M	A															Q	
2540-58173	U	J															M	D
2540-58174	U	J															M	M[22]
2540-58175	F	A															K	K
2540-58176	M	A															Q	
2540-58177	F	A															K	K
2540-58178	F	J															K	K

Table E.1. Willow Flycatchers Banded and/or Resighted by SWCA along the Virgin and Lower Colorado Rivers in 2003–2012* (Continued)

Original Federal Band Number	Sex[2]	Age When Banded[3]	Study Area Detected[1]															
			1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
2540-58179	M	J															K	K
2540-58180	U	J															K	
2540-58182	U	J															K	
2540-58183	U	J															K	
2540-58184	F	A															M	M
2540-58185	U	J													P			
2540-58186	M	A													S			
2540-58187	F	A													P		K	
2540-58188	U	J													P			
2540-58189	F	A													P			
2540-58190	U	J														T		
2540-58191	U	J														P		
2540-58192	M	A														Q	Q[23]	M
2540-58193	F	A														N	N	N
2540-58194	U	J														D		
2540-58195	U	J														P		
2540-58196	U	J														P		
2540-58197	U	J														P		
2540-58198	U	J														P		
2540-58199	M	J														K		P
2540-58200	U	J														K		
2540-58201	M	J														K	P	P
2540-58202	M	A														K		K
2540-58203	F	A														K	K	
2540-58204	F	A														K		
2540-58205	U	J														K		
2540-58206	U	J														P		
2540-58207	U	J														P		
2540-58208	U	J														P		
2540-58209	F	A														P		
2540-58211	M	J															K	K
2540-58212	U	J															K	
2540-58213	U	J															M	
2540-58214	U	J															K	
2540-58216	U	J													M			
2540-58217	M	A													S	S		
2540-58218	U	J													S			
2540-58219	U	J													Q			
2540-58220	M	A														B	B	
2540-58221	M	A														B		
2540-58222	U	J														K		

Table E.1. Willow Flycatchers Banded and/or Resighted by SWCA along the Virgin and Lower Colorado Rivers in 2003–2012* (Continued)

Original Federal Band Number	Sex[2]	Age When Banded[3]	Study Area Detected[1]															
			1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
2540-58223	M	A														K	K	K
2540-58224	F	J														K	K	K
2540-58225	U	J														K		
2540-58226	F	A														K		
2540-58227	M	A														T		
2540-58228	M	A														T	T	
2540-58229	M	A														B		
2540-58230	F	A														B	B	
2540-58231	F	A														T	M	M
2540-58232	U	J														T		
2540-58233	F	A														N		
2540-58235	U	J														N		
2540-58236	U	J														N		
2540-58237	U	J														K		
2540-58238	F	J														K	E[24]	
2540-58239	U	J														K		
2540-58240	F	J														K	E	K
2540-58241	F	A														K	K	
2540-58242	U	J														K		
2540-58243	U	J														K		
2540-58244	U	J														K		
2540-58245	M	A															P	K
2540-58246	M	A															E	P
2540-58247	F	J															K	K
2540-58258	U	J																K
2540-58259	U	J																K
2540-58260	U	J																M
2540-58261	F	A																M
2540-58263	U	J																K
2540-58264	U	J																K
2540-58265	U	J																M
2540-58266	U	J																P
2540-58267	U	J																P
2540-58268	M	A																K
2540-58269	F	A																K
2540-58274	U	J															N	
2540-58275	U	J															N	
2540-58276	U	J															K	
2540-58277	U	J															K	K
2540-58278	U	J															D	
2540-58279	U	J															D	

Table E.1. Willow Flycatchers Banded and/or Resighted by SWCA along the Virgin and Lower Colorado Rivers in 2003–2012* (Continued)

Original Federal Band Number	Sex[2]	Age When Banded[3]	Study Area Detected[1]															
			1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
2540-58280	U	J															K	
2540-58282	U	J															K	
2540-58283	U	J															K	
2540-58284	U	J															P	
2540-58285	M	J															P	K
2540-58286	F	J															P	P
2540-58287	M	A															S	S
2540-58288	U	J														P		
2540-58289	F	A														K		
2540-58290	F	J														K		P
2540-58291	U	J														K		
2540-58292	U	J														K		
2540-58293	F	A														P	P	P
2540-58294	U	J														P		
2540-58295	U	J														P		
2540-58296	U	J														P		
2540-58297	F	A															K	
2540-58298	U	J															K	
2540-58299	U	J															K	
2540-58300	U	J																K
2540-58301	U	J																P
2540-58302	U	J																P
2540-58303	U	J																P
2540-58304	U	J																P
2540-58320	U	J																K
2540-58321	U	J																D
2540-58322	F	A																K
2540-58323	U	J																P
2540-58325	U	J																K
2540-58326	U	J																K
2540-58327	U	J																K
2540-58373	U	J																M
2540-58378	U	J															K	
2540-58385	U	J															S	
2540-58386	F	A															K	
2540-58387	M	A															K	K
2590-53101	U	J															P	
2590-53102	U	J															P	
2590-53103	U	J															P	
2590-53104	U	J															P	

Table E.1. Willow Flycatchers Banded and/or Resighted by SWCA along the Virgin and Lower Colorado Rivers in 2003–2012* (Continued)

Original Federal Band Number	Sex[2]	Age When Banded[3]	Study Area Detected[1]															
			1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
2590-53105	F	A															D	
2590-53106	U	J															M	
2590-53107	M	J															M	Q[25]
2590-53108	F	A															D	
2590-53109	U	J															P	
2590-53110	F	A															K	
2590-53111	U	J															K	
2590-53112	M	J															K	K
2590-53113	U	J															K	
2590-53114	U	J															K	
2590-53115	U	J															M	
2590-53116	U	J															M	
2590-53117	U	J															M	Q
2590-53118	U	J															K	
2590-53119	U	J															M	
2590-53121	F	A															K	K
2590-53122	U	J															K	
2590-53123	U	J															K	
2590-53124	M	A															K	
2590-53125	U	J															K	
2590-53126	U	J															D	
2590-53127	U	J															K	
2590-53141	U	J															M	
2590-53142	U	J															M	
2590-53143	U	J															N	
2590-53144	U	J															K	
2590-53145	M	A															S	
2590-53147	U	J															D	
2590-53148	M	A															K	K
2590-53149	U	J															K	
2590-53150	U	J															M	
2590-53151	U	J															M	
2590-53152	U	J															Q	
2590-53153	M	A																K
2590-53154	U	J															Q	
2590-53155	U	J																M
2590-53156	F	A																M
2590-53157	U	J																M
2590-53158	U	J																K
2590-53162	M	A															T	
2590-53163	F	A															B	

Table E.1. Willow Flycatchers Banded and/or Resighted by SWCA along the Virgin and Lower Colorado Rivers in 2003–2012* (Continued)

Original Federal Band Number	Sex[2]	Age When Banded[3]	Study Area Detected[1]															
			1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
2590-53164	U	J															B	
2590-53165	F	A																B
2590-53166	M	A																T
2590-53171	F	A															E	K
2590-53172	U	J															K	
2590-53173	F	A															K	K
2590-53182	U	J															B	
2660-23012	U	J																K
2660-23014	U	J																P
2660-23024	U	J																M
3500-68963	U	J								T								
3500-68968	U	J								P								
3500-68969	U	J								P								
3500-68972	F	J								P	P	P						

* Table includes individuals banded at sites prior to 2003 (Braden and McKernan, unpubl. data) and recaptured or resighted by SWCA.

[1] K = Key Pittman, E = River Ranch, P = Pahranagat NWR, W = Meadow Valley Wash, L = Littlefield, Q = Mesquite, M = Mormon Mesa, D = Muddy River, N = Warm Springs, G = Grand Canyon, T = Topock Marsh, B = Bill Williams River NWR, I = Imperial, Y = Yuma, S = St. George, V = Las Vegas Wash, R = Roosevelt Lake, A = Ash Meadows. Study area indicated is the study area where the individual was first detected during the given season. Within-season movements are indicated with individual footnotes.

[2] M = male, F = female, U = unknown.

[3] A = adult, J = juvenile.

[4] Within-season movement from Mormon Mesa to Mesquite.

[5] Within-season movement from Mesquite to Mormon Mesa.

[6] Within-season movement from Mormon Mesa to Mesquite, then from Mesquite back to Mormon Mesa.

[7] Within-season movement from Mesquite to Mormon Mesa.

[8] Within-season movement from Littlefield to Mesquite.

[9] Within-season movement from Grand Canyon to Mesquite.

[10] Within-season movement from Mormon Mesa to Muddy River.

[11] Within-season movement from Muddy River to Mormon Mesa.

[12] Within-season movement from Pahranagat to Key Pittman.

[13] Within-season movement from Muddy River to Mesquite.

[14] Within-season movement from Littlefield to Mesquite.

[15] Within-season movement from Muddy River to Mesquite.

[16] Within-season movement from Grand Canyon to Mesquite.

[17] Within-season movement from Grand Canyon to Mormon Mesa.

[18] Within-season movement from River Ranch to Key Pittman.

[19] Within-season movement from River Ranch to Key Pittman.

[20] Within-season movement from Pahranagat to River Ranch.

[21] Within-season movement from Muddy River to Mormon Mesa. Likely also within-season movement from Topock to Muddy River in 2010.

[22] Within-season movement from Mormon Mesa to Muddy River.

[23] Within-season movement from Mesquite to Mormon Mesa.

[24] Within-season movement from River Ranch to Key Pittman.

[25] Within-season movement from Mesquite to Key Pittman.

Appendix F

CONTRIBUTING PERSONNEL

Contributor	Role
Steven W. Carothers, Ph.D.	Principal-in-Charge
Mary Anne McLeod, M.S.	Project Manager/Scientist/Field Supervisor
Thomas J. Koronkiewicz, M.S.	Senior Scientist/Banding Lead
Anne Pellegrini, M.S.	Project Coordinator
Wendy Langeberg, Ph.D.	Statistician
Glenn A. Dunno, M.A.	GIS Specialist
Jessica Maggio	Project Administrator/Formatting Specialist
Kimberly Proa	Administrative Assistant/Data Entry
Dorothy A. House, M.A.	Technical Editor
Tim Hauck	Field Coordinator/Bander
Brad McLeod	Field Coordinator/Bander
Brian Cato Cook	Bander/Nest Monitor
Ashley Daniels	Bander/Nest Monitor
Alana Demko	Bander/Nest Monitor
Louise Peppe	Bander/Nest Monitor
Guillermo Alba	Nest Monitor/Surveyor
Sam Flake	Nest Monitor/Surveyor
Kate Noonan	Nest Monitor/Surveyor
Jill Peiffer	Nest Monitor/Surveyor
NickVandehei	Surveyor
Chris Yunker	Surveyor