Avian Surveys and Parasitism Control and Evaluation on Clark County Multiple Species Habitat Conservation Plan Properties – 2025 Final Project Report

SEPTEMBER 2025

PREPARED FOR

Desert Conservation Program

Clark County Department of Environment and Sustainability

PREPARED BY

SWCA Environmental Consultants

AVIAN SURVEYS AND PARASITISM CONTROL AND EVALUATION ON CLARK COUNTY MULTIPLE SPECIES HABITAT CONSERVATION PLAN PROPERTIES – 2025 FINAL PROJECT REPORT

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EXECUTIVE SUMMARY

In 2025, SWCA Environmental Consultants (SWCA) conducted avian surveys across all properties managed by the Clark County Desert Conservation Program (County); these properties include the Riparian Reserve Units and the Boulder City Conservation Easement (BCCE). Surveys were conducted to build on the baseline dataset of avian species presence and distribution at the County's properties. These baseline data can be compared with future data to quantify the success of management and restoration efforts at the County's properties. Surveys consisted of three rounds of breeding bird point-count surveys at the Riparian Reserve Units and at the BCCE and species-specific surveys for southwestern willow flycatcher (*Empidonax traillii extimus*)[1] and yellow-billed cuckoo (*Coccyzus americanus*) (hereafter cuckoo) within appropriate habitat at the Riparian Reserve Units. SWCA also continued intensive flycatcher monitoring at Mesquite West (a historical flycatcher breeding site that includes County Parcel 1-A) and Mormon Mesa Parcel 5-A and brown-headed cowbird (*Molothrus ater*) (hereafter cowbird) control at Mesquite West. In addition, SWCA completed three on-call surveys at the Bunkerville East, Bunkerville West, and Muddy River subunits, as requested by the County.

General avian point-count surveys and species-specific surveys and monitoring were completed between March 21 and August 8. During point-count surveys, surveyors detected seven of the eight bird species covered by the Clark County Multiple Species Habitat Conservation Plan (MSHCP): American peregrine falcon (*Falco peregrinus anatum*), Arizona Bell's vireo (*Vireo bellii arizonae*), blue grosbeak (*Passerina caerulea*), flycatcher, phainopepla (*Phainopepla nitens*), summer tanager (*Piranga rubra*), and vermilion flycatcher (*Pyrocephalus rubinus*). One additional MSHCP covered avian species, cuckoo, was detected both incidentally and during species-specific surveys at the Riparian Reserve Units. The surveys also yielded three evaluation species: loggerhead shrike (*Lanius ludovicianus*), crissal thrasher (*Toxostoma crissale*), and LeConte's thrasher (*Toxostoma lecontei*). In total, 91 avian species were recorded across all the County's properties, and MSHCP covered or evaluation species were observed at each property.

Flycatcher monitoring was conducted between May 18 and August 11 to determine residency of willow flycatchers, find and monitor flycatcher nests, and band adult and nestling flycatchers. The monitoring program was important in assessing the effects of cowbird control on flycatcher nest success at Mesquite West. In total, 23 adult willow flycatchers were detected at Mesquite West and Mormon Mesa Parcel 5-A. One within-year, between-study area movement was observed: one adult that held a territory at Mormon Mesa and was identified to individual via resighting was later recaptured at Mesquite West. This individual moved 26.8 kilometers (16.7 miles) during the breeding season and is counted only once in the total number of adults detected at monitored sites. The 23 individuals detected at monitored sites comprised 10 pairs, two unpaired resident males, and three individuals for which residency and breeding status could not be determined. Eleven confirmed nesting attempts were documented; five of these attempts were successful. Two adult and nine nestling flycatchers were newly banded; three adults banded in a previous year were recaptured. Of the nine nestlings banded at Mesquite West, four were confirmed to have fledged. Four additional nestlings from two nests at which banding would have been too destructive to the vegetation surrounding the nest remained unbanded and were also confirmed to have fledged.

SWCA conducted cowbird control at Mesquite West from May 5 through July 28. SWCA biologists performed targeted mist netting of adult and fledgling cowbirds over 19 mornings, totaling 39.0 net-hours. Male cowbirds were released, and females were euthanized. In total, 35 adult cowbirds (0.9 adult per net-hour) were captured, of which 17 were male. Eighteen female cowbirds were euthanized.

[1] Throughout this document, when residency status for an individual is undetermined and the subspecies is unknown, the term *willow flycatcher* is used to refer to *E. traillii*. The term *flycatcher* refers to *E. t. extimus*.

SWCA completed three on-call surveys between February 14 and April 1. Fence surveys were conducted at the Bunkerville East and Bunkerville West subunits. A total of 6,237 meters of fence line and 17 gates were surveyed and distinguished as good, fair, or poor quality across both subunits. Nesting bird surveys were conducted at the Bunkerville West and Muddy River subunits prior to vegetation disturbance or treatments at those subunits. No active nests were located during surveys.

CONTENTS

1 Introduction 1
1.1 Description of the Project 1
1.2 Background and Need 4
1.2.1 Riparian Reserve Units 4
1.2.2 Boulder City Conservation Easement 9
1.3 Management Actions, Goals, and Objectives 10
2 Methods 11
2.1 Federally Listed Bird Surveys 11
2.2 Southwestern Willow Flycatcher Monitoring 17
2.3 Data Management for Federally Listed Bird Surveys and Monitoring 18
2.4 Data Analyses 18
2.5 Brown-Headed Cowbird Control 19
2.5.1 Target Netting 19
2.5.2 Egg Addling and Replacement 20
2.5.3 Nestling Euthanasia 20
2.6 Point-Count Surveys 20
2.7 On-Call Services 28
3 Results and Evidence of the Results 30
3.1 Objectives Completed 30
Survey Effort 30
3.1.1 Federally Listed Bird Surveys 30
3.1.2 Point-Count Surveys 30
3.2 Findings 32
3.2.1 Federally Listed Bird Surveys and Monitoring 32
3.2.2 Brown-Headed Cowbird Control 38
3.2.3 Point-Count Surveys 38
3.2.4 On-Call Services 46
4 Evaluation/Discussion of Results 47
4.1 Mesquite 47
4.1.1 Parcel 1-A 47
4.1.2 Mesquite West West 49
4.2 Bunkerville East 50
4.3 Bunkerville West 51
4.3.1 Parcels 2-I and 2-J 51
4.3.2 Parcels 2-K Through 2-M 52
4.4 Riverside 53
4.5 Mormon Mesa 54
4.6 Mormon Mesa South 55
4.7 Muddy River 55
4.8 Boulder City Conservation Easement 56
4.9 Timing of Brown-Headed Cowbird Netting 56
4.10 Brown-Headed Cowbird Control and Southwestern Willow Flycatcher Nest Success 57
5 Conclusion 60

6 Recommendations 61

7 Literature Cited 63

Appendices

Appendix A. Site Photographs
Appendix B. Location Maps for Federally Listed Birds – CONFIDENTIAL

Figures

Figure 1. Riparian Reserve Unit locations. 2
Figure 2. BCCE location. 3
Figure 3. Yellow-billed cuckoo and southwestern willow flycatcher survey areas at Mesquite West West and the Mesquite Subunit. 12
Figure 4. Yellow-billed cuckoo and southwestern willow flycatcher survey areas at the Bunkerville East and Bunkerville West Subunits. 13
Figure 5. Yellow-billed cuckoo survey area at the Riverside Subunit. 14
Figure 6. Yellow-billed cuckoo and southwestern willow flycatcher survey areas at the Mormon Mesa Subunit. 15
Figure 7. Yellow-billed cuckoo survey areas at the Muddy River Reserve Unit. 16
Figure 8. Point-count locations within the Mesquite Subunit. 22
Figure 9. Point-count locations within the Bunkerville East and Bunkerville West Subunits. 23
Figure 10. Point-count locations within the Riverside Subunit. 24
Figure 11. Point-count locations within the Mormon Mesa Subunit. 25
Figure 12. Point-count locations within the Mormon Mesa South Subunit. 26
Figure 13. Point-count locations within the Muddy River Reserve Unit. 27
Figure 14. Point-count locations within the BCCE. 29
Figure 15. Aerial image depicting locations of several dry cattail marshes at Mesquite West in 2010 (Google Earth). 49

Tables

Table 1. Survey Dates and Effort for Southwestern Willow Flycatcher Surveys, 2025 31
Table 2. Survey Dates and Effort for Yellow-Billed Cuckoo Surveys, 2025 31
Table 3. Survey Dates for Point-Count Surveys at the Riparian Reserve Units, 2025 31
Table 4. Survey Dates for Point-Count Surveys at the BCCE, 2025 31
Table 5. Details of Flycatchers and Willow Flycatchers Detected at All Riparian Reserve Properties, 2025 34
Table 6. Summary of Flycatcher Nest Monitoring Results at All Study Areas, 2019–2025 36
Table 7. Flycatcher Nest Productivity and Fecundity at Mesquite West, 2019–2025 37
Table 8. Number of Cowbirds Netted by Date at Mesquite West, 2025 39
Table 9. Number of Detections and Breeding Codes for MSHCP-Listed Avian Species Recorded at the Riparian Reserve Subunits, 2025 39

Table 10. Number of Detections and Breeding Codes for Non-MSHCP-Listed Avian Species Recorded at the Riparian Reserve Subunits, 2025 41
Table 11. Number of Detections and Breeding Codes for MSHCP Evaluation Species Recorded at the BCCE During Point-Count Surveys, 2025 45
Table 12. Number of Detections and Breeding Codes for Non-MSHCP-Listed Species Recorded at the BCCE During Point-Count Surveys, 2025 45
Table 13. Female Cowbird Captures Occurring Through May 31 at Southern Nevada Study Areas, 2021–2025 57
Table 14. Cowbird Control by Method Used, Cowbird Parasitism, and Flycatcher Productivity at Mesquite West, 2019–2025 58
Table 15. Cowbird Parasitism Rates, Nest Success, Number of Fledglings, and Fecundity at Mesquite West, 2016–2025 59

1 INTRODUCTION

The Clark County Desert Conservation Program (County) manages compliance with the Endangered Species Act (ESA) through the Clark County Multiple Species Habitat Conservation Plan (MSHCP) (Clark County Department of Comprehensive Planning [CCDCP] and U.S. Fish and Wildlife Service [USFWS] 2000). This is accomplished, in part, through the management of a reserve system, which includes Riparian Reserve Units and the Boulder City Conservation Easement (BCCE). The MSHCP covers eight bird species, six of which are known to occur primarily in desert riparian habitats: Arizona Bell's vireo (*Vireo bellii arizonae*), blue grosbeak (*Passerina caerulea*), southwestern willow flycatcher (*Empidonax traillii extimus*) (hereafter flycatcher),[1] summer tanager (*Piranga rubra*), vermilion flycatcher (*Pyrocephalus rubinus*), and yellow-billed cuckoo (*Coccyzus americanus*) (hereafter cuckoo). The other two MSHCP covered bird species can occur either in or away from desert riparian habitats: phainopepla (*Phainopepla nitens*) is typically found in desert washes with mesquite (*Prosopis* spp.) or catclaw acacia (*Senegalia greggii*), and American peregrine falcon (*Falco peregrinus anatum*) can be found in almost any type of habitat but prefers to nest on cliff faces (CCDCP and USFWS 2000). Two of the eight covered bird species are also federally protected under the ESA—flycatcher, listed as endangered (USFWS 1995), and cuckoo, listed as threatened (USFWS 2014). In addition to the eight covered species, several evaluation species can be found in a variety of desert habitats, including upland habitats, which compose most of the BCCE.

The extent and quality of native desert habitat across the Southwest, particularly desert riparian habitat, have been steadily diminishing for decades, threatened by urban and agricultural development, invasion of nonnative species such as tamarisk (*Tamarix* spp.), fire, and the reduction of water tables through unsustainable water use (Clark County 2015). Because quality avian habitats, particularly riparian habitat, are scarce within arid environments, management of these areas, and conservation of the MSHCP covered avian species that inhabit them, are essential to these species' survival.

1.1 Description of the Project

In 2023, the County solicited proposals to continue work that SWCA Environmental Consultants (SWCA) had performed from 2017 through 2023: avian surveys on its Riparian Reserve Units (Figure 1) and on the BCCE (Figure 2). The County contracted SWCA to conduct presence/absence surveys for both flycatcher and cuckoo across its Riparian Reserve Units (see Figure 1) as well as to conduct avian point counts at predetermined locations across the Riparian Reserve Units and the BCCE. The new contract (County Project No. 2023-SWCA-2325B) was awarded in December 2023 for work beginning in the spring of 2024. Data collected during these surveys build on baseline presence/absence and relative abundance data for all bird species on these properties, including any MSHCP covered and evaluation avian species. These data can be used to inform and evaluate the success of restoration efforts and land management decisions for the County's properties.

The 2024 contract renewal included a one-time habitat suitability assessment of each property in the Riparian Reserve Units for flycatcher and cuckoo. Surveys prior to 2024 included all vegetation ≥3 m (10 feet) tall. Habitat assessments in 2024 took into consideration habitat suitability criteria developed from the summary of habitat conditions documented in flycatcher territories along the lower Colorado River and its tributaries (McLeod et al. 2008; McLeod and Pellegrini 2013) as well as descriptions of suitable habitat in Sogge et al. (2010), which specify that suitable flycatcher habitat consists of patches of

[1] Throughout this document, when residency status for an individual is undetermined and the subspecies is unknown, the term *willow flycatcher* is used to refer to *E. traillii*. The term *flycatcher* refers to *E. t. extimus*.

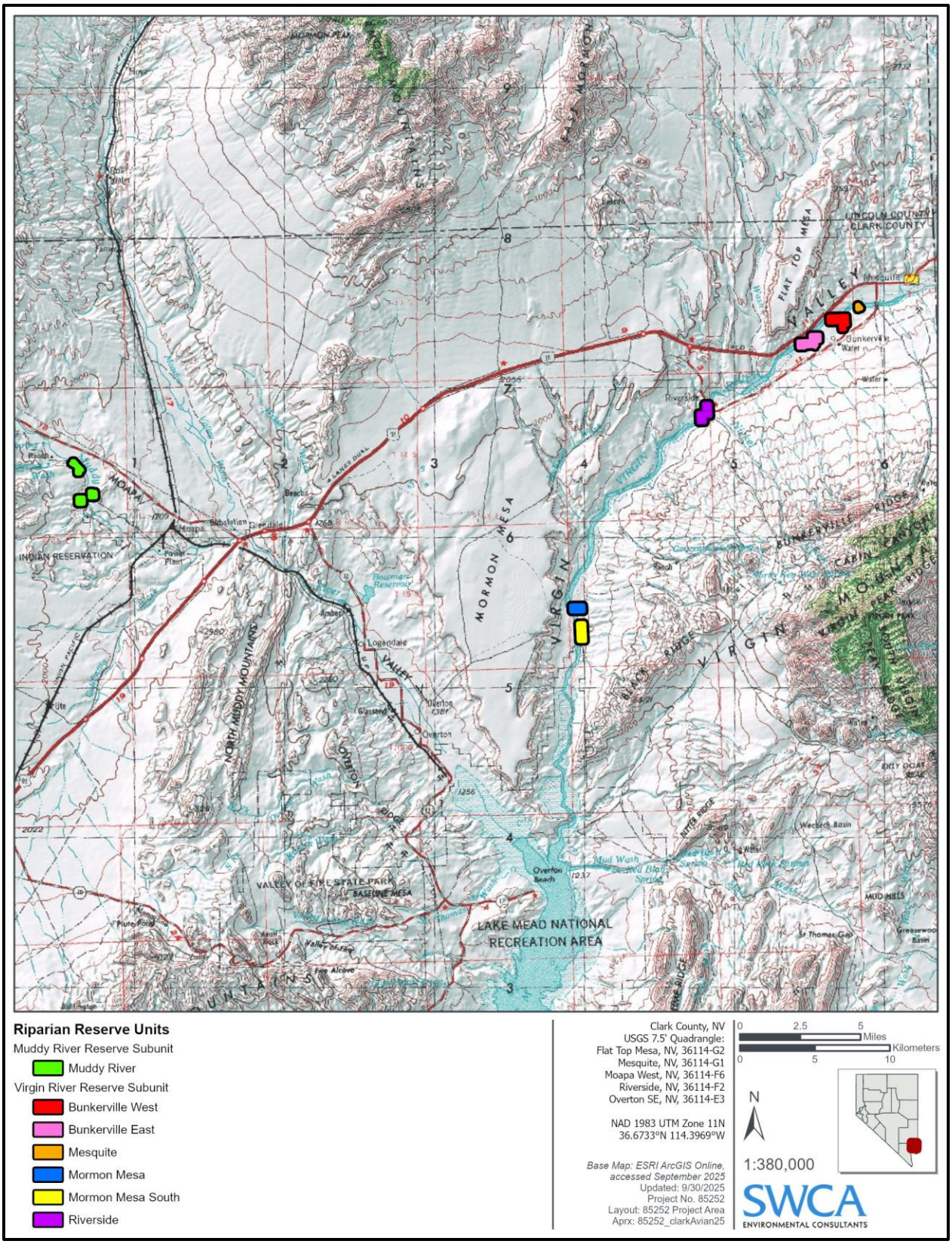

Figure 1. Riparian Reserve Unit locations.

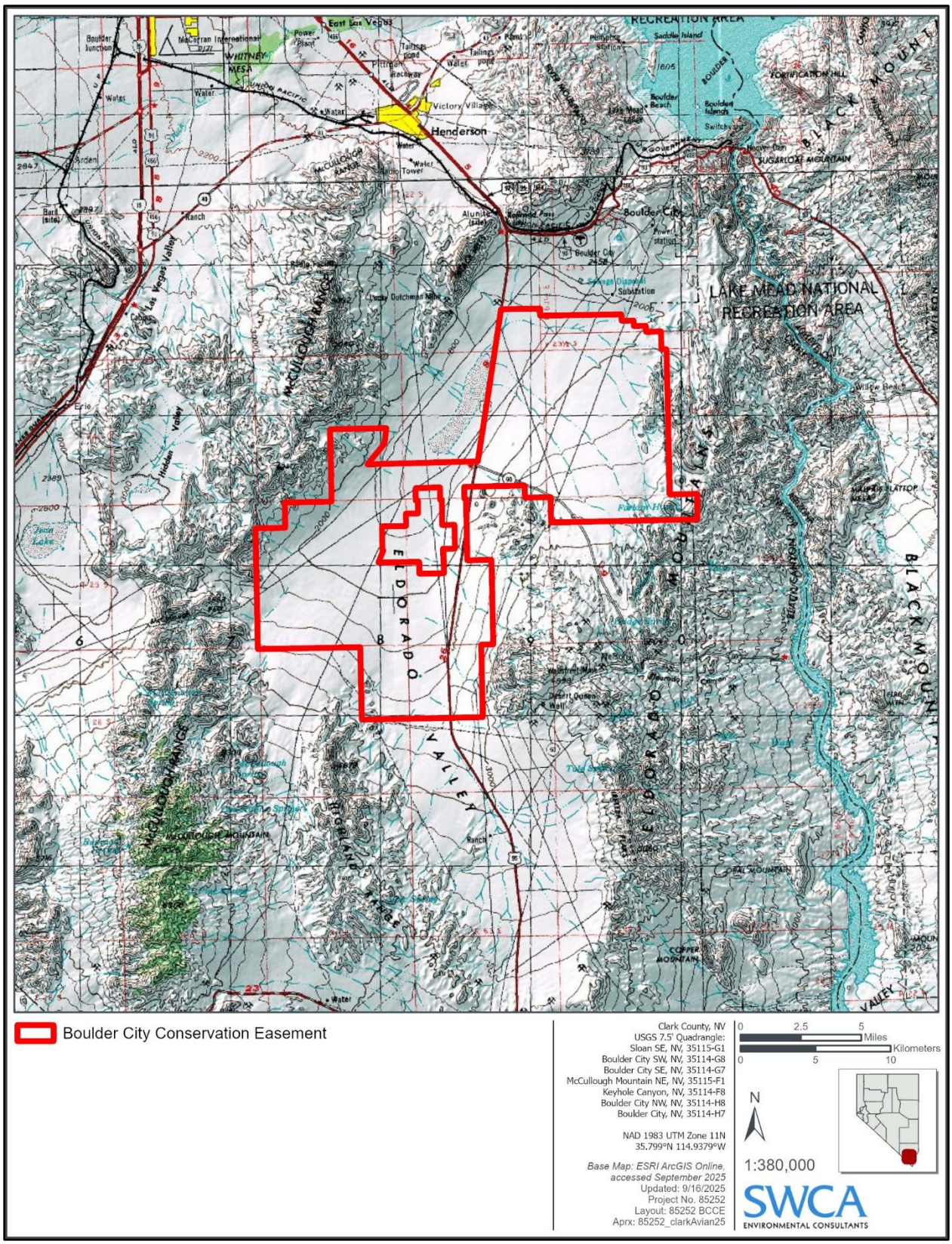

Figure 2. BCCE location.

vegetation ≥10 m (33 feet) wide and ≥4.5 m (14.8 feet) tall with canopy closure ≥85% (McLeod and Pellegrini 2017). Some characteristics of suitable flycatcher habitat are similar to those of suitable cuckoo habitat, including dense vegetation ≥3 m (10 feet) tall and ≥80% canopy closure (Stanek et al. 2021). Only habitat with vegetation ≥4 m (13 feet) tall and ≥75% canopy closure was delineated for survey for both flycatcher and cuckoo in 2024. In addition, sizable (≥0.4 hectare [ha] [1.0 acres]) areas of relatively dense mesquite were included in newly delineated cuckoo survey areas, as several detections were recorded in mesquite in 2019 through 2023 (SWCA 2019a, 2020, 2023a). In 2025, surveys were continued in the areas that were delineated in 2024.

Work conducted by SWCA in 2025 also included continued flycatcher surveys and monitoring at Mesquite West (a historical flycatcher breeding site that includes Mesquite Parcel 1-A); combined-method brown-headed cowbird (*Molothrus ater*) (hereafter cowbird) control at Mesquite West; flycatcher monitoring at Mormon Mesa Parcel 5-A; and on-call services under a separate contract (County Project No. 2019-SWCA-1935A). Flycatcher surveys and monitoring at Mesquite West were first performed by SWCA under contract with the County in 2020, and the combined-method cowbird control program was instituted in 2021. SWCA also began flycatcher nest monitoring at Mormon Mesa Parcel 5-A in 2021.

1.2 Background and Need

On November 19, 2000, the USFWS issued the *Intra-Service Biological and Conference Opinion on Issuance of an Incidental Take Permit to Clark County, Nevada, for a Multiple Species Habitat Conservation Plan* (Biological and Conference Opinion) (USFWS 2000). Then, on March 28, 2001, the USFWS issued an amended incidental take permit for the Clark County MSHCP (USFWS 2001).

1.2.1 Riparian Reserve Units

According to both the Biological and Conference Opinion and Condition K.1 of the associated incidental take permit, the County must acquire private property that contains desert riparian habitat along the Virgin River, Muddy River, and Meadow Valley Wash in Clark County. It was recognized that proper management of desert riparian habitats would be crucial in conserving the six bird species covered by the MSHCP (including the two federally listed species) that are known to use this habitat. To date, the County has acquired 318 ha (785 acres) of land along the Muddy and Virgin Rivers in northeastern Clark County, Nevada.

Prior to 2017, the County acquired 116 ha (286 acres) along the Muddy and Virgin Rivers. SWCA began conducting avian surveys at these properties in 2017 to establish a baseline dataset of avian species presence and distribution under two separate projects: 1) Federally Listed Bird Surveys on Riparian Properties (SWCA 2017a) and 2) Point-Count Surveys on Riparian Properties (SWCA 2017b). In late 2017, the County acquired an additional 130 ha (320 acres) along the Virgin River. Point-count surveys and species-specific surveys for federally listed species were conducted at these newly acquired properties under one project in 2018 (SWCA 2018a). In 2019, avian surveys at all the County's properties were combined into one project (SWCA 2019a). Point-count surveys and species-specific surveys for federally listed species were conducted at all the County's riparian properties, including 24 ha (59 acres) of newly acquired land, through the 2021 field season (SWCA 2020, 2021). In late 2021, the County acquired an additional 48 ha (119 acres) along the Virgin River. Surveys were initiated at this property and continued at all other County properties in 2022 (SWCA 2022), and surveys at all properties continued in 2023 (SWCA 2023a). The County contracted SWCA for continuation of this work beginning in 2024 under a new contract (County Project No. 2023-SWCA-2325B) (SWCA 2024a); the 2025 survey efforts are described herein.

1.2.1.1 FEDERALLY LISTED BIRD SURVEYS

1.2.1.1.1 Species Background

Southwestern Willow Flycatcher

Flycatcher is one of four subspecies of willow flycatcher (*E. traillii*) (Unitt 1987). Flycatchers breed 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). Factors contributing to the decline of flycatcher on its breeding grounds include loss, degradation, and/or fragmentation of riparian habitat; invasion of riparian habitat by nonnative plants; and brood parasitism (parasitism) by cowbirds. One of the last long-distance neotropical migrants to arrive in North America in spring, flycatchers typically arrive in May or June and depart in August (Sogge et al. 2010).

Flycatchers nest in a variety of habitats, but common characteristics of flycatcher breeding habitat include dense tree or shrub cover ≥ 4.5 m (14.8 feet) tall, high canopy closure (≥85%), vegetation with dense twig structure, and flight paths in the midstory (McLeod et al. 2008; McLeod and Pellegrini 2013; Sogge et al. 2010). The presence of surface water or saturated soil is required to maintain suitable vegetation structure, but this structure may persist for a year or more without nearby wet soils. Flycatchers nest in habitat patches ranging in size from 0.8 ha (2.0 acres) to several hundred hectares but are rarely found in narrow strips of habitat less than 10 m (33 feet) wide (Sogge et al. 2010). During the nesting season, flycatchers occupy home ranges averaging less than 0.5 ha (1.2 acres) (Cardinal 2005). Willow flycatchers are generally monogamous, but polygyny has been documented (Ehrlich et al. 1988), particularly in the southwestern subspecies (SWCA 2019a, 2019b, 2020, 2021, 2022, 2023b, 2024b). Migrant willow flycatchers are found in both spring and fall in a variety of habitats that are unsuitable for breeding. These migration stopover habitats, though not necessarily used for breeding, are likely important for both reproduction and survival. Designated critical habitat for flycatcher includes riparian habitats along the Virgin River from Berry Springs, Utah, downstream to the full pool level of Lake Mead (USFWS 2013a) and includes all six subunits (Mesquite, Bunkerville East, Bunkerville West, Riverside, Mormon Mesa, and Mormon Mesa South) of the Virgin River Reserve Unit.

Yellow-Billed Cuckoo

Cuckoo was historically widespread and locally common along rivers throughout the western United States (USFWS 2013b). However, populations have declined across the West in recent years, largely as a result of loss, degradation, and fragmentation of riparian habitat. Consequently, the western distinct population segment was listed as threatened under the ESA in October 2014 (USFWS 2014). Critical habitat for cuckoo was designated in 2021, but no critical habitat units were designated within the state of Nevada (USFWS 2021).

Cuckoos are late neotropical migrants, arriving on their breeding grounds around mid-June and departing by mid-September. Cuckoo home ranges are generally at least 40 ha (100 acres) and often exceed 80 ha (200 acres), though home ranges as small as 1 ha (3 acres) have been documented (USFWS 2020). These patches are typically at least 100 m (328 feet) wide (USFWS 2020). Cuckoos have not been found nesting in isolated patches less than 0.8 ha (2.0 acres) or in linear habitats less than 10 to 20 m (33 to 66 feet) wide, but they may use these habitats during migration and early in the breeding season (Halterman et al. 2016). Breeding habitat is typically thought to include multistoried riparian woodlands dominated by willow (*Salix* spp.) or cottonwood (*Populus* spp.) adjacent to watercourses with less than 3% slopes (USFWS 2020). In a study at the South Fork Kern River Valley, California, Wohner et al. (2020) found dense early successional riparian habitats 1 to 5 m (3–16 feet) tall to be especially important to cuckoos.

A study of nest placement in Arizona and California found that nests were placed between 1 and 22 m (3 and 72 feet) above the ground, with an average height of 7 m (23 feet) (Hughes 2020). Wohner et al. (2020) found nest height ranged from 2 to 4 m (7–13 feet) across two studies and averaged 4.8 m (15.7 feet) at another study. Cuckoos tend to be serially monogamous, but serial polyandry has been regularly documented in western populations.

1.2.1.1.2 Survey Background

In 2017, SWCA evaluated habitat for flycatcher and cuckoo on 41.9 ha (103.5 acres) across the Muddy River, Bunkerville East, and Mormon Mesa subunits.[2] Habitat suitability and the need for species-specific surveys were assessed during a site reconnaissance. According to Sogge et al. (2010), the minimum canopy height for breeding flycatcher is 3 m (10 feet); this habitat characteristic was considered during site assessment, and any portions of the habitat identified by the County for flycatcher and cuckoo surveys that were devoid of woody vegetation ≥ 3 m (10 feet) tall (as a result of scouring, restoration activities, etc.) were not surveyed. These areas were described (e.g., species, height, and percent cover of the dominant vegetation), photographed, and delineated in ArcGIS. Of the 41.9 ha (103.5 acres) originally estimated for survey by the County, SWCA delineated 31.7 ha (78.3 acres) in 2017 as potential habitat to be surveyed for both species across all subunits. Surveys in 2017 yielded several flycatcher detections at the Mormon Mesa subunit. No cuckoo detections were recorded.

In late 2017, a wildfire burned a 0.3-ha (0.7-acre) portion of the Bunkerville East subunit; this area was removed from 2018 flycatcher and cuckoo surveys. In 2018, SWCA conducted flycatcher and cuckoo surveys on 18.2 ha (44.9 acres) of newly acquired land across the Bunkerville West and Riverside subunits. Surveys in 2018 yielded detections of several territorial flycatchers at the Mesquite subunit. No cuckoo detections were recorded.

By 2019, the County had outlined 53.5 ha (132.2 acres) within the Muddy River, Mesquite, Bunkerville East, Bunkerville West, Riverside, and Mormon Mesa subunits that were targeted for flycatcher and cuckoo surveys. Of the habitat originally estimated for survey by the County, SWCA delineated 47.9 ha (118.4 acres) in 2019 as potential habitat to be surveyed for both species across all subunits. Surveys in 2019 yielded territorial flycatchers at the Mesquite and Mormon Mesa subunits and nine cuckoo detections across the Muddy River, Mesquite, and Mormon Mesa subunits. One cuckoo nest was incidentally located at Mesquite Parcel 1-A during flycatcher monitoring activities; one cuckoo fledgling was later observed, marking the third known breeding site in the state of Nevada and the first nesting attempt documented in the state since 2001 (SWCA 2019a). During cuckoo surveys at Mormon Mesa Parcel 5-A, a cuckoo was detected in a screwbean mesquite (*Prosopis pubescens*)–dominated bosque outside the delineated survey area. To better document cuckoo habitat use within this portion of the parcel, SWCA added this 5.1 ha (12.7 acres) of mesquite bosque to the Mormon Mesa Parcel 5-A cuckoo survey area in 2020.

In early 2020, the County acquired three new parcels (2-K, 2-L, and 2-M) within the Bunkerville West subunit. SWCA delineated 2.6 ha (6.4 acres) of riparian habitat within Parcels 2-L and 2-M (no habitat was identified in Parcel 2-K) to be surveyed for flycatcher and cuckoo. SWCA surveyed a total of 50.5 ha (124.7 acres) for flycatcher and 55.6 ha (137.4 acres) for cuckoo across all Riparian Reserve Units in 2020. Surveys yielded several flycatcher territories at the Mesquite and Mormon Mesa subunits and five cuckoo detections across all Riparian Reserve Units.

[2] County naming conventions changed in 2020, and the Bunkerville subunit was split into Bunkerville East (Parcels 2-A through 2-G), Bunkerville West (Parcels 2-I and 2-J), and Mesquite (Parcel 1-A; formerly Bunkerville Parcel 2-H). Current names are used throughout this report.

In late 2020, the County masticated 14.6 ha (36.1 acres) of dead and dying tamarisk at Mormon Mesa Parcel 5-A, and an additional 16.7 ha (41.3 acres) of tamarisk was masticated in early 2021; these areas were not surveyed for flycatcher or cuckoo in 2021. Flycatcher monitoring data collected at Mesquite West from 2003 through 2013 show that flycatcher nest and territory locations varied from year to year according to the distribution of suitable habitat within Mesquite West and sometimes were outside the County's Parcel 1-A (McLeod et al. 2008; McLeod and Pellegrini 2013, 2014). Monitoring at Parcel 1-A in 2020 resulted in detections of singing male willow flycatchers well west of the County's Parcel 1-A boundary (within a portion of the Mesquite West site referred to as Mesquite West West) (SWCA 2020). Therefore, SWCA and the County determined that flycatcher surveys across the entire Mesquite West site were important for detecting between-year habitat changes and flycatcher movements, as well as for assessing the effects of cowbird control on the breeding success of flycatcher across all occupied habitat at Mesquite West. To accomplish these goals, 11.4 ha (28.1 acres) of additional habitat within Mesquite West, generally west of the County's Parcel 1-A, was added to the flycatcher survey area in 2021. SWCA surveyed 43.9 ha (108.4 acres) for flycatcher and 38.5 ha (95.2 acres) for cuckoo across all Riparian Reserve Units in 2021. These surveys yielded territorial flycatchers at the Mesquite and Mormon Mesa subunits. No cuckoo detections were recorded.

In late 2021, the County acquired two additional parcels along the Virgin River (6-A and 6-B) that constitute the Mormon Mesa South subunit. SWCA delineated 14.3 ha (35.4 acres) along the eastern boundaries of the parcels to be surveyed for flycatcher and cuckoo. During the first round of flycatcher surveys at Bunkerville 2-I and 2-J in May 2022, the habitat in one previously surveyed portion of 2-I was deemed insufficient for flycatcher and cuckoo surveys due to defoliated tamarisk and lack of any continuous canopy. This 1.6-ha (4.0-acre) area was not surveyed in 2022 or thereafter. SWCA surveyed 57.9 ha (143.0 acres) for flycatcher and 51.2 ha (126.5 acres) for cuckoo across all Riparian Reserve Units in 2022. Surveys yielded territorial flycatchers at the Mesquite and Mormon Mesa subunits and one migrant willow flycatcher at the Bunkerville East subunit. No cuckoo detections were recorded.

During the winter of 2022 to 2023, the Bunkerville, Nevada, area experienced higher than average precipitation (Western Regional Climate Center 2023), which resulted in flooding along the Virgin River. Throughout the spring of 2023, melting of above-average winter snowpack in the Virgin River watershed in Arizona, Nevada, and Utah resulted in high flows in the Virgin River that scoured vegetation in portions of flycatcher and cuckoo survey areas; 1.4 ha (3.4 acres) at Bunkerville East Parcel 2-D, 0.01 ha (0.03 acre) at Bunkerville West Parcel 2-I, 0.4 ha (1.0 acres) at Bunkerville West Parcels 2-L and 2-M, and 0.3 ha (0.8 acre) at Riverside Parcel 3-A were eliminated from flycatcher and cuckoo survey areas in 2023. SWCA surveyed 55.8 ha (137.8 acres) for flycatcher and 49.1 ha (121.4 acres) for cuckoo in 2023. Surveys yielded territorial flycatchers at Mesquite and Mormon Mesa. Thirteen cuckoo detections were recorded across all Riparian Reserve Units.

In 2024, a habitat assessment was completed at each property in the Riparian Reserve Units as part of the requirements for County Project No. 2023-SWCA-2325B. Each Riparian Reserve subunit was assessed for habitat suitability for flycatcher and cuckoo, and survey boundaries for each species were adjusted based on results of the assessment. Only areas deemed to be suitable habitat (i.e., those with vegetation ≥4 m (13 feet) tall and ≥75% canopy closure) were included for both flycatcher and cuckoo. In addition, swaths of mesquite at least 0.4 ha (1.0 acres) in size with trees ≥4 m (≥13 feet) tall and with ≥65% canopy closure were included in cuckoo survey areas. Habitat assessments resulted in the reduction or complete elimination of flycatcher and/or cuckoo survey areas at each Riparian Reserve subunit. Both flycatcher and cuckoo survey areas were reduced by 0.3 ha (0.7 acre) at Mesquite; 6.0 ha (14.8 acres) at Bunkerville East; 5.4 ha (13.5 acres) at Bunkerville West Parcels 2-I and 2-J; and 1.5 ha (3.9 acres) at Bunkerville West Parcels 2-K through 2-M. All flycatcher survey areas (3.6 ha [8.9 acres]) at Riverside were eliminated; areas previously surveyed for cuckoo were eliminated and a mesquite bosque was added, resulting in a net reduction of 0.6 ha (1.7 acres). Flycatcher survey areas were reduced by 0.6 ha

(1.6 acres) and cuckoo survey areas were reduced by 2.5 ha (6.2 acres) at Mormon Mesa. All areas (14.0 ha [35.4 acres]) previously surveyed for flycatcher and cuckoo at Mormon Mesa South were eliminated. Areas previously surveyed for flycatcher (3.5 ha [8.6 acres]) at Muddy River were eliminated; areas previously surveyed for cuckoo were reduced and one new mesquite bosque was added, resulting in a net reduction of 0.04 ha (0.1 acre). The resulting adjusted survey areas were surveyed in 2024. Surveys yielded territorial flycatchers at the Mesquite and Mormon Mesa subunits and two migrant willow flycatchers each at the Bunkerville East and Bunkerville West subunits. Three cuckoo detections were recorded across all Riparian Reserve Units.

In 2025, flycatcher and cuckoo surveys were conducted at the County's Riparian Reserve Units under County Project No. 2023-SWCA-2325B.

1.2.1.2 FLYCATCHER MONITORING

Flycatcher breeding has been documented in Mesquite West for decades, and SWCA has been conducting surveys and monitoring for flycatcher in southern Nevada since 2003.[3] Over the course of this work, SWCA documented consistently high rates of parasitism of flycatcher nests.

In 2020, SWCA was contracted by the County to perform flycatcher territory and nest monitoring at Mesquite Parcel 1-A. As part of this effort, cowbird control (not specifically covered in the 2020 contract) was limited to the addling of one cowbird egg. All six flycatcher nesting attempts failed in 2020. SWCA and the County determined that continued monitoring of flycatcher territories and nests would be an essential component of determining whether cowbird control had an effect on flycatcher nesting success at not only Mesquite Parcel 1-A, but also Mesquite West as a whole. The flycatcher monitoring program was expanded to include all of Mesquite West in 2021, and the entirety of Mesquite West has been monitored annually since 2021. Nest monitoring results at Mesquite West in 2021 through 2024 showed varied results, with productivity[4] ranging from 0.50 to 1.64 fledglings per nest (SWCA 2024a).

Additionally, SWCA monitored flycatcher at Mormon Mesa Parcel 5-A from 2021 through 2024, following successful breeding within that parcel in 2020. Territory and nest monitoring continued at Mesquite West and Mormon Mesa Parcel 5-A in 2025 under County Project No. 2019-SWCA-1935A.

1.2.1.3 BROWN-HEADED COWBIRD CONTROL

From 2013 through 2019, the Mesquite study area (which encompasses several sites, including Mesquite West) consistently yielded one of the lowest average productivity rates (mean productivity = 0.45 fledgling per nest) of all the flycatcher study areas in southern Nevada (SWCA 2019b). Productivity at all southern Nevada study areas monitored in 2019 ranged from 0 to 2.5 fledglings per nest, with an overall average of 1.43 fledglings per nest (SWCA 2019b)—over three times greater than the 2013 through 2019 average at Mesquite West.

Parasitism by cowbirds is believed to have significantly contributed to nest failures and low productivity at Mesquite West (SWCA 2019b). As part of a previous project with the Bureau of Reclamation, SWCA used modified Australian crow traps to passively trap cowbirds across the Mesquite study area from 2003 through 2007 (McLeod and Pellegrini 2013). Despite substantial trapping efforts, the percentage of nests

[3] In 1996–2002, flycatcher surveys and monitoring in southern Nevada were performed by the San Bernardino County Museum. SWCA assumed the responsibilities of flycatcher survey and monitoring activities in southern Nevada in 2003 under contract with the Bureau of Reclamation. Since 2003, SWCA has also conducted flycatcher activities in southern Nevada under contract with the Nevada Department of Wildlife (NDOW), the Animal and Health Inspection Service, and the County. The NDOW performed flycatcher surveys and/or monitoring in years in which SWCA was not contracted to conduct flycatcher activities.

[4] Productivity is the number of young fledged per nest that contained flycatcher eggs and for which outcome was known.

that were successful did not significantly improve during or following trapping (pre-trapping: 48%; trapping: 49%; post-trapping: 36%).

Starting in 2010, SWCA began addling cowbird eggs on flycatcher projects for the Bureau of Reclamation and the NDOW. After addling began, the proportion of cowbird eggs that hatched dropped from 74% (2003–2009) to 11% (2010–2012) (McLeod and Pellegrini 2013). Nest productivity did not increase significantly as a result of cowbird egg addling, possibly because high depredation rates obscured any benefits of egg addling. However, data collected in earlier years showed that nests with unhatched cowbird eggs produced more flycatcher fledglings, on average, than did nests with cowbird nestlings; therefore, McLeod and Pellegrini (2013) recommended that addling continue to be used as a cowbird control method in the lower Colorado River watershed.

Flycatcher nests in the Mesquite study area had high (51%) parasitism rates from 2015 through 2020 (SWCA 2019b, 2020). Rothstein et al. (2003) recommended implementing a cowbird control program when parasitism rates reach 20% to 30% for a threatened or endangered host or 50% for non-protected host species. Although trapping or addling alone did not prove beneficial to flycatcher nest success or productivity across Mesquite West, several avian studies have shown an increase in nest success when different means of cowbird control were combined, such as shooting adult cowbirds, addling cowbird eggs, and removing nestling cowbirds (Kostecke et al. 2005; Whitfield et al. 1999).

In 2021, SWCA implemented a combined-method cowbird control program at Mesquite West to evaluate the potential of target netting, in combination with cowbird egg addling and nestling euthanasia, in reducing the negative effects of parasitism on flycatcher nest success. Parasitism rates at Mesquite West under the combined-method cowbird treatment program in 2021, 2022, 2023, and 2024 were 50%, 22%, 8%, and 9%, respectively. This combined-method cowbird control program was continued in 2025 under County Project No. 2019-SWCA-1935A.

1.2.1.4 POINT-COUNT SURVEYS

In 2017, SWCA began conducting breeding bird point-count surveys for the County at 27 locations across the Riparian Reserve Units (SWCA 2017b). In 2018, SWCA conducted point-count surveys at 24 locations across newly acquired properties in the Virgin River Reserve Unit (SWCA 2018a). In 2019, SWCA continued breeding bird point-count surveys at a subset of the 51 previously surveyed locations as part of the comprehensive bird survey effort across all the County's properties (SWCA 2019a). A subset of the total point-count locations across the Riparian Reserve Units has been surveyed annually since 2019. Four point-count locations were added with the acquisition of Bunkerville West Parcels 2-K, 2-L, and 2-M in 2020 (SWCA 2020), and four more point-count locations were added at Mormon Mesa South Parcels 6-A and 6-B at the beginning of surveys in 2022 (SWCA 2022); since 2022, 59 point-count locations have been surveyed across all Riparian Reserve Units. Point-count surveys continued at all Riparian Reserve Units in 2025 under County Project No. 2023-SWCA-2325B.

1.2.1.5 ON-CALL SERVICES

In 2025, County Project No. 2019-SWCA-1935A included an on-call task for surveys to be completed at the County's request.

1.2.2 Boulder City Conservation Easement

In addition to the acquisition of riparian properties, implementation of the MSHCP required the establishment of a conservation easement in the Eldorado Valley. This easement, known as the BCCE, was established on approximately 34,400 ha (approximately 85,000 acres) in July 1995 through an

agreement between Clark County and Boulder City. The easement was amended once in 2010 and again in 2020. As a result of these amendments, the BCCE currently encompasses 35,216 ha (87,268 acres).

According to both the Biological and Conference Opinion (USFWS 2000) and Condition P of the associated incidental take permit (USFWS 2001), the County is required to take measures necessary to ensure maintenance of habitat connectivity for Mojave desert tortoise (*Gopherus agassizii*) and other covered species within the BCCE. While the BCCE is primarily managed for protecting desert tortoise, it was recognized that proper management of desert tortoise habitat could also be beneficial for protecting habitat for other species covered by the MSHCP, including avian species (Clark County 2023).

1.2.2.1 POINT-COUNT SURVEYS

In 2018, SWCA began conducting breeding bird point-count surveys for the County at 40 locations across the BCCE (SWCA 2018b). From 2019 through 2023, SWCA continued breeding bird point-count surveys at a subset of these locations as part of the comprehensive bird survey effort across all the County's properties (SWCA 2019a, 2020, 2021, 2022, 2023a, 2024a). Point-count surveys continued in 2025 under County Project No. 2023-SWCA-2325B.

1.3 Management Actions, Goals, and Objectives

The County's Riparian Reserve Unit Management Plan (Clark County 2015) identifies goals and objectives that help guide management directives on the Riparian Reserve Units. The first goal listed in this plan is to "manage reserve units to provide habitat for the six MSHCP covered bird species" (Clark County 2015:35) that use desert riparian habitat. The objective identified to reach this goal is to "restore, create, and enhance habitat for riparian bird species" (Clark County 2015:35). In addition, the BCCE Management Plan (Clark County 2023) identifies goals and objectives that help guide management directives within the BCCE. The second goal listed in the BCCE Management Plan is to "protect and manage the BCCE for other MSHCP covered species" (Clark County 2023). Managing MSHCP covered species and their habitats requires an in-depth understanding of baseline conditions within a given management unit. Collecting species abundance and distribution data is a critical first step in monitoring and conserving habitat for the MSHCP covered bird species. Furthermore, once management actions have been taken, monitoring responses to those actions is integral in determining success or failure of that action. The combined short-term objectives for the projects discussed in this report include both documenting baseline conditions and monitoring responses to management actions; these objectives are to 1) continue building a record of federally listed and non-listed bird species present at the County's Riparian Reserve Units and the BCCE; 2) conduct surveys for flycatcher and cuckoo where suitable habitat exists; 3) conduct flycatcher nest searching at Mesquite West and Mormon Mesa; 4) monitor all flycatcher nests found at Mesquite West and Mormon Mesa and record all successes and failures; 5) record instances of parasitism by cowbirds; 6) conduct cowbird control at Mesquite West throughout the flycatcher breeding season; and 7) conduct on-call surveys as requested by the County.

The long-term goals are to 1) track changes in the presence and relative abundance of all bird species that use these properties to measure the success of management and restoration efforts conducted therein and 2) maintain and/or improve habitat for flycatcher and help identify lands where habitat enhancement may be implemented to expand habitat for flycatcher.

2 METHODS

Surveys and monitoring for flycatcher and cuckoo were conducted by biologists authorized under USFWS 10(a)1(A) Permit No. PER0009523-3 and NDOW Scientific Collecting Permit No. 495754. Bird banding was performed under U.S. Geological Survey Federal Bird Banding Permit No. 23258. Cowbird control activities were conducted by personnel authorized under USFWS 10(a)1(A) Permit No. PER0009523-3, USFWS Migratory Bird Scientific Collecting Permit No. PER0038972, and NDOW Scientific Collecting Permit No. 495754.

2.1 Federally Listed Bird Surveys

Multiple flycatcher broadcast surveys conducted throughout the breeding season were used to assess the presence of the southwestern subspecies of willow flycatcher. Flycatcher surveys followed the standard five-survey protocol described in Sogge et al. (2010), which calls for one survey between May 15 and 31, two surveys between June 1 and 24, and two surveys between June 25 and July 17. Each round of surveys at a particular site was separated by a minimum of 5 days. To elicit responses from nearby flycatchers, surveyors stopped approximately every 30 m (98 feet) and broadcast 18 seconds of the flycatcher's primary song (*fitz-bew*) and call (*breet*). Surveyors watched for willow flycatchers and listened for vocal responses for 1 minute before proceeding to the next survey station. If an unidentified *Empidonax* flycatcher was observed but did not respond with song to the initial broadcast, other flycatcher vocalizations were broadcast, including *creets/breets*, *wee-oos*, *whitts*, *churr/kitters*, and a set of interaction calls given by a mated pair of flycatchers (in accordance with Lynn et al. 2003). These calls are frequently effective in eliciting a *fitz-bew* song or *wee-oo* vocalization, thereby enabling surveyors to positively identify willow flycatchers.

Cuckoos vocalize infrequently, have a short breeding cycle, and typically occupy home ranges varying from 40 to 80 ha (100–200 acres) in size (USFWS 2020). These factors make it difficult to use survey results to determine the number of cuckoo territories at a site. However, repeated broadcast surveys allow an assessment of the presence of cuckoos, and survey results can be used to estimate the number of possible and probable breeding territories (Halterman et al. 2016).

Cuckoo surveys followed the standard four-survey protocol described by Halterman et al. (2016). The survey protocol requires one survey between June 15 and 30, two surveys between July 1 and 31, and one survey between August 1 and 15, with a 3-day leeway for start and end dates for each survey period. Surveys were separated by 12 to 15 days. Surveyors stopped every 100 m (328 feet) and listened for 1 minute for spontaneously calling cuckoos, then broadcast a succession of five cuckoo contact calls (*kuk/kowlp*), each separated by a 1-minute period of silence. Surveyors listened and watched for cuckoo responses between each set of broadcast calls; the total time spent at each survey point was approximately 6 minutes.

If a willow flycatcher or cuckoo was detected, the observer recorded the location of the bird, the type of detection (i.e., territory center, territorial male, female, pair, family group, or unknown for flycatcher and visual, aural, or both for cuckoo), and any other pertinent notes. The surveyor then proceeded at least 40 m (131 feet) away from any detected willow flycatcher and 300 m (984 feet) away from any cuckoo before resuming the survey to avoid double-counting individuals. All surveys commenced at or after first light and concluded by 10:30 a.m. for flycatcher (Sogge et al. 2010) and by 11:00 a.m. or when the temperature reached 40 degrees Celsius (ºC) (104 degrees Fahrenheit [ºF]) for cuckoo (Halterman et al. 2016). No surveys were conducted if winds exceeded 4 on the Beaufort scale (21–29 kilometers [km] [13–18 miles] per hour).

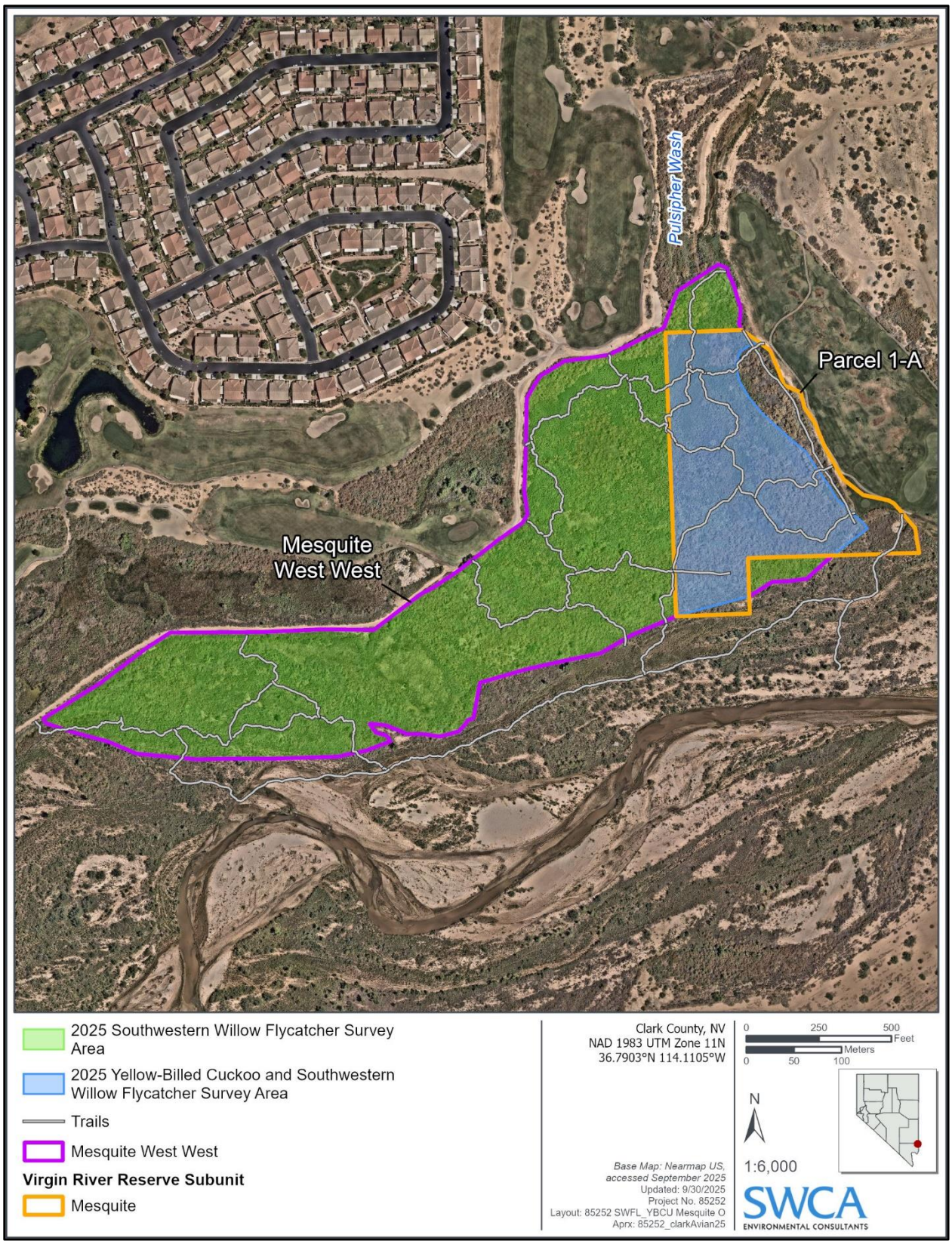

Figure 3. Yellow-billed cuckoo and southwestern willow flycatcher survey areas at Mesquite West West and the Mesquite Subunit.

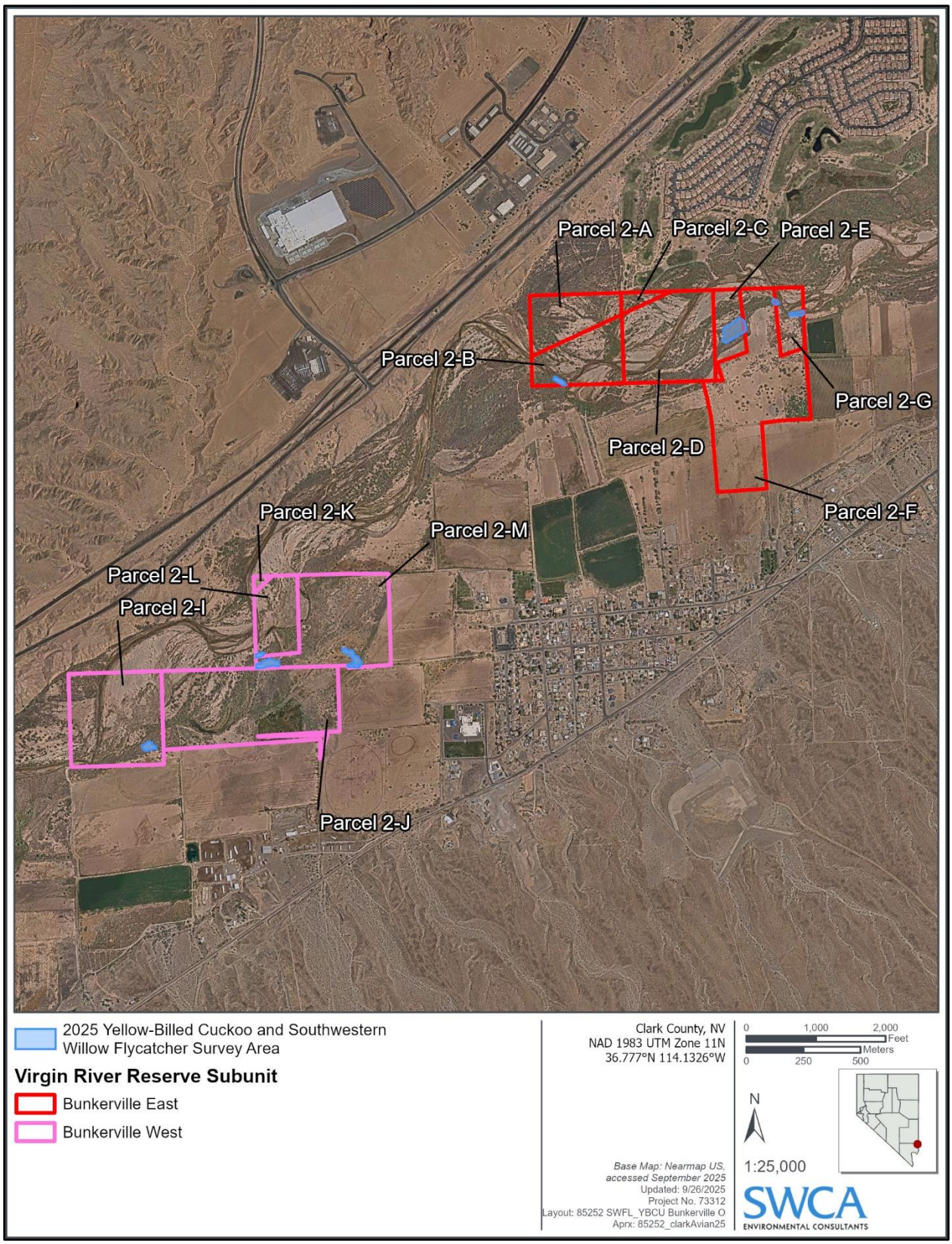

Figure 4. Yellow-billed cuckoo and southwestern willow flycatcher survey areas at the Bunkerville East and Bunkerville West Subunits.

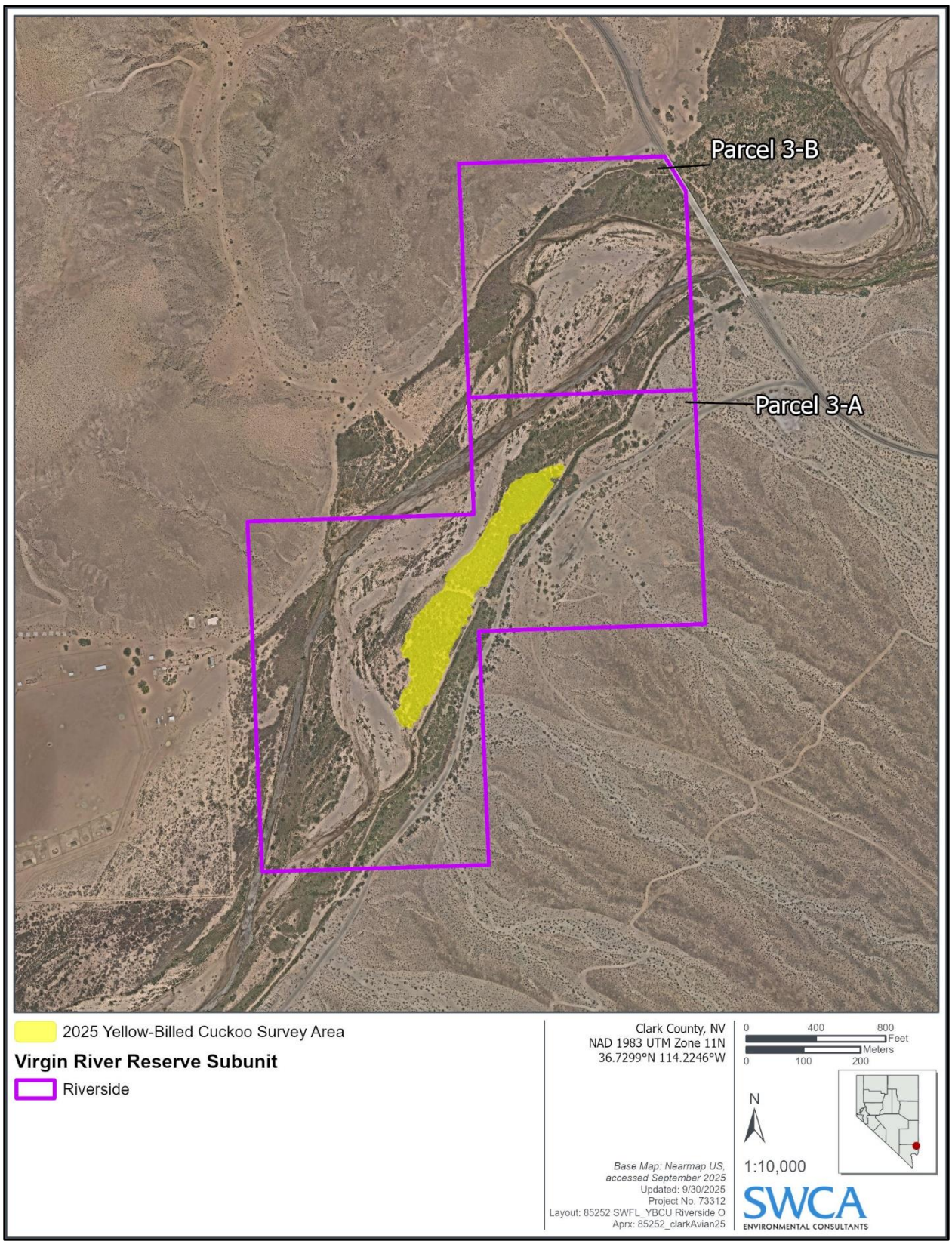

Figure 5. Yellow-billed cuckoo survey area at the Riverside Subunit.

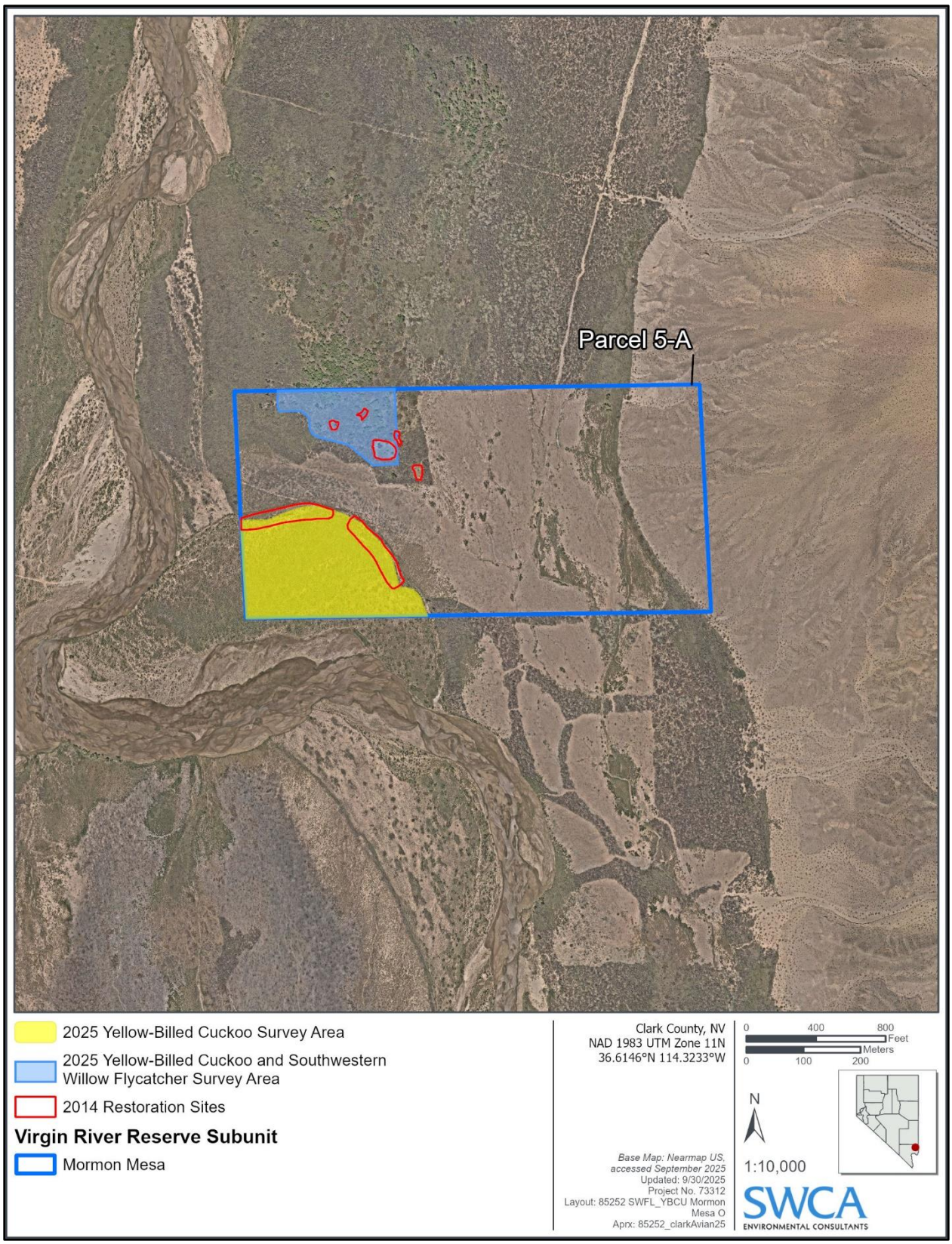

Figure 6. Yellow-billed cuckoo and southwestern willow flycatcher survey areas at the Mormon Mesa Subunit.

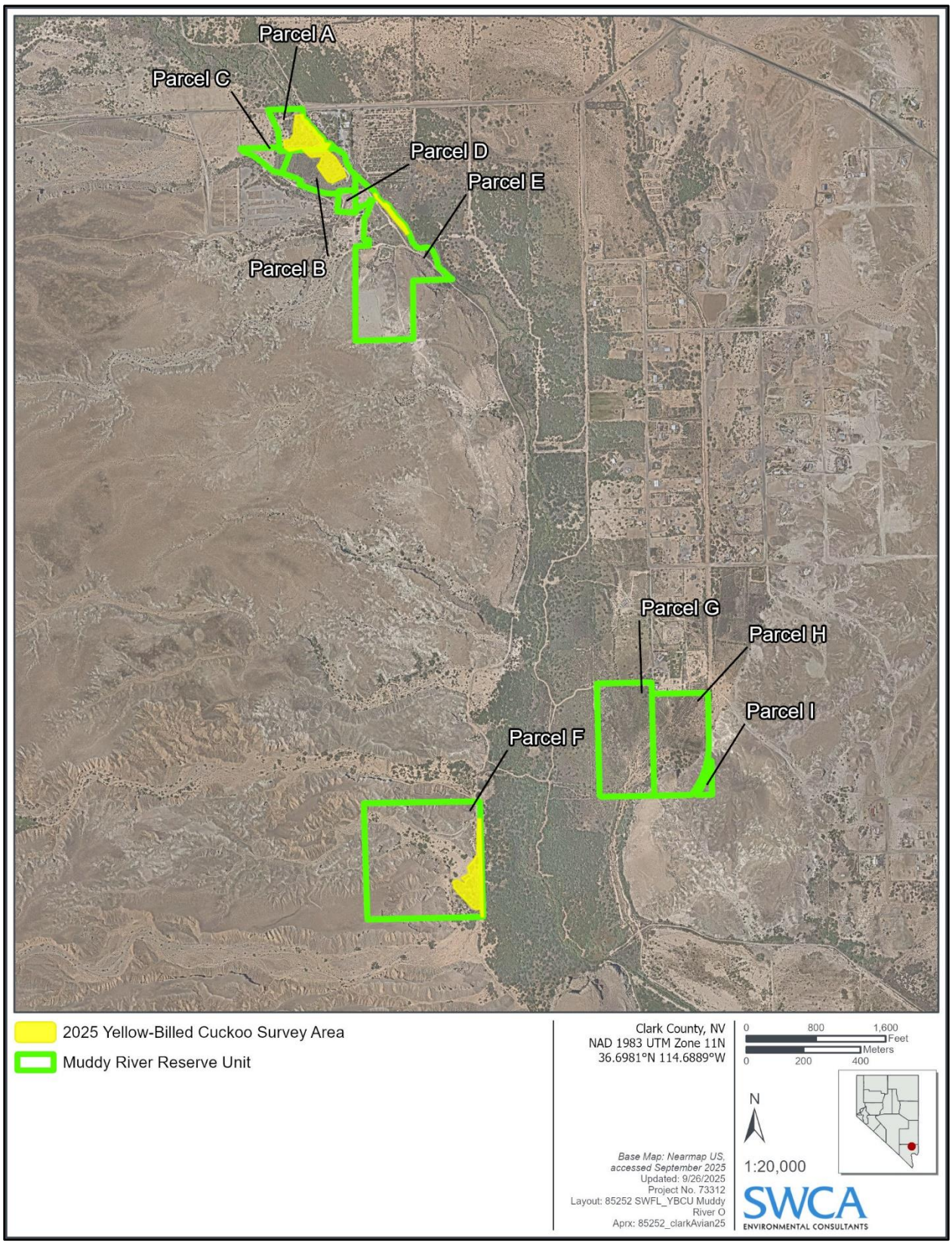

Figure 7. Yellow-billed cuckoo survey areas at the Muddy River Reserve Unit.

Start points, end points, and routes for flycatcher and cuckoo surveys varied between surveys. Standard flycatcher and cuckoo survey summary forms were completed following each survey. In addition to completing flycatcher and cuckoo surveys, SWCA recorded qualitative site descriptions for each parcel. Surveyors recorded the dominant vegetation species, visual estimates of vegetation height (to the nearest meter), canopy closure (to the nearest 5%), and qualitative assessments of surface hydrology. Surveys were completed in all areas that were dominated by trees or shrubs ≥ 4 m (13 feet) tall (Figures 3–7).

2.2 Southwestern Willow Flycatcher Monitoring

Flycatcher territory and nest monitoring involves more frequent visits to flycatcher territories than do broadcast surveys alone and facilitates locating nests, determining nest fates, and calculating productivity. Territory monitoring commenced at Mesquite West and Mormon Mesa Parcel 5-A once a territorial flycatcher was detected. Nest searching and nest monitoring (when appropriate) commenced once a pair of flycatchers was detected. The methods for territory and nest monitoring described herein followed a combination of those described by Martin and Geupel (1993), Martin et al. (1997), Ralph et al. (1993), and Rourke et al. (1999), which recommend monitoring every 2 to 4 days, depending on territory stage and activity.

SWCA conducted flycatcher territory and nest monitoring at each territory approximately every 4 days to determine territory status, locate nests, and monitor known nests. Nests were monitored using a mirror on a telescoping pole to determine nest contents, including any cowbird eggs or nestlings. When appropriate, biologists addled cowbird eggs, replaced cowbird eggs with fake eggs, or removed cowbird nestlings from nests (see Sections 2.4.2 and 2.4.3). No nest was mirror poled after flycatcher nestlings reached 8 days of age to avoid forced fledging.

Nesting attempts were determined to be successful if fledged young were observed in the vicinity of the nest or were identified by their color bands. The number of young produced from each nest was determined by the number of fledglings visually confirmed (not just aurally detected or presumed fledged upon finding an empty nest), resulting in a conservative number of young produced per nest. Fledgling begging calls of many songbird species sound similar, which could be problematic to a biologist when confirming flycatcher fledglings by sound alone; erroneous identification of fledglings could result in inaccurate nest productivity and fecundity calculations.[5] Therefore, only fledglings that were visually located were confirmed to have fledged. Failed nests were inspected to determine the condition of the nest and to record the presence of eggs, eggshells, or dead nestlings in or around the nest. These data were used to determine the stage and cause of nest failure.

Color banding and subsequent resighting can greatly improve the certainty with which individual flycatchers can be associated with a specific territory or nest. Furthermore, color banding nestling flycatchers helps with confirming the number of fledglings produced from each nest and allows for a more accurate determination of nest success and productivity. Color banding involves fitting each flycatcher with an aluminum federal band (either standard silver or anodized in one of several colors) on one leg and a colored, aluminum, pinstriped band on the opposite leg, resulting in a unique color combination of bands.

Resighting involves subsequently observing these color bands via binoculars and digital cameras to confirm a bird's identity. Resighting color-banded birds at different times of the season or in subsequent years can also help with understanding movements of flycatchers within and between sites.

[5] Fecundity is the number of young fledged per female for which all nest outcomes over the breeding season were known.

Biologists captured, uniquely color banded, and subsequently monitored adult and nestling flycatchers whenever possible. Adult willow flycatchers were captured with mist nets, which provide the most effective technique for live capture of adult songbirds (Ralph et al. 1993). A targeted capture technique was used (in accordance with Sogge et al. 2001) whereby a variety of conspecific vocalizations were broadcast via Apple iPods connected by Bluetooth to remote speakers to lure territorial flycatchers into the nets. Nestlings were banded at 7 to 10 days of age, when they were large enough to retain leg bands, yet young enough that they would not prematurely fledge from the nest (Paxton et al. 1997; Whitfield 1990).

2.3 Data Management for Federally Listed Bird Surveys and Monitoring

For flycatcher and cuckoo surveys and flycatcher monitoring, biologists collected data on Apple iPad tablets or iPhones equipped with Field Maps for ArcGIS (Version 25.1.0) and paired with an external Juniper Geode GPS receiver. The GPS receiver was capable of submeter accuracy and provided real-time data corrections; data post-processing was not required. Several feature services were published to ArcGIS Online for use in Field Maps. These included site boundaries, trails, a 30 × 30–m (98 × 98–foot) grid, and feature services for field data. High-resolution aerial imagery of all survey sites was used to facilitate navigation and estimate the location of any willow flycatcher or cuckoo detected at a location offset from the biologist's location.

Data collected included point locations of surveys (start, stop, and broadcast points) and willow flycatcher and cuckoo detections (e.g., territorial male, territory center, pair, nest, nest flag, or family group) and line features to show the relationship between any two willow flycatcher or cuckoo detection locations (e.g., same bird, different bird, countersinging males, or possible pair). All data collected in the field were recorded into an offline copy of the feature services.

Summary information for each resight and for each territory or nest visit (time in and out of the territory, breeding stage [e.g., single male, pair, nest stage, or no activity], nest contents [if applicable], and behavioral comments) was entered in a form in Survey123 for ArcGIS. Each form was a child feature linked to its respective territory center or nest flag parent point.

All data recorded in Field Maps were synced to and managed in a feature service that resided on an ESRI server. All data on the ESRI server were backed up to an SWCA server periodically and will be stored indefinitely. Quality control features that facilitate identifying common errors were built into Field Maps. All data were reviewed and proofed before data were finalized and delivered to the County.

All spatial data collected in the field, as well as any spatial data provided by the County and edited by SWCA, were exported to a geodatabase and are included as part of the 2025 Final Data Deliverable. A full list of the spatial layers and a description of the data that each layer contains are included in the metadata for the geodatabase. The geodatabase also includes general project information, such as the County project number, the name of SWCA's project manager, the dates for the project, a brief project description, the title of the associated final report, the model of GPS receiver used for the project, and relative positional accuracy.

2.4 Data Analyses

Apparent nest success, parasitism rate, productivity, and fecundity were calculated for Mormon Mesa and Mesquite West (see Section 3.2.1.1). Apparent nest success was calculated as the number of successful nests/total number of nests containing at least one flycatcher egg. The parasitism rate was calculated as

the number of nests containing at least one flycatcher egg and one cowbird egg/total number of nests containing at least one flycatcher egg. Productivity was calculated as the number of young fledged/ number of nesting attempts that contained at least one flycatcher egg and had a known outcome. Fecundity was calculated as the number of young fledged/number of females for which the outcome of all nesting attempts throughout the season was known. Mesquite West data from 2025 were pooled with data from 2021 through 2024 (i.e., the cowbird netting period) and compared with data from both the 5-year period (2016–2020) immediately before cowbird netting began and the entire data set from years when SWCA or NDOW biologists conducted flycatcher monitoring at Mesquite West (2003–2020).[6] Parasitism and nest success were compared using one-tailed Fisher's exact tests. Productivity and fecundity in pre-netting and netting periods were compared using one-tailed t-tests. A statistical significance level of $P \leq 0.05$ was chosen to reject the null hypotheses for all calculations (Section 4.10).

2.5 Brown-Headed Cowbird Control

2.5.1 Target Netting

Cowbird target netting commenced at Mesquite West just prior to the beginning of the flycatcher breeding season (i.e., early May) in anticipation of the site being occupied by flycatchers. Target netting employed broadcasts of conspecific vocalizations to lure cowbirds into a mist net. Each target-netting attempt consisted of erecting a single mist net 2.6 m (8.5 feet) tall with 38-millimeter (1.5-inch) mesh size and placing a female cowbird decoy near the midpoint of the net. A small, portable speaker was placed near the decoy, and a second speaker was placed on the opposite side of the net. These speakers were coupled to Apple iPods loaded with multiple tracks of cowbird vocalizations.

Once the net was erected and the decoy and speakers were in place, the observer hid approximately 10 m (33 feet) from the net in a place with a full view of the net. The observer began broadcasting a female cowbird chatter vocalization, with periodic pauses to mimic a natural vocalization rate, until a female cowbird came near the net. Once a female cowbird was in sight, different tracks were played to agitate the female and draw her into the net. Any male cowbird or non-target species that was caught in the net was removed immediately and released. The observer clipped the tail of each male cowbird in a "swallow pattern" prior to release to signify that the bird had been previously captured, should the bird be caught again later in the season. All female and juvenile cowbirds were euthanized via decapitation, a method approved under the current American Veterinary Medical Association guidelines for euthanizing small birds (American Veterinary Medical Association 2020).

2.5.1.1 NET LOCATIONS

Mist nets were placed in semi-open areas at least 70 m (230 feet) from all known flycatcher nests or territory centers, which resulted in net locations being approximately 50 m (164 feet) or more from the edge of those occupied territories. Because SWCA also conducted territory and nest monitoring for flycatcher at Mesquite West in 2025, biologists attempting to net cowbirds had access to current information on all flycatcher detection, territory, and nest locations. All cowbird mist-net locations were approached from a direction that did not cause the observer to pass through or near a flycatcher territory.

Female cowbirds can occupy territories of 4.5 ha (11.1 acres) or greater (Lowther 2020), which is a much larger area than a typical flycatcher territory (less than 0.5 ha [1.2 acres]) (Cardinal 2005); thus, placing netting attempts between 50 and 100 m (164 and 328 feet) from the edge of flycatcher territories targeted female cowbirds whose ranges likely overlapped those flycatcher territories. Placing all cowbird nets

[6] Data in the cited reports may be presented differently, as the reports dated before 2020 include not only Mesquite West but also all other sites in the Mesquite study area.

outside flycatcher territories minimized the chance of inadvertently capturing a flycatcher or attracting a cowbird into a flycatcher territory. However, because it was still possible that a flycatcher could be captured during cowbird target netting, all biologists who attempted to target net cowbirds were also authorized through SWCA's existing USFWS 10(a)1(A) Permit No. PER0009523-3 and U.S. Geological Survey Federal Bird Banding Permit No. 23258 to handle flycatchers.

2.5.1.2 TIMING OF NETTING ATTEMPTS

Any netting attempt that failed to attract female cowbirds to the vicinity was terminated after 1 hour. The first netting attempt of the day began as early as first light, allowing for multiple netting attempts in a day. Female cowbirds are typically on their laying territories in the early morning (Goguen and Mathews, 2001); thus, morning netting attempts targeted those cowbirds likely to parasitize hosts in the vicinity. Netting attempts were terminated by 10:00 a.m., and no netting attempts were conducted during inclement weather or with direct sunlight on the net. The net was removed at the conclusion of each netting attempt. Netting attempts began in early May and were conducted twice per week through May 31, then once per week through July 28. Starting target netting for cowbirds in early May allowed for six netting visits prior to the initiation of the earliest flycatcher nests.

2.5.2 Egg Addling and Replacement

When a flycatcher nest was parasitized on or before the fifth day of incubation and the nest was accessible by an observer without causing damage to the nest, the cowbird egg(s) was either addled via vigorous shaking or replaced with a fake egg painted to resemble the speckled pattern of a cowbird egg. Cowbird eggs were not removed from the nest without replacement so as not to mimic a partial depredation event, which could cause nest desertion. Shaking cowbird eggs greatly reduces the chance of the egg hatching, and there is no evidence that this activity results in nest desertion (McLeod and Pellegrini 2013; McLeod et al. 2019). If a ladder was necessary to access the cowbird egg without causing damage to the nest, the egg was addled or replaced with a fake egg on the next visit to the site.

2.5.3 Nestling Euthanasia

Cowbird nestlings may be present in a flycatcher nest either when the nest is found or after an addling attempt has failed and the cowbird egg hatches. If a cowbird nestling was discovered in a nest, the nestling was removed. If the nest was accessible without a ladder, the nestling was removed at the time of discovery. If a ladder was necessary to remove the nestling without causing damage to the nest, the nestling was removed on the next visit to the site.

2.6 Point-Count Surveys

Surveys conducted in 2025 followed methods used during the 2017 through 2024 point-count surveys (SWCA 2017b, 2018a, 2018b, 2019a, 2020, 2021, 2022, 2023a, 2024a), which applied established point-count protocols and drew from methods described in *A Habitat-Based Monitoring Program for Breeding Birds of Nevada* (Great Basin Bird Observatory [GBBO] 2003) and in the *Handbook of Field Methods for Monitoring Landbirds* (Ralph et al. 1993).

In 2017, SWCA conducted surveys at all 27 point-count locations across the Bunkerville East (Parcels 2-A through 2-E), Mormon Mesa, and Muddy River subunits. In 2018, surveys were completed at all 24 points across the Bunkerville East (Parcels 2-F and 2-G), Mesquite, Bunkerville West, and Riverside subunits. In 2019, SWCA randomly selected 25 of the 51 previously established point-count locations across all Riparian Reserve Units to be surveyed in odd-numbered years (i.e., 2019, 2021, 2023); the

remaining 26 points were selected to be surveyed in even-numbered years (i.e., 2020, 2022, 2024) (Figures 8–13). In 2020, the County added four survey points in Parcels 2-L and 2-M, two to be surveyed in odd years and two to be surveyed in even years. In 2022, another four points were added in Parcels 6-A and 6-B, two to be surveyed in odd years and two to be surveyed in even years.

In 2025, SWCA conducted avian point-count surveys at the 29 odd-year point-count locations. SWCA did not anticipate any impediments to access at any of the point-count locations; therefore, a reconnaissance visit was not conducted. A biologist assessed site conditions during the first survey visit to each site. All the original odd-year point-count locations were easily accessed during the first survey visit and were used in 2025. The biologist navigated to each survey point and marked the point with flagging so that it could be easily located on subsequent visits.

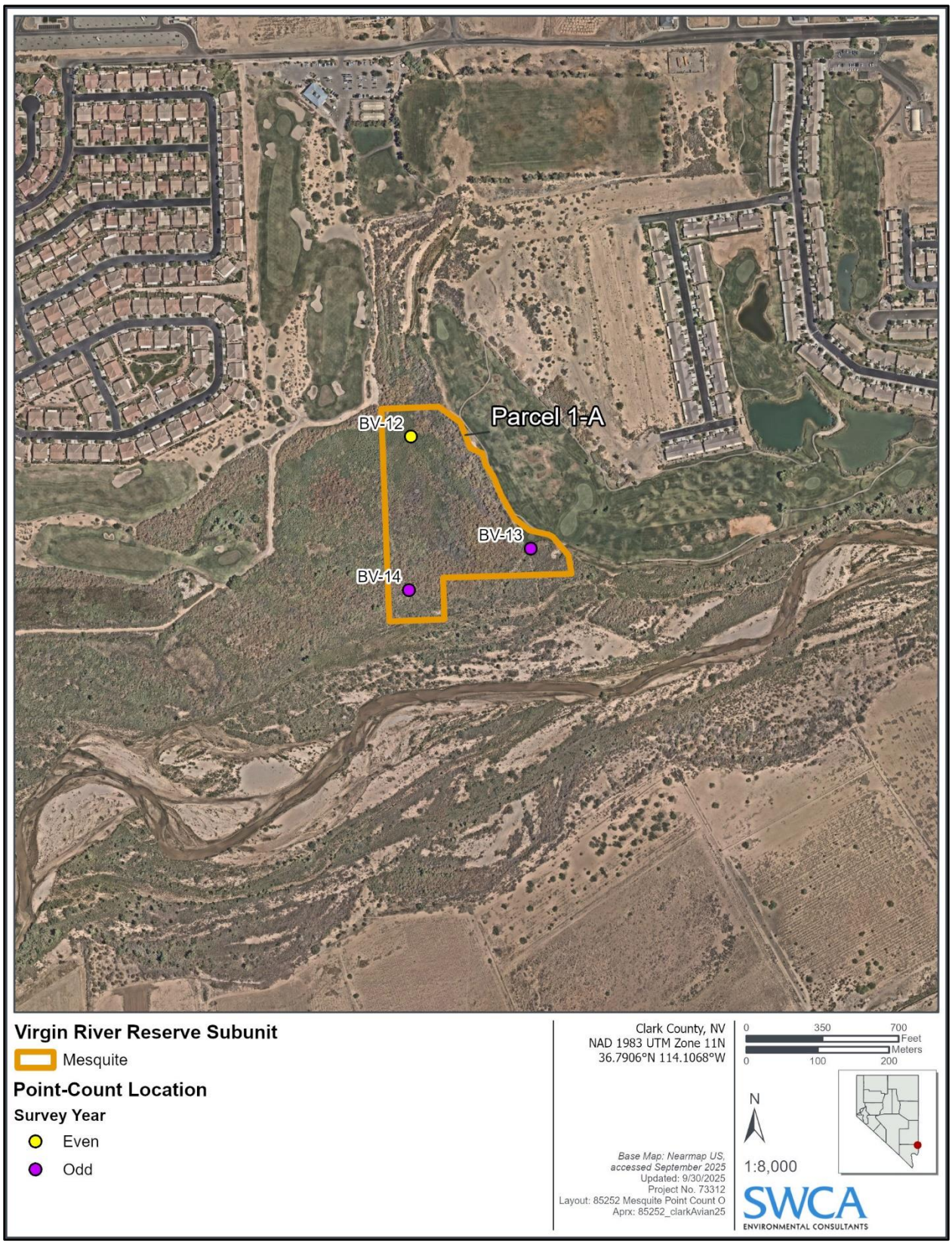

Figure 8. Point-count locations within the Mesquite Subunit.

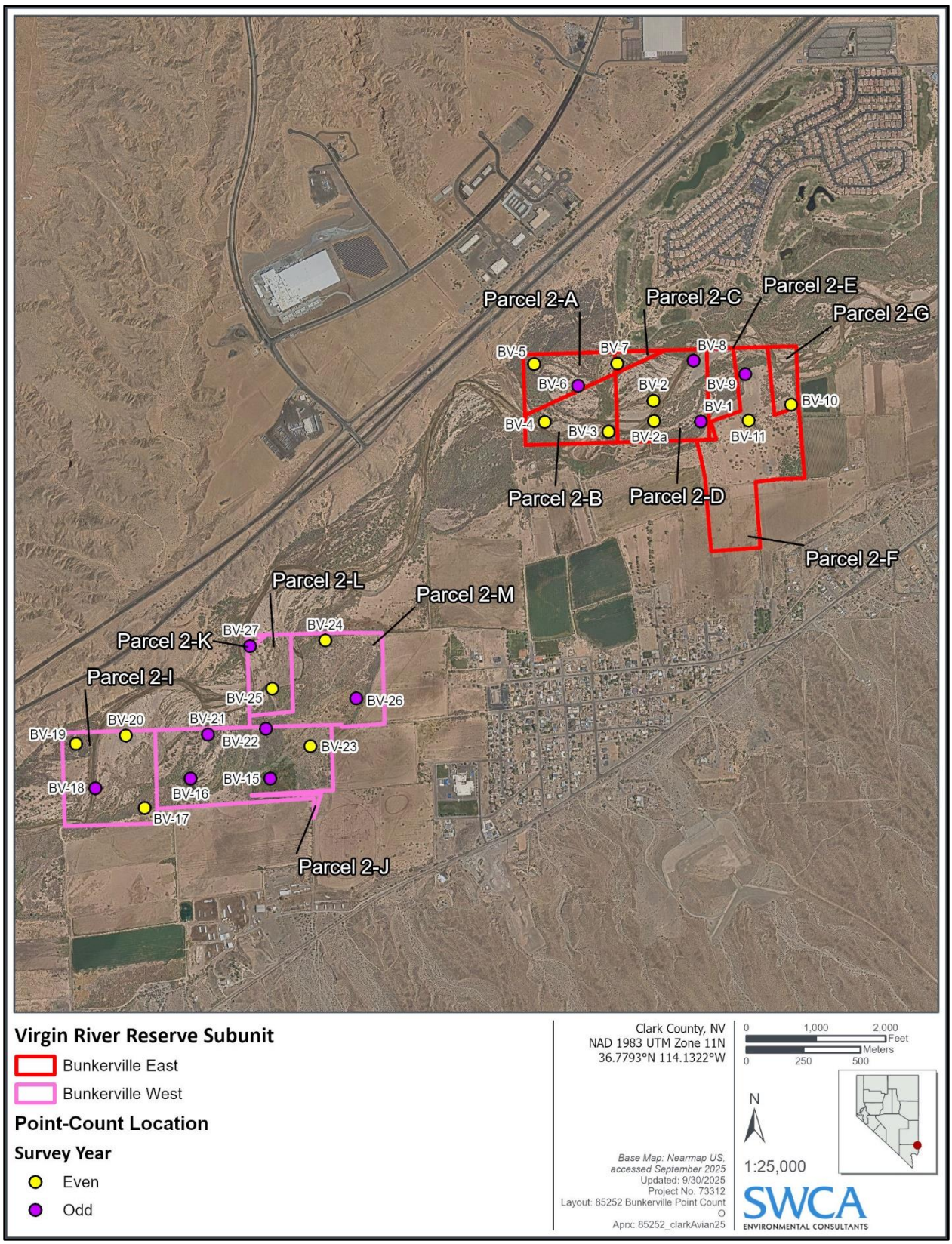

Figure 9. Point-count locations within the Bunkerville East and Bunkerville West Subunits.

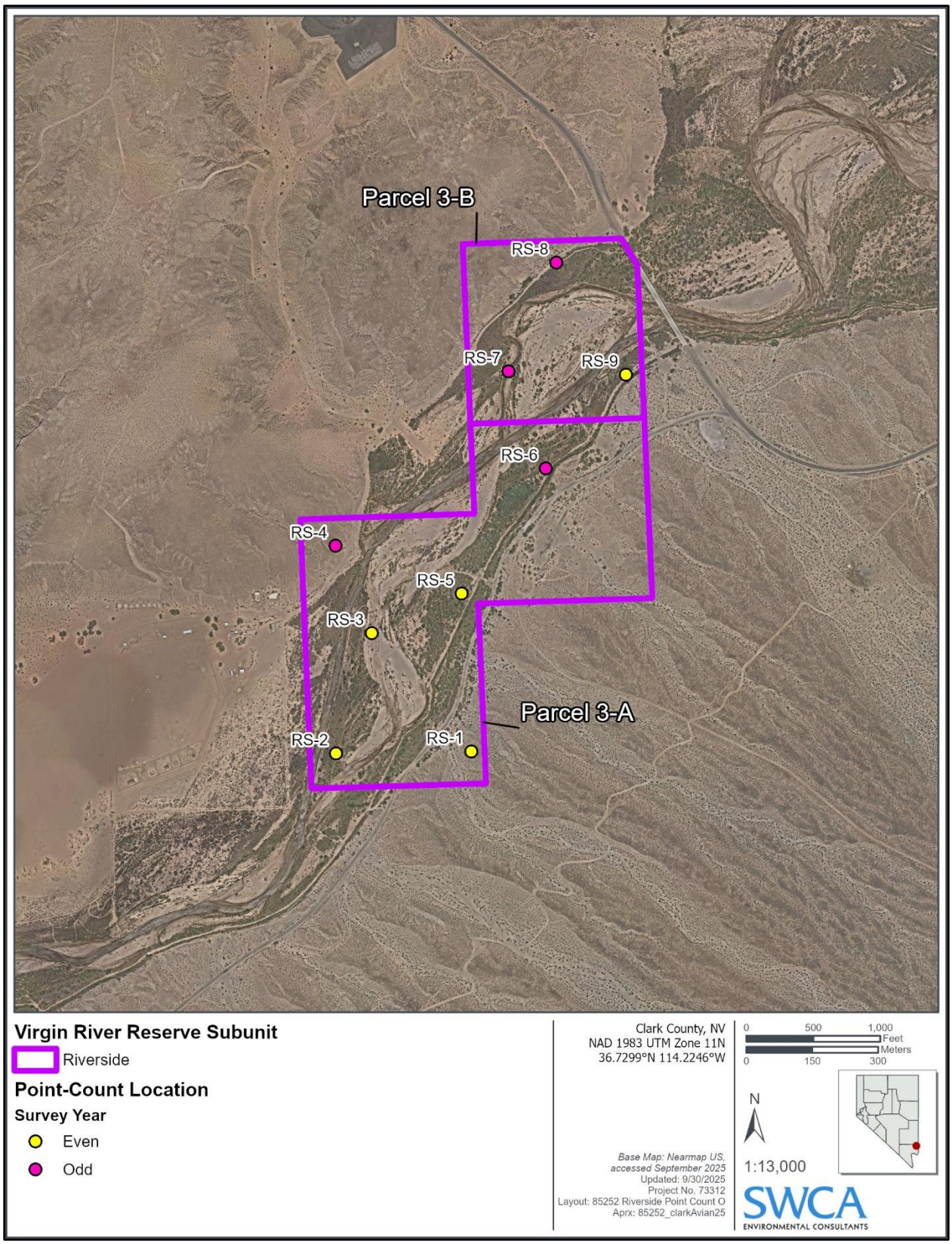

Figure 10. Point-count locations within the Riverside Subunit.

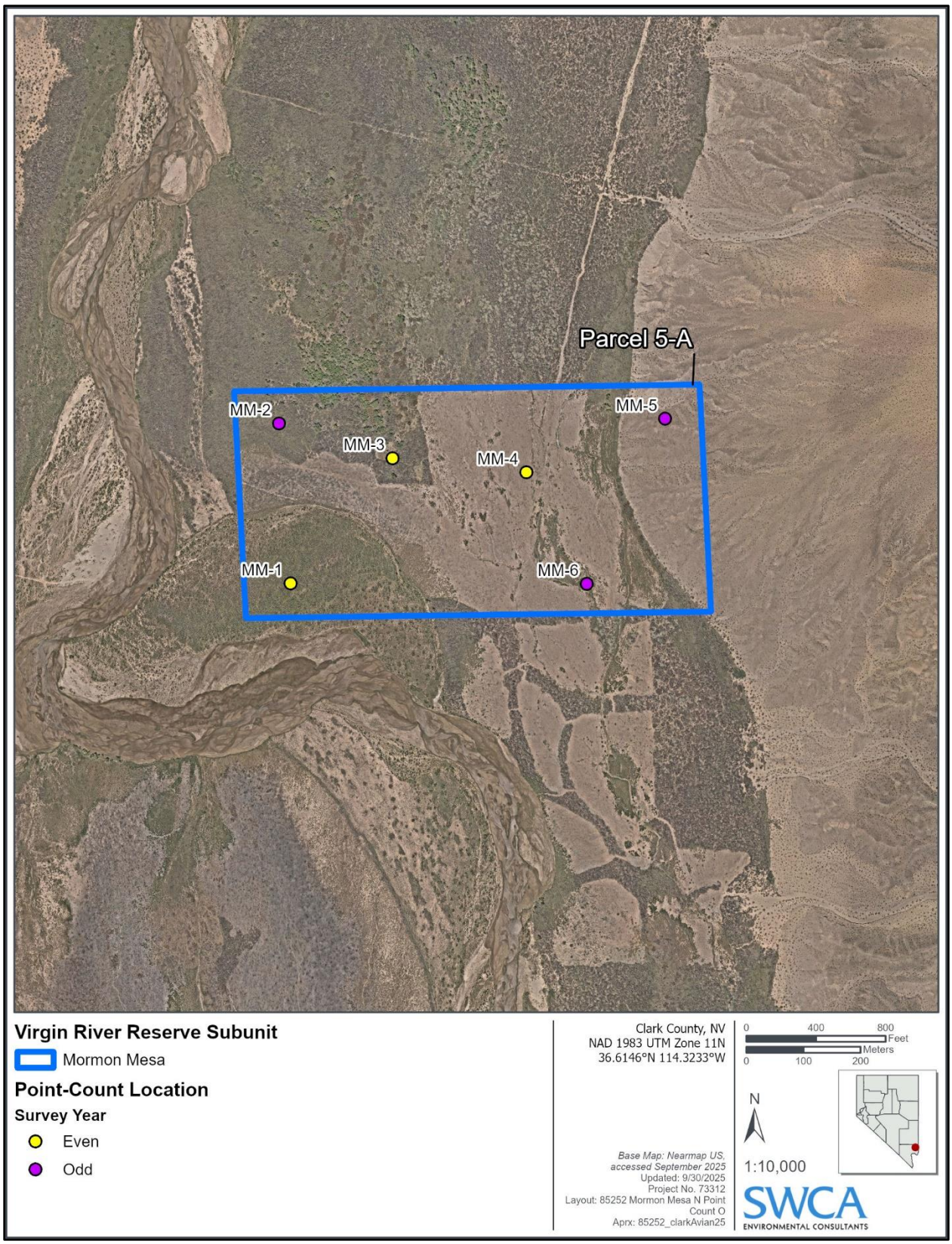

Figure 11. Point-count locations within the Mormon Mesa Subunit.

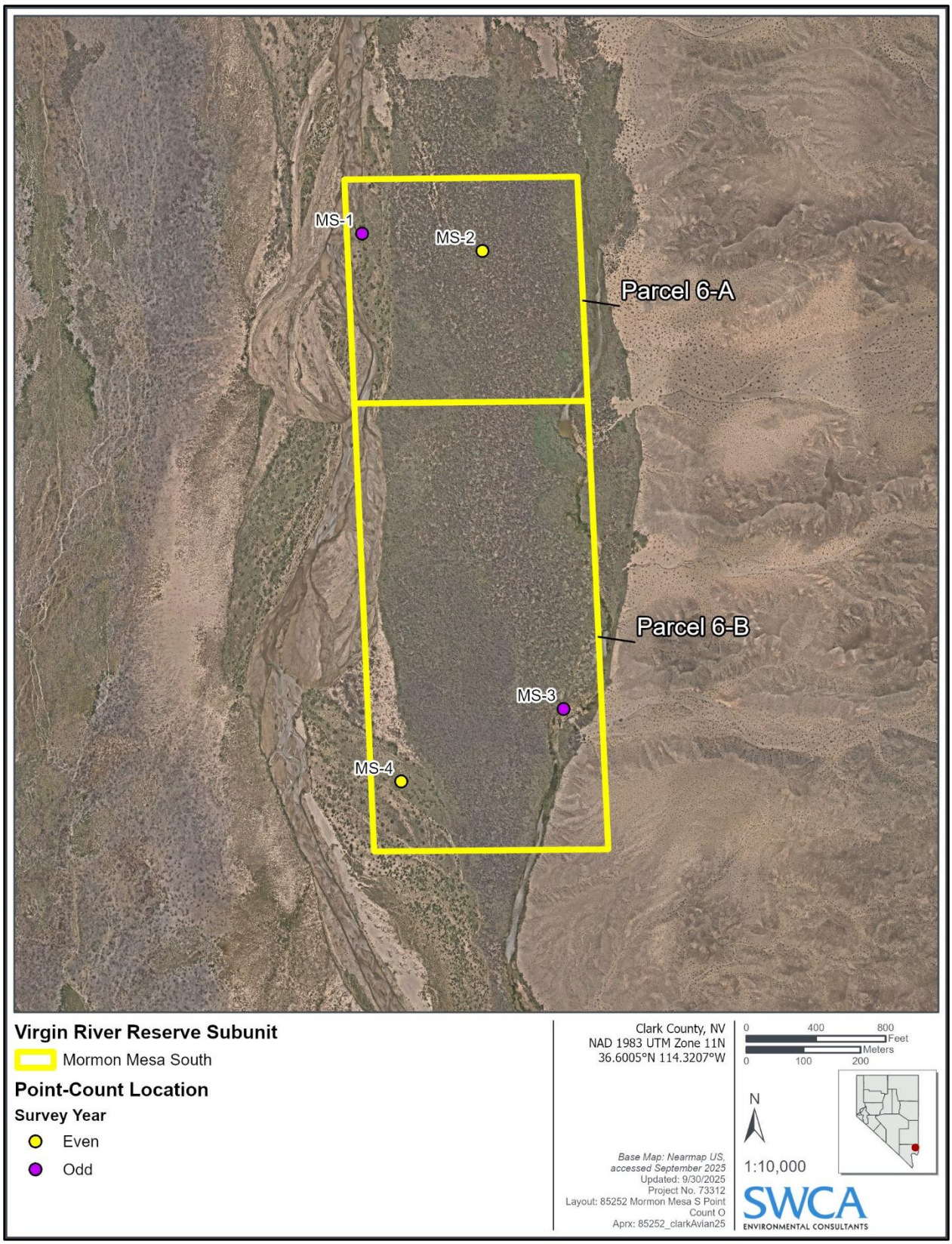

Figure 12. Point-count locations within the Mormon Mesa South Subunit.

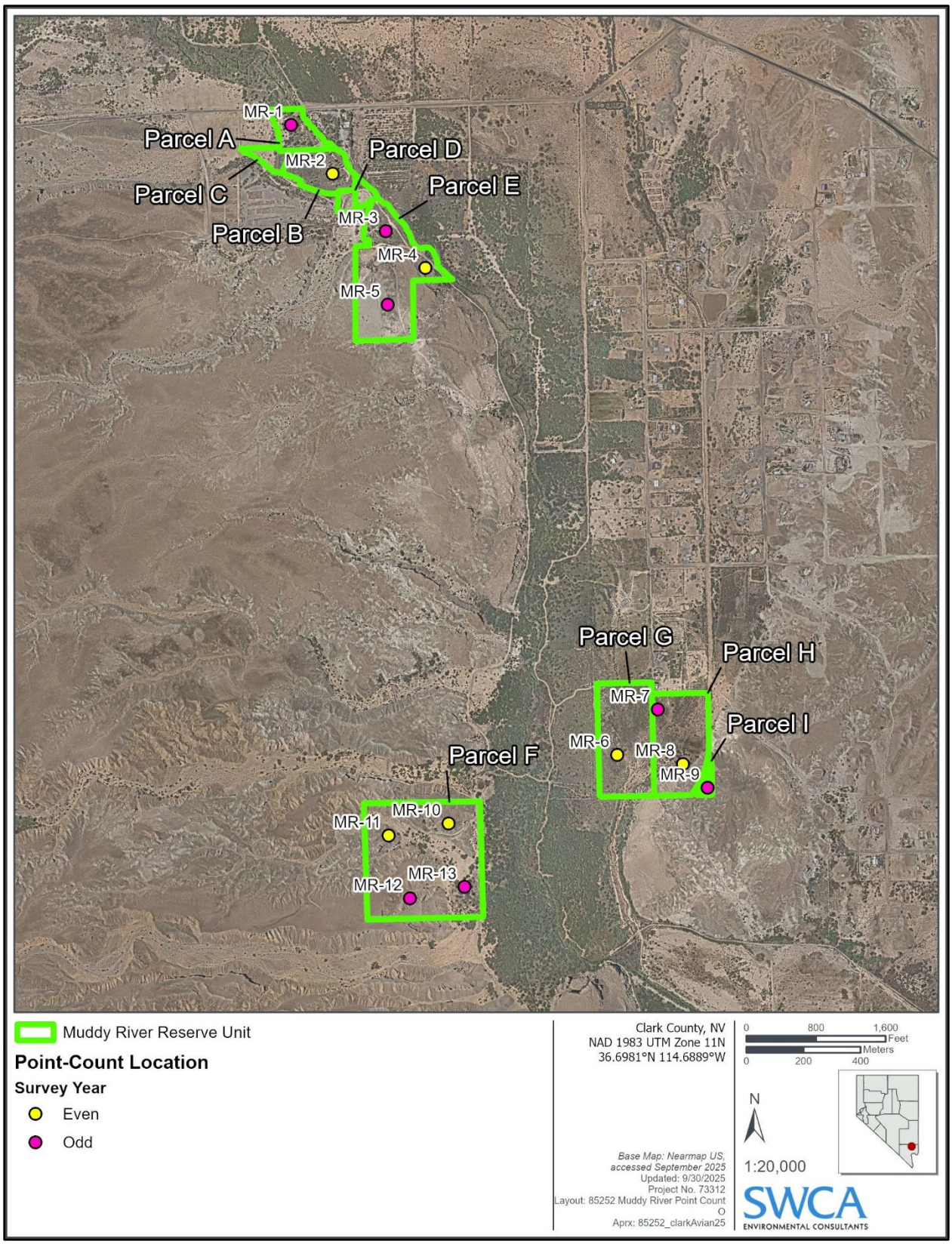

Figure 13. Point-count locations within the Muddy River Reserve Unit.

In 2018, surveys were conducted at all 40 point-count locations across the BCCE. In 2019, SWCA randomly selected 20 of the 40 previously surveyed point-count locations at the BCCE to be surveyed in odd-numbered years (i.e., 2019, 2021, 2023); the remaining 20 locations were selected to be surveyed in even-numbered years (i.e., 2020, 2022, 2024) (Figure 14). It was anticipated that conditions at the BCCE had not changed dramatically since odd-year points were last surveyed in 2023, and no field reconnaissance was completed prior to field surveys in 2025. Surveyors were able to access all 20 of the original point-count locations without impediment, and all the original locations assigned to odd-numbered years were used in 2025.

Each surveyor followed standard unlimited-radius point-count procedures, with surveys starting at sunrise and concluding by 10:00 a.m. (GBBO 2003; Ralph et al. 1993). Consecutive surveys at each point were separated by a minimum of 7 days. The order in which point counts were completed was altered between each round of surveys.

For each survey, the surveyor approached each point quietly to avoid unnecessary disturbance to any birds present. Prior to or immediately following each point count, the surveyor recorded weather data, including percent cloud cover, wind speed and direction, temperature, and precipitation, on a standardized form. No surveys were conducted when wind speeds exceeded 40 km (25 miles) per hour or during periods of heavy rain (GBBO 2003).

Point counts consisted of a 10-minute observation period broken into four intervals (0–3, 3–5, 5–8, and 8–10 minutes). Surveyors noted the time interval in which the first detection of a given bird or group of birds was made. For each detection, surveyors also recorded species code, sex, age, number of birds, estimated distance from the observer, compass bearing to the bird(s), and behavior of the bird(s) as it pertained to breeding status. Any bird(s) that flushed as the surveyor approached the point-count location but was not detected during the survey was recorded as observed during the 0- to 3-minute interval and in the location from where it flushed. All detections were recorded on hardcopy datasheets. Any bird that gave an unknown vocalization was pursued following the survey to determine its identity (Ralph et al. 1993).

2.7 On-Call Services

SWCA conducted three on-call surveys at the Riparian Reserve Units: fence surveys at the Bunkerville East and Bunkerville West subunits (Work Authorization Form [WAF] 001); nest surveys at the Bunkerville West subunit in advance of vegetation planting (WAF 002); and nest surveys at the Bunkerville West and Muddy River subunits in advance of weed treatments performed by the National Park Service Invasive Plant Management Team (WAF 003). During all surveys, location information was collected with an Apple iPad equipped with Field Maps for ArcGIS and paired with an external Juniper Geode GPS receiver.

During WAF 001 fence surveys at the Bunkerville East and West subunits, a biologist collected fence and gate locations and condition information along the perimeters of the subunits as well as within each subunit. Fence and gate conditions were recorded as good, fair, or poor, and representative photographs of fences and gates in each condition were taken (Figures A-42 through A-47).

During WAF 002 nest surveys, a biologist slowly walked through and adjacent to areas in Bunkerville West Parcel 2-M, conducting a nesting bird survey where cattail (*Typha* sp.) flattening was planned in preparation for planting of native vegetation. The biologist searched for nests and observed adult bird behavior that would indicate possible nesting in the area.

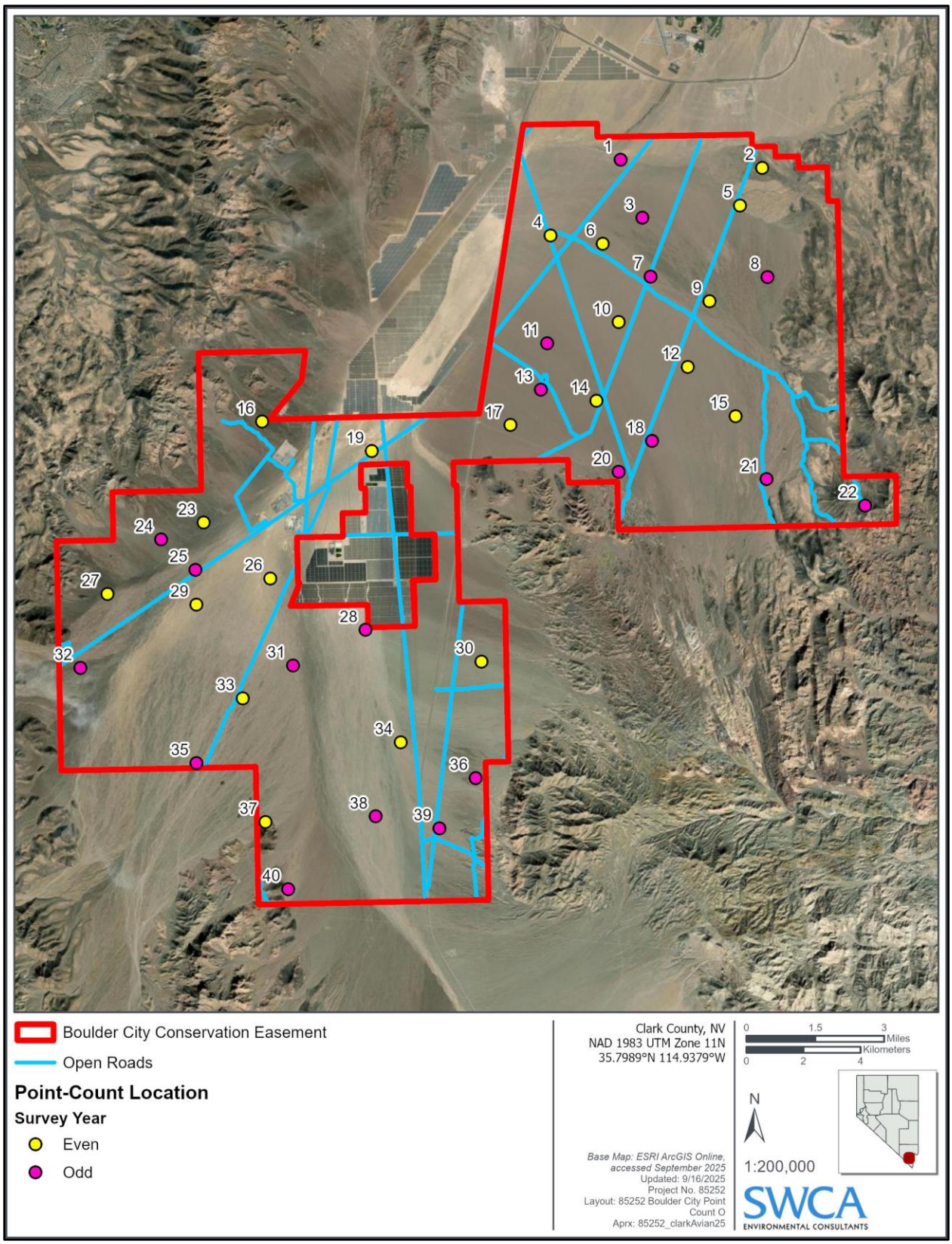

Figure 14. Point-count locations within the BCCE.

During WAF 003 nest surveys, a biologist conducted a nesting bird survey at Bunkerville West Parcels 2-J and 2-M prior to tamarisk treatment. Also under this Work Authorization, a biologist conducted a nesting bird survey at Muddy River Parcels A and B prior to California fan palm (*Washingtonia filifera*) treatment.

3 RESULTS AND EVIDENCE OF THE RESULTS

3.1 Objectives Completed

The objectives for this project were to 1) conduct point-count surveys for all avian species at predetermined locations in all Riparian Reserve Units and the BCCE, 2) conduct protocol-level presence/absence surveys for flycatcher and cuckoo where suitable habitat exists, 3) conduct flycatcher nest searching at the Mesquite West and Mormon Mesa sites, 4) monitor all flycatcher nests found at the Mesquite West and Mormon Mesa sites and record all successes and failures, 5) record instances of parasitism by cowbirds, 6) conduct cowbird control at Mesquite West throughout the flycatcher breeding season, and 7) conduct on-call surveys as requested by the County. All above objectives were completed in 2025, and results of field efforts are presented here.

Survey Effort

3.1.1 Federally Listed Bird Surveys

The five rounds of flycatcher surveys were completed by SWCA biologists Steve Dougill, MaKenna Magdos, and Sarah Nichols between May 21 and July 17 (Table 1). Each round of flycatcher surveys required four observer-mornings. SWCA surveyed 18.6 ha (45.9 acres) for flycatcher at the Mesquite, Bunkerville East, Bunkerville West, and Mormon Mesa subunits (see Figures 3, 4, and 6), and surveys required 59.3 survey-hours (see Table 1). Flycatcher surveys concluded by 10:33 a.m. Site photographs are presented in Appendix A.

The four rounds of cuckoo surveys were completed by SWCA biologists Steve Dougill, MaKenna Magdos (under direct supervision of a permitted biologist), and Sarah Nichols between June 25 and August 8 (Table 2). Each cuckoo survey round required three or four observer-mornings. SWCA surveyed 18.3 ha (45.3 acres) for cuckoo across all Riparian Reserve Units (see Figures 3–7), and surveys required 37.0 survey-hours (see Table 2). Cuckoo surveys concluded by 10:32 a.m. or when the temperature reached 40ºC (104°F), whichever occurred first. Site photographs are presented in Appendix A.

3.1.2 Point-Count Surveys

The three rounds of point-count surveys were completed at the Riparian Reserve Units by S. Dougill between May 12 and June 29 (Table 3). Each round of point counts required four observer-mornings. Weather conditions were favorable during all three survey rounds, with no precipitation and wind speeds ranging from 0 to 16.9 km (0 to 10.5 miles) per hour.

S. Dougill, Rachel Kuhl, M. Magdos, and S. Nichols completed three rounds of point-count surveys within the BCCE between March 21 and May 8 (Table 4). Each round of point counts at the BCCE required three or four observer-mornings. Weather conditions were favorable during all three survey rounds, with light drizzle and rain recorded during one point count each and wind speeds ranging from 0 to 13.3 km (0 to 8.3 miles) per hour.

Table 1. Survey Dates and Effort for Southwestern Willow Flycatcher Surveys, 2025

Subunit	Parcel(s)	Area Surveyed (acres)	Total Survey-Hours	Survey Dates				
				First	Second	Third	Fourth	Fifth
Mesquite	West West	28.2	24.5	May 21, 22	June 5, 6	June 23	July 1	July 17
	1A	9.2	9.9	May 21, 22	June 6, 7	June 17	July 4	July 13
Bunkerville East	2-A through 2-G	2.2	8.3	May 23	June 7	June 17	June 30	July 16
Bunkerville West	2-1 and 2-J	0.4	1.9	May 26	June 7	June 20	June 30	July 16
	2-K through 2-M	1.4	6.3	May 26	June 7	June 20	June 30	July 16
Mormon Mesa	5-A	4.5	8.4	May 29	June 9	June 19	July 3	July 15

Table 2. Survey Dates and Effort for Yellow-Billed Cuckoo Surveys, 2025

Subunit	Parcel(s)	Area Surveyed (acres)	Total Survey-Hours	Survey Dates			
				First	Second	Third	Fourth
Mesquite	1A	9.2	7.1	June 26	July 9	July 21	August 4
Bunkerville East	2-A through 2-G	2.2	5.1	June 25	July 10	July 22	August 5
Bunkerville West	2-1 and 2-J	0.4	1.9	June 25	July 10	July 22	August 5
	2-K through 2-M	1.4	3.5	June 25	July 10	July 22	August 5
Riverside	3-A and 3-B	7.2	3.9	June 25	July 10	July 22	August 5
Mormon Mesa	5-A	16.3	9.4	June 27	July 12	July 24	August 8
Muddy River	A through H	8.6	6.1	June 26	July 11	July 23	August 6

Table 3. Survey Dates for Point-Count Surveys at the Riparian Reserve Units, 2025

Subunit	Parcel(s)	Survey Dates		
		First	Second	Third
Mesquite	1A	May 13	May 29	June 25
Bunkerville East	2-A through 2-G	May 13	May 29	June 25
Bunkerville West	2-1 and 2-J	May 13, 14	May 29, 30	June 26
	2-K through 2-M	May 13, 14	May 29, 30	June 26
Riverside	3-A and 3-B	May 14	May 30	June 25
Mormon Mesa	5-A	May 12	May 30	June 25
Mormon Mesa South	6-A and 6-B	May 12	June 1	June 27
Muddy River	A through H	May 15	June 4	June 29

Table 4. Survey Dates for Point-Count Surveys at the BCCE, 2025

Survey Round	Dates
First	March 21, 22, 23, 24
Second	April 22, 23, 24
Third	May 6, 7, 8

3.2 Findings

3.2.1 Federally Listed Bird Surveys and Monitoring

3.2.1.1 SOUTHWESTERN WILLOW FLYCATCHER

Adult willow flycatchers detected for at least 7 days at a particular study area were considered to be residents at that study area and were determined to be of the southwestern subspecies. Additionally, adults detected between June 24 and July 17 were also considered to be of the southwestern subspecies, regardless of detection duration.

In total, 26 adult willow flycatchers were detected during survey and monitoring activities at the Virgin River Reserve Subunits (Table 5). Twenty-three willow flycatchers were detected at monitored sites, two were detected at survey-only sites, and one was detected during general avian point-count surveys at a site where no flycatcher surveys occurred. Of the 26 willow flycatchers, 20 were detected at Mesquite West (Figure B-1 in Appendix B), two were detected south of the Parcel B boundary at Bunkerville East Parcels A through G (Figure B-2), one was detected at Riverside Parcel 3-A (Figure B-3), and three were detected north of the Mormon Mesa Parcel 5-A boundary (Figure B-4). One male was detected as part of a pair at Mormon Mesa through July 3; this individual was subsequently captured during an attempt to band a different individual at Mesquite West on July 9. This individual was present for more than 7 days at both the Mormon Mesa and Mesquite subunits and is considered to have occupied territories at both subunits; this individual is counted only once, as one of the three residents at the Mormon Mesa subunit, in the total number of birds detected.

All three of the individuals detected at non-monitored sites were considered to be of the southwestern subspecies. One of these individuals demonstrated territorial behavior (i.e., lengthy, unsolicited song) for approximately 6 weeks and was determined to be male. This individual was resighted and determined to be banded and was later recaptured, further confirming that the individual was of the southwestern subspecies. Banding and resight data indicated that this individual fledged from a nest at Mesquite West in 2024. The other two individuals were each detected for a single day (one on June 25 and the other on June 30) and were considered to be of the southwestern subspecies based on their date of detection being outside known migration windows (i.e., after June 24 and before July 20); neither individual demonstrated territorial behavior, and sex remained undetermined for both individuals.

Of the 23 adult willow flycatchers detected at monitored sites, 20 were detected at Mesquite West and three were detected at Mormon Mesa Parcel 5-A. Of the 20 adults detected at Mesquite West, 17 were residents of the southwestern subspecies that were present for at least 7 days. Individuals detected for at least 7 days were considered to have occupied territories, whereas individuals detected for less than 7 days were considered floaters. All three floaters at Mesquite West were detected during the period when willow flycatchers fly north to their breeding grounds; one was detected on May 22, one was detected on May 31, and one was detected on June 15. Two of these individuals were resighted and determined to be unbanded; the band status of the third individual remained undetermined. All three adults detected at Mormon Mesa Parcel 5-A were residents of the southwestern subspecies that were present for at least 7 days and occupied two breeding territories; one female paired consecutively with two different males.

Of the 26 adult willow flycatchers detected across all sites, 17 (65%) were known to be banded, five (19%) were unbanded, and the band status of four (15%) could not be determined. Two of the 17 banded adults were newly banded in 2025, and 15 were banded in previous years. Of the 15 previously banded birds, 13 were individually identified by band combination while two could not be identified to individual. Of the 15 identified individuals banded in previous years, nine were banded as adults and four were banded as nestlings. Of the nine identified individuals that had been previously detected as adults,

eight returned to Mesquite West and one returned to Mormon Mesa; all individuals returned to the subunits where they had been most recently detected. The individual that was detected at Mormon Mesa in previous years and returned to Mormon Mesa in 2025 was subsequently observed at Mesquite West. This individual is included as a resident at both Mormon Mesa Parcel 5-A and Mesquite West in Table 5 but is counted only once, as a resident of Mormon Mesa Parcel 5-A, in the overall total. Four adults were detected for the first time since they were banded as juveniles; all three individuals fledged from nests at Mesquite West in 2024; three returned to Mesquite West and one dispersed to a location just south of Bunkerville 2-A through 2-G in 2025.

3.2.1.1.1 Mesquite West

Biologists spent 135.5 observer-hours on territory and nest monitoring at Mesquite West; activities included determining residency status, observing resident flycatchers, monitoring nests, and banding adults and nestlings. The 20 adults documented at Mesquite West comprised eight pairs; two territorial, unpaired males; and three floaters (see Table 5). The three floaters were detected for one day each during the northbound migration window; subspecies identification could not be determined.

One new adult was color banded (see Table 5). Two adults banded in previous years were recaptured. Nine additional adults were identified to individual via resighting. Two adults were determined to be banded, but their color combinations could not be confirmed. Five adults remained unbanded; band status could not be determined for the remaining two adults. Nine nestling flycatchers were newly banded (see Table 5); four of the banded nestlings were confirmed to have fledged. In addition, four nestlings from two nests where banding would have been too destructive to vegetation in the nest area remained unbanded and were confirmed to have fledged. Three banded nestlings are known to have died: one nest containing two banded nestlings was depredated, and one dead banded nestling was located beneath a nest after another nestling from the nest was confirmed to have fledged.

Nests were confirmed for all eight pairs documented in 2025. Ten confirmed nesting attempts were documented (see Figure B-1). All 10 nesting attempts were known to contain at least one flycatcher egg and were used in calculating nest success and productivity. Five (50%) of these 10 nests were successful and fledged young and five (50%) failed (Table 6). Six females each had one nesting attempt and two females each had two nesting attempts. In total, eight fledglings were produced from 10 nests with known outcome. Productivity at Mesquite West was 0.8 fledgling per nest, and fecundity was 1.0 fledglings per female (Table 7).

Table 5. Details of Flycatchers and Willow Flycatchers Detected at All Riparian Reserve Properties, 2025

Subunit*	Parcel	Date Banded†	Federal Band No.†	Color Combination‡	Age§	Sex¶	Territory or Location#	Observation Status**, ††
MESQ	West‡‡	N/A	N/A	UB:UB	AHY	U	F00	RS; detected May 31
		INA	INA	Banded	AHY	F	01	RS
		June 27, 2019	2660-23228	MY(M):VI	7Y	M	01	R July 2
		July 9, 2025	2590-59213	Vs:KK(M)	L	U	01	N
		N/A	N/A	UB:UB	AHY	F	02	RS
		INA	INA	Banded	AHY	M	02	RS
		July 19, 2022	2940-35234	Xs:YB(M)	A5Y	F	03	RS
		July 18, 2024	1710-58977	GN:RD(M)	A3Y	M	03	RS
		July 4, 2025	2590-59256	Vs:RY(M)	L	U	03	N; died
		July 4, 2025	3080-27720	Xs:WBW(M)	L	U	03	N; died
		June 25, 2022	2940-35207	Xs:BMB(M)	A5Y	F	04	RS
		May 27, 2020	2660-23165	MG(M):VI	A7Y	M	04	RS
		June 28, 2025	1710-58996	RG(M):GN	L	U	04	N; not confirmed to have fledged¶¶
		June 28, 2025	2590-59257	Vs:WK(M)	L	U	04	N; not confirmed to have fledged¶¶
		June 28, 2025	3010-42168	YMY(M):EY	L	U	04	N
		N/A	N/A	UB:UB	AHY	F	05	RS
		June 25, 2022	2940-35206	Xs:BW(M)	4Y	M	05	RS
		N/A	N/A	UB:UB	L	U	05	RS
		N/A	N/A	UB:UB	L	U	05	RS
		July 13, 2021	2660-23395	WGW(M):EY	6Y	F	06	RS
		July 1, 2021	2660-23379	EY:RKR(M)	6Y	M	06	RS; polygynous with 14
		N/A	N/A	UB:UB	L	U	06	RS
		N/A	N/A	UB:UB	L	U	06	RS
		July 18, 2024	2590-59240	Vs:DR(M)	SY	M	T08	RS; detected May 22–July 1
		INA	INA	Undetermined	AHY	U	F09	Detected May 22
		July 1, 2024	2590-59279	Vs:RDR(M)	SY	M	T11	RS; detected June 7–July 21
		N/A	N/A	UB:UB	AHY	U	F13	RS; detected June 15

Subunit*	Parcel	Date Banded†	Federal Band No.†	Color Combination‡	Age§	Sex¶	Territory or Location#	Observation Status**, ††
MESQ	West‡‡	INA	INA	Undetermined	AHY	F	14	
		July 9, 2025	3080-27778	TT:DW(M)	AHY	F	15	N
		July 1, 2024	2940-35269	DR(M):Xs	SY	M	15	R July 9
		July 9, 2025	3010-42162	GMG(M):EY	L	U	15	N; not confirmed to have fledged
		July 9, 2025	3080-27718	WMW(M):Xs	L	U	15	N
		July 9, 2025	3080-27779	YW(M):TT	L	U	15	N; died
		June 15, 2022	2590-53200	Xs:BY(M)§§	A5Y	M	T16§§	R July 9; detected July 9–22; previously detected at Mormon Mesa
BUNK E	2-B	July 2, 2024	3010-42142	EY:MB(M)	SY	M	T01	R June 30; detected June 7–July 16
		INA	INA	Undetermined	AHY	U	F02	Detected June 30
RIVE	3-A	N/A	N/A	Unbanded	AHY	U	F01	RS; detected June 25
MOME	5-A	INA	INA	Undetermined	AHY	F	01, 02	Paired consecutively with two males
		June 22, 2025	3010-42141	GM(M):EY	SY	M	01	N
		June 15, 2022	2590-53200	Xs:BY(M)§§	A5Y	M	02§§	RS; subsequently detected at Mesquite West

* BUNK E = Bunkerville East, MESQ = Mesquite, MOME = Mormon Mesa, and RIVE = Riverside

† INA = information not available, and N/A = not applicable

‡ Color-band codes: B = light blue, banded = bird was banded but combination could not be determined, D = dark blue, EY = electric yellow federal band, G = green, GN = green federal band, K = black, M = mulberry, (M) = metal pinstriped band, R = red, TT = turquoise federal band, UB = unbanded, undetermined = presence of bands could not be determined, Vs = violet federal band, W = white, Xs = standard silver federal band, and Y = yellow. 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 left and right legs are separated with a colon. Combinations applied in 2025 could represent a re-use of combinations used in earlier years; standard silver federal bands applied prior to 2022 were reported as XX, and violet federal bands applied prior to 2023 were reported as VI.

§ Age in 2025: L = nestling, SY = 2 years, AHY = 2 years or older, A3Y = 3 years or older, 4Y = 4 years, A5Y = 5 years or older, 6Y = 6 years, 7Y = 7 years, and A7Y = 7 years or older

¶ Sex codes: F = female, M = male, and U = unknown

Territory or location code: Numbers indicate unique individual, pair, or nest locations; a number without an alpha prefix indicates a flycatcher pair; F = individual detected for less than 7 days; and T = territorial individual detected for at least 7 days.

** Observation status codes: N = new capture, R = recapture followed by date captured, and RS = resight

†† Dates shown aid in distinguishing floaters (F) from territorial residents (T). All pairs were residents; no dates of detection are shown for pairs.

‡‡ Includes Mesquite Parcel 1-A

§§ This individual moved from the Mormon Mesa subunit to the Mesquite subunit during the breeding season and is counted only once in the total number of birds detected.

¶¶ Two of three nestlings were confirmed to have fledged at territory 04. Only one fledgling was identified to individual; the identity of the second fledgling could not be determined.

Table 6. Summary of Flycatcher Nest Monitoring Results at All Study Areas, 2019–2025

Subunit[*]	Year	Pairs	Nests with 1+ WE[†]	Successful Nests[‡]	Failed Nests[‡]	Nests with Unknown Fate	Nests with 1+ WE[†] and Known Parasitism Status	Parasitized Nests[§]	Young Fledged
MESQ	2019	6	9	4 (44)	4 (44)	1 (11)	8	4 (50)	5
	2020[¶]	4	5	0	5 (100)	0	5	2 (40)	0
	2021	3	6	2 (33)	4 (67)	0	6	3 (50)	3
	2022	7	9	7 (78)	1 (11)	1 (11)	9	2 (22)	13
	2023	8	13	6 (46)	7 (54)	0	12	1 (8)	11
	2024	7	12	7 (58)	4 (33)	1 (8)	11	1 (9)	18
	2025	8	10	5 (50)	5 (50)	0	8	1 (13)	8
	Total	**43**	**64**	**31 (48)**	**30 (47)**	**3 (5)**	**59**	**14 (24)**	**58**
MOME	2019	0	0	0	0	0	0	0	0
	2020	2	1	1 (100)	0	0	1	0	1
	2021	0	0	0	0	0	0	0	0
	2022	0	0	0	0	0	0	0	0
	2023	1	1	0	1 (100)	0	1	1 (100)	0
	2024	1	1	0	1 (100)	0	1	0	0
	2025	2	0	0	0	0	0	0	0
	Total	**6**	**3**	**1 (33)**	**2 (67)**	**0**	**3**	**1 (33)**	**1**
All	2019	6	9	4 (44)	4 (44)	1 (11)	8	4 (50)	5
	2020	6	6	1 (17)	5 (83)	0	6	2 (33)	1
	2021	3	6	2 (33)	4 (67)	0	6	3 (50)	3
	2022	7	9	7 (78)	1 (11)	1 (11)	9	2 (22)	13
	2023	9	14	6 (46)	7 (54)	0	13	2 (15)	11
	2024	8	13	7 (54)	6 (38)	1 (8)	12	1 (8)	18
	2025	10	10	5 (50)	5 (50)	0	8	1 (13)	8
Overall total		**49**	**67**	**32 (48)**	**32 (48)**	**3 (4)**	**62**	**15 (24)**	**59**

[*] MESQ= Mesquite and MOME = Mormon Mesa

[†] WE = willow flycatcher egg

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

[§] Parasitized nests include all nests that contained at least one flycatcher egg and one cowbird egg regardless of nest fate. Percentages in parentheses include only nests with at least one flycatcher egg and for which parasitism status could be determined.

[¶] Data presented are for Mesquite Parcel 1-A only; no monitoring was conducted at Mesquite West West.

Table 7. Flycatcher Nest Productivity and Fecundity at Mesquite West, 2019–2025

Year	No. Young Fledged	No. Nests with Known Outcome	Productivity Mean (SE)*	No. Females with Known Outcome	Fecundity Mean (SE) †
2019	5‡	8	0.63 (0.26)	5¶	1.00 (0.71)
2020	0	5	0	4	0
2021	3	6	0.50 (0.34)	3	1.00 (0.58)
2022	13§	8	1.63 (0.26)	6¶	1.83 (0.54)
2023	11	13	0.85 (0.32)	8	1.38 (0.46)
2024	18‡	11	1.64 (0.49)	6¶	2.83 (1.01)
2025	8	10	0.80 (0.29)	8	1.00 (0.32)
Total	**58**	**61**	**0.86 (0.22)**	**40#**	**1.29 (0.33)**

* Productivity calculations (number of young fledged per nest) include nests that contained flycatcher eggs and had a known outcome. SE = standard error.

† Fecundity calculations (number of young fledged per female over the breeding season) include all females for which all nest outcomes were known. SE = standard error.

‡ One fledgling associated with a female for which the fate of her subsequent nesting attempt was unknown was not included in the fecundity calculation.

§ Two fledglings associated with a female for which the fate of her subsequent nesting attempt was unknown were not included in the fecundity calculation.

¶ One female that had one successful nest and one nest of unknown outcome was not included.

Two females that each had one successful nest and one nest of unknown outcome were not included.

Five nest failures were documented at Mesquite West. Depredation was the cause of failure at three nests (60%), one nest failed when the only nestling died (20%), and the cause of failure was unknown for one nest (20%). Nests that were found empty or destroyed 2 days or more before their anticipated fledge date were considered to have been depredated. Nests that were found empty less than 2 days before their anticipated fledge date were considered to have been depredated if there was other evidence that the nest had not fledged (i.e., material pulled up from the bottom of the nest or a female building a new nest with no defense of the previous nest location); otherwise, nest fate was unknown.

Eight of the 10 nests documented had a known parasitism status (see Table 6). One nest with unknown parasitism status was found during the nestling stage. The nest contents were not observed during incubation; therefore, parasitism status could not be determined. The other nest with unknown parasitism status failed between the time the female was observed building and the first check for nest contents, which occurred 11 days later. Only remnants of the nest remained in the nest tree, and nest contents could not be determined. One (13%) of eight nests with flycatcher eggs and known parasitism status was parasitized by cowbirds. Nest 01A in Mesquite West West contained one flycatcher egg and one cowbird egg when the nest was located. Two days later, the nest contained three flycatcher eggs and one cowbird egg. The cowbird egg was replaced with a fake egg, and the female flycatcher continued to incubate the nest. This nest was ultimately successful and produced one flycatcher fledgling.

3.2.1.1.2 Mormon Mesa

Biologists spent 16.8 observer-hours on territory and nest monitoring at Mormon Mesa Parcel 5-A; monitoring activities included determining residency status, observing resident flycatchers, banding one adult, and monitoring one flycatcher nest. Three adult flycatchers were documented at Mormon Mesa. The three adults composed two breeding pairs; one female consecutively paired with two different males.

One adult was newly banded in 2025. The identity of one banded adult was confirmed through resighting; this individual was later recaptured at Mesquite West. The band status of the remaining adult could not be confirmed.

One nesting attempt was documented just north of Mormon Mesa Parcel 5-A (see Figure B-4). This nest was abandoned before nest construction was complete.

3.2.1.2 YELLOW-BILLED CUCKOO

Cuckoo surveys across the Riparian Reserve Units resulted in one cuckoo detection at the Riverside subunit (Figure B-6) and one at the Muddy River subunit (Figure B-8). In addition, one incidental cuckoo detection was recorded at Mesquite West (Figure B-5) and another was recorded at Mormon Mesa just north of Parcel 5-A (Figure B-7). Only one detection was recorded at each subunit; therefore, no possible or probable breeding territories were detected (Halterman et al. 2016). No cuckoo detections were recorded at the Bunkerville East or Bunkerville West subunits.

3.2.2 Brown-Headed Cowbird Control

Cowbird netting was conducted at Mesquite West over a period of 13 weeks, beginning May 5 and ending July 28 (Table 8). Netting occurred on 19 mornings, with a total of 46 separate net set-ups totaling 39.0 net-hours. No individual netting attempt lasted more than 1.1 hours. One to four nets were set up each morning, beginning at first light and ending by 10:05 a.m. In total, 35 cowbirds were captured: 17 males and 18 females (0.9 adult per net-hour). No males were recaptured. Biologists used a small mammal guillotine to decapitate the 18 female cowbirds immediately following extraction from the net.

Of the 18 female cowbirds captured at Mesquite West, 9 (50%) were captured between May 5 and May 31 (see Table 8). These results are consistent with those observed at other flycatcher breeding sites in southern Nevada where cowbird netting was conducted in 2023 and 2024 (SWCA 2023b, 2024b). In Lincoln County, 57% and 75% of female cowbird captures at Key Pittman Wildlife Management Area were recorded between May 15 and May 31 during the 2023 and 2024 field seasons, respectively. At River Ranch, 67% of female cowbird captures occurred between May 15 and May 31 in 2024. In Clark County, 60% and 86% of female cowbird captures recorded at Warm Springs Natural Area were recorded between May 16 and May 31 in 2023 and 2024, respectively. At Overton Wildlife Management Area, 50% of female cowbird captures occurred between May 14 and May 31 in 2024. The first flycatcher nests of the season are typically initiated in late May; starting cowbird netting in early May allows for a substantial proportion of the total female cowbird captures to occur before most flycatcher nesting activity begins.

3.2.3 Point-Count Surveys

In total, 91 avian species were recorded across all the County's properties during point-count surveys, and MSHCP covered species were observed at each property. Two additional species were detected during federally listed bird surveys but were not detected during point counts; one was detected during species-specific surveys, and one was incidentally detected.

3.2.3.1 RIPARIAN RESERVE UNITS

3.2.3.1.1 MSHCP-Listed Species

Of the eight avian species covered by the MSHCP, seven were recorded during point-count surveys: Arizona Bell's vireo, blue grosbeak, American peregrine falcon, phainopepla, summer tanager, vermilion flycatcher, and flycatcher. Cuckoo was not detected during general avian point counts but was detected both incidentally and during species-specific surveys (Table 9).

Table 8. Number of Cowbirds Netted by Date at Mesquite West, 2025

Sex	May 05	May 09	May 11	May 16	May 18	May 21	May 28	May 31	June 03	June 04	June 13	June 15	June 16	June 23	July 01	July 07	July 13	July 20	July 28	Total
Male	1	0	2	3	0	0	1	0	0	0	0	0	0	2	3	0	3	1	1	17
Female	1	2	1	1	0	3	1	0	1	0	2	1	0	1	0	1	1	1	1	18
Total	**2**	**2**	**3**	**4**	**0**	**3**	**2**	**0**	**1**	**0**	**2**	**1**	**0**	**3**	**3**	**1**	**4**	**2**	**2**	**35**

Table 9. Number of Detections and Breeding Codes for MSHCP-Listed Avian Species Recorded at the Riparian Reserve Subunits, 2025

Common Name (*Scientific Name*)	Mesquite	Bunkerville East	Bunkerville West	Riverside	Mormon Mesa	Mormon Mesa South	Muddy River
American peregrine falcon (*Falco peregrinus anatum*)	–	–	–	–	–	–	X
Arizona Bell's vireo (*Vireo bellii arizonae*)	–	3 (PO)	–	4 (PO)	I	2 (PO)	4 (PO)
Blue grosbeak (*Passerina caerulea*)	–	3 (PO)	5 (PO)	3 (PO)	2 (PO)	–	2 (PO)
Crissal thrasher (*Toxostoma crissale*)	X	3 (PO)	2	1	1	1	2
Loggerhead shrike (*Lanius ludovicianus*)	–	–	I	–	3	–	I
Phainopepla (*Phainopepla nitens*)	–	–	2	2	–	–	7 (PO)
Southwestern willow flycatcher (*Empidonax traillii extimus*)	S*	I	–	1‡	1*	–	–
Summer tanager (*Piranga rubra*)	1	I	–	–	–	–	–
Vermilion flycatcher (*Pyrocephalus rubinus*)	–	–	1	–	–	–	–
Yellow-billed cuckoo (*Coccyzus americanus*)	I†	–	–	S	I§	–	S

Note: X = species recorded at that subunit during point counts but not within 100 m (328 feet) of a point-count location; PO = breeding possible—individual(s) singing in appropriate habitat at that subunit during the breeding season; I = species recorded incidentally during surveys or monitoring for federally listed birds but not during point-count surveys; S = species recorded during protocol-level presence/absence surveys. The lack of a breeding code does not indicate that the species was not breeding but only that no evidence of such was recorded. A dash indicates no detections of the species.

* Breeding was confirmed for this species during surveys or monitoring for federally listed birds but not during point-count surveys.

† This yellow-billed cuckoo was incidentally detected approximately 140 m west of Parcel 1-A (within the Mesquite West West boundary).

‡ This flycatcher was detected during point-count surveys; no flycatcher surveys were conducted at the Riverside subunit.

§ This yellow-billed cuckoo was incidentally detected during flycatcher monitoring approximately 60 m north of Parcel 5-A.

In addition to the eight covered bird species, the MSHCP also identifies seven evaluation bird species for which future viability is a concern and that may be considered for inclusion in subsequent amendments to the MSHCP. Crissal thrasher (*Toxostoma crissale*) was recorded at all subunits. Loggerhead shrike (*Lanius ludovicianus*) was detected during general avian point counts at the Mormon Mesa subunit and incidentally at the Bunkerville and Muddy River subunits (see Table 9). For each species, the number of recorded individuals is listed for each set of connected parcels. To standardize the data and account for species that may be detected at greater distances (e.g., crissal thrasher) than others, numbers reported in Table 9 only include birds detected within 100 m (328 feet) of a point-count location (GBBO 2003; Ralph et al. 1995).

SWCA documented multiple flycatcher nesting attempts at Mesquite West and one nesting attempt at Mormon Mesa Parcel 5-A. Arizona Bell's vireo, blue grosbeak, crissal thrasher, and phainopepla were suspected of breeding at various other Riparian Reserve Subunits (refer to breeding codes in Table 9; note that a species without a breeding code does not indicate that the species was not breeding in a particular subunit or set of parcels, but only that no evidence of such was recorded). Breeding could not be confirmed for any of the other MSHCP-listed species.

3.2.3.1.2 Non-MSHCP-Listed Species

During the three rounds of point-count surveys, biologists recorded 78 non-MSHCP-listed avian species across all the Riparian Reserve Units (Table 10). Of these 78 species, 71 were recorded within 100 m (328 feet) of a point-count location. To account for species that may be detected at greater distances than others, numbers reported in Table 10 only include birds detected within 100 m (328 feet) of a point-count location (GBBO 2003; Ralph et al. 1995). Two additional non-MSHCP-listed avian species were incidentally detected during species-specific surveys for federally listed birds.

Of the 78 non-MSHCP-listed species detected during point-count surveys, nine were recorded at each of the seven subunits: Abert's towhee (*Melozone aberti*), Bewick's wren (*Thryomanes bewickii*), cowbird, Gambel's quail (*Callipepla gambelii*), Lucy's warbler (*Leiothlypis luciae*), mourning dove (*Zenaida macroura*), red-winged blackbird (*Agelaius phoeniceus*), verdin (*Auriparus flaviceps*), and yellow-breasted chat (*Icteria virens*). Although some species (e.g., MacGillivray's warbler [*Geothlypis tolmiei*], western tanager [*Piranga ludoviciana*], and yellow-rumped warbler [*Setophaga coronata*]) were likely migrating through the area on their way to breeding grounds farther north or at higher elevations, most of the species recorded during point-count surveys are known to breed in the Mojave Desert. While breeding could not be confirmed for most of the species recorded at the Riparian Reserve Units, it is assumed that many may have bred or attempted to breed in the Riparian Reserve Units.

Breeding was confirmed for cowbird, Lucy's warbler, red-winged blackbird, verdin, and western kingbird (*Tyrannus verticalis*), for which biologists observed a fledgling, an adult carrying food, or eggs in a nest. Thirty-three additional species were recorded singing or performing territorial displays, indicating that breeding for those species was possible within the Riparian Reserve Units (though some species may also exhibit either of these behaviors during migration).

Species richness varied between the seven subunits; the Bunkerville West subunit showed the highest avian species richness, with 51 species recorded during point-count surveys, while the Mormon Mesa South subunit yielded the lowest species richness, with 22 species recorded. The three species with the highest number of detections within 100 m (328 feet) of a point-count location across all the Riparian Reserve Units were Abert's towhee, Lucy's warbler, and northern rough-winged swallow (*Stelgidopteryx serripennis*).

Table 10. Number of Detections and Breeding Codes for Non-MSHCP-Listed Avian Species Recorded at the Riparian Reserve Subunits, 2025

Common Name	Scientific Name	Clark County Riparian Reserve Subunits (number of point-count locations)						
		Mesquite (1)	Bunkerville East (8)	Bunkerville West (6)	Riverside (5)	Mormon Mesa (3)	Mormon Mesa South (2)	Muddy River (6)
Abert's towhee	*Melozone aberti*	10	24	16 (PO)	9 (PO)	13	6	45 (PO)
American avocet	*Recurvirostra americana*	–	I	–	–	–	–	–
American kestrel	*Falco sparverius*	–	1	–	–	–	–	–
Anna's hummingbird	*Calypte anna*	3 (PO)	1 (PO)	3 (PO)	–	–	–	1 (PO)
Ash-throated flycatcher	*Myiarchus cinerascens*	–	1	–	4	2	4 (PO)	5 (PO)
Bank swallow	*Riparia riparia*	–	–	1	–	–	–	–
Barn swallow	*Hirundo rustica*	–	–	9	–	–	–	–
Bewick’s wren	*Thryomanes bewickii*	7 (PO)	4 (PO)	4 (PO)	3 (PO)	3 (PO)	2 (PO)	7 (PO)
Black-chinned hummingbird	*Archilochus alexandri*	3	1 (PO)	–	–	–	–	–
Black-headed grosbeak	*Pheucticus melanocephalus*	1	–	1 (PO)	1	1	–	–
Black-tailed gnatcatcher	*Polioptila melanura*	–	2	3	1	3	1	–
Black-throated gray warbler	*Setophaga nigrescens*	–	–	–	1	–	1	–
Black-throated sparrow	*Amphispiza bilineata*	–	–	–	3 (PO)	–	–	X
Black phoebe	*Sayornis nigricans*	–	–	1 (PO)	–	–	–	3 (PO)
Blue-gray gnatcatcher	*Polioptila caerulea*	–	–	–	–	–	–	1
Brewer’s sparrow	*Spizella breweri*	–	7 (PO)	4 (PO)	5 (PO)	–	–	–
Brown-crested flycatcher	*Myiarchus tyrannulus*	–	–	–	–	2 (PO)	–	–
Brown-headed cowbird	*Molothrus ater*	1 (CO)*	3	28 (PO)	8 (PO)	2	1	11
Bullock’s oriole	*Icterus bullockii*	–	1	3 (PO)	7 (PO)	1	–	6 (PO)
Canada goose	*Branta canadensis*	X	X	X	X	X	–	–
Canyon wren	*Catherpes mexicanus*	–	–	–	–	–	–	X
Cassin’s vireo	*Vireo cassinii*	–	–	–	–	–	–	1
Chipping sparrow	*Spizella passerina*	1	–	–	–	–	–	–

Common Name	Scientific Name	Clark County Riparian Reserve Subunits (number of point-count locations)						
		Mesquite (1)	Bunkerville East (8)	Bunkerville West (6)	Riverside (5)	Mormon Mesa (3)	Mormon Mesa South (2)	Muddy River (6)
Cliff swallow	*Petrochelidon pyrrhonota*	–	3	9	17	–	–	2
Common raven	*Corvus corax*	–	–	X	X	X	–	1
Common yellowthroat	*Geothlypis trichas*	8 (PO)	–	26 (PO)	–	8 (PO)	5 (PO)	–
Double-crested cormorant	*Nannopterum auritum*	–	X	–	–	–	–	–
Eurasian collared-dove	*Streptopelia decaocto*	1 (PO)	1	X	2 (PO)	1 (PO)	–	19 (PO)
Gambel's quail	*Callipepla gambelii*	4	22 (PO)	17 (PO)	6 (PO)	3 (PO)	1	24 (PO)
Gray flycatcher	*Empidonax wrightii*	–	–	2	–	–	1	2
Great blue heron	*Ardea herodias*	X	X	X	–	–	–	–
Great horned owl	*Bubo virginianus*	–	–	–	–	–	–	1
Greater roadrunner	*Geococcyx californianus*	–	2	X	2	–	–	–
Great-tailed grackle	*Quiscalus mexicanus*	9	3 (PO)	9 (PO)	–	1	–	1
Green heron	*Butorides virescens*	–	1	–	–	–	–	–
Hermit thrush	*Catharus guttatus*	–	1	–	–	–	–	–
Hooded oriole	*Icterus cucullatus*	–	–	–	–	–	–	1
House finch	*Haemorhous mexicanus*	–	3	11 (PO)	4 (PO)	1 (PO)	1	12
House sparrow	*Passer domesticus*	–	–	5	–	–	–	29 (PO)
Killdeer	*Charadrius vociferus*	–	8	7	1	–	–	–
Ladder-backed woodpecker	*Dryobates scalaris*	–	2	–	1	2	2	4
Lark sparrow	*Chondestes grammacus*	–	1	–	–	–	–	–
Lazuli bunting	*Passerina amoena*	2 (PO)	2 (PO)	3	4 (PO)	–	1	7
Lesser goldfinch	*Spinus psaltria*	2	2	2	–	1	–	–
Lesser nighthawk	*Chordeiles acutipennis*	–	1	–	–	5 (PO)	–	1 (PO)
Lesser yellowlegs	*Tringa flavipes*	–	–	X	–	–	–	–
Lucy's warbler	*Leiothlypis luciae*	19 (CO)	19 (PO)	21 (PO)	19 (PO)	7 (PO)	4 (PO)	18 (PO)
MacGillivray’s warbler	*Geothlypis tolmiei*	–	–	–	1	–	–	–

Common Name	Scientific Name	Clark County Riparian Reserve Subunits (number of point-count locations)						
		Mesquite (1)	Bunkerville East (8)	Bunkerville West (6)	Riverside (5)	Mormon Mesa (3)	Mormon Mesa South (2)	Muddy River (6)
Mallard	*Anas platyrhynchos*	2	–	–	X	–	–	2
Marsh wren	*Cistothorus palustris*	–	–	1	–	–	–	–
Mourning dove	*Zenaida macroura*	11 (PO)	5 (PO)	25 (PO)	11 (PO)	7 (PO)	4 (PO)	16 (PO)
Northern mockingbird	*Mimus polyglottos*	–	7 (PO)	4	1 (PO)	X	1 (PO)	8 (PO)
Northern rough-winged swallow	*Stelgidopteryx serripennis*	2	12	56	7	10	–	4
Prairie falcon	*Falco mexicanus*	–	X	–	–	–	–	–
Red-tailed hawk	*Buteo jamaicensis*	X	–	X	–	–	–	–
Red-winged blackbird	*Agelaius phoeniceus*	5 (PO)	9 (CO)	57 (PO)	1	3 (PO)	9 (PO)	2 (PO)
Rock pigeon	*Columba livia*	–	–	X	–	–	–	–
Rock wren	*Salpinctes obsoletus*	–	–	–	–	–	–	1 (PO)
Savannah sparrow	*Passerculus sandwichensis*	–	–	1	–	–	–	–
Say's phoebe	*Sayornis saya*	–	3 (PO)	–	5	–	–	2 (PO)
Song sparrow	*Melospiza melodia*	11 (PO)	1 (PO)	3 (PO)	5 (PO)	–	1	1 (PO)
Spotted sandpiper	*Actitis macularius*	–	1	–	–	–	–	–
Townsend's warbler	*Setophaga townsendi*	–	–	–	–	–	–	2
Tree swallow	*Tachycineta bicolor*	–	6	7	–	–	–	–
Turkey vulture	*Cathartes aura*	1	1	X	X	X	–	X
Vaux's swift	*Chaetura vauxi*	–	–	–	–	–	–	X
Verdin	*Auriparus flaviceps*	4	15 (PO)	24 (CO)	8 (PO)	7 (CO)	12 (PO)	19 (PO)
Violet-green swallow	*Tachycineta thalassina*	–	–	2	3	–	–	1
Virginia rail	*Rallus limicola*	–	–	2 (PO)	–	–	–	–
Warbling vireo	*Vireo gilvus*	–	–	–	–	–	–	1
Western kingbird	*Tyrannus verticalis*	–	3 (PO)	7 (PO)	1	–	1 (PO)	10 (CO)
Western tanager	*Piranga ludoviciana*	–	–	–	–	–	–	1
Western wood-pewee	*Contopus sordidulus*	–	2	–	3	–	–	5

Common Name	Scientific Name	Clark County Riparian Reserve Subunits (number of point-count locations)						
		Mesquite (1)	Bunkerville East (8)	Bunkerville West (6)	Riverside (5)	Mormon Mesa (3)	Mormon Mesa South (2)	Muddy River (6)
White-crowned sparrow	*Zonotrichia leucophrys*	1	1	–	–	–	–	–
White-winged dove	*Zenaida asiatica*	–	–	–	X	–	–	5 (PO)
Wilson's warbler	*Cardellina pusilla*	1	1	1	3	–	–	–
Yellow warbler	*Setophaga petechia*	10 (PO)	4 (PO)	7 (PO)	12 (PO)	2 (PO)	–	4 (PO)
Yellow-breasted chat	*Icteria virens*	16 (PO)	1	10 (PO)	5 (PO)	11 (PO)	6 (PO)	3 (PO)
Yellow-rumped warbler	*Setophaga coronata*	–	–	2	–	1	–	–

Note: X = species recorded at that subunit during point counts but never within 100 m (328 feet) of a point-count location; CO = Breeding confirmed—adult observed carrying food observed; PO = breeding possible—individual(s) singing in appropriate habitat at that subunit during the breeding season; I = species recorded incidentally during surveys or monitoring for federally listed birds but not during point-count surveys. The lack of a breeding code does not indicate that the species was not breeding but only that no evidence of such was recorded. A dash indicates no detections of the species.

* Breeding was confirmed for this species during surveys or monitoring for federally listed birds but not during point-count surveys.

3.2.3.2 BOULDER CITY CONSERVATION EASEMENT

3.2.3.2.1 MSHCP-Listed Species

None of the eight MSHCP covered bird species were recorded during point-count surveys in the BCCE. Two evaluation bird species were recorded: loggerhead shrike and LeConte's thrasher (*Toxostoma lecontei*). Loggerhead shrike was detected from six point-count locations, and LeConte's thrasher was detected from two point-count locations (Table 11). While breeding could not be confirmed for either species in 2025, LeConte's thrasher nests have been documented in the BCCE during previous survey years (SWCA 2020).

Table 11. Number of Detections and Breeding Codes for MSHCP Evaluation Species Recorded at the BCCE During Point-Count Surveys, 2025

Common Name	Scientific Name	Total Detections	Detections Within 100 m	Breeding Codes
Loggerhead shrike	*Lanius ludovicianus*	6	6	–
LeConte's thrasher	*Toxostoma lecontei*	2	0	–

Note: A dash indicates no indication of breeding status for the species.

3.2.3.2.2 Non-MSHCP-Listed Species

SWCA biologists recorded 23 avian species not listed under the MSHCP across the BCCE point-count locations over all three rounds of point-count surveys (Table 12). These data are presented as total detections and detections within 100 m (328 feet) of the observer to account for species with different detection probabilities and reduce bias towards species that are more conspicuous at greater distances (e.g., common raven) (GBBO 2003; Ralph et al. 1995). Of the 23 species recorded during point-count surveys, 17 were recorded within 100 m (328 feet) of a point-count location. The two species with the highest number of detections within 100 m (328 feet) of a point-count location were black-throated sparrow (*Amphispiza bilineata*) and horned lark (*Eremophila alpestris*) (see Table 12).

Although some of the species detected at the BCCE were likely migrating through the area on their way to breeding grounds farther north or at higher elevations (e.g., Vaux's swift [*Chaetura vauxi*] and violet-green swallow [*Tachycineta thalassina*]), most of these species are known to breed in the Mojave Desert and may have bred or attempted to breed within the BCCE boundary.

Table 12. Number of Detections and Breeding Codes for Non-MSHCP-Listed Species Recorded at the BCCE During Point-Count Surveys, 2025

Common Name	Scientific Name	Total Detections	Detections Within 100 m	Breeding Codes
American kestrel	*Falco sparverius*	2	1	–
Ash-throated flycatcher	*Myiarchus cinerascens*	3	1	PO
Black-tailed gnatcatcher	*Polioptila melanura*	2	2	–
Black-throated sparrow	*Amphispiza bilineata*	68	57	PO
Blue-gray gnatcatcher	*Polioptila caerulea*	2	2	–
Brewer's sparrow	*Spizella breweri*	1	1	–
Cactus wren	*Campylorhynchus brunneicapillus*	2	2	–

Common Name	Scientific Name	Total Detections	Detections Within 100 m	Breeding Codes
Common raven	*Corvus corax*	45	0	–
Gambel's quail	*Callipepla gambelii*	1	0	PO
Horned lark	*Eremophila alpestris*	55	51	PO
House finch	*Haemorhous mexicanus*	8	2	PO
Ladder-backed woodpecker	*Dryobates scalaris*	1	1	–
Lesser nighthawk	*Chordeiles pusillus*	1	0	PO
Mourning dove	*Zenaida macroura*	1	0	PO
Northern mockingbird	*Mimus polyglottos*	1	1	–
Rock wren	*Salpinctes obsoletus*	2	1	PO
Say's phoebe	*Sayornis saya*	1	0	–
Spotted towhee	*Pipilo maculatus*	1	1	–
Vaux's swift	*Chaetura vauxi*	1	0	–
Verdin	*Auriparus flaviceps*	1	1	–
Violet-green swallow	*Tachycineta thalassina*	1	1	–
Western kingbird	*Tyrannus verticalis*	7	0	–
Western tanager	*Piranga ludoviciana*	1	1	–

Note: PO = breeding possible—individual(s) singing in appropriate habitat during the breeding season. A dash indicates no indication of breeding for the species.

Eight species were recorded singing at the BCCE, which indicates that breeding for those species was possible (though some species sing during migration) (see Table 12). Species lacking a breeding code in Table 12 may have bred within the BCCE; however, no evidence of breeding was recorded.

3.2.4 On-Call Services

M. Magdos completed a fence survey under WAF 001 at the Bunkerville East and Bunkerville West subunits on February 14. The type of fence (e.g., barbed wire, smooth wire, or cyclone) was recorded for each section of fence line, and gates and fence line sections were distinguished as good, fair, or poor condition. A total of 6,237 m of fence line was surveyed across both subunits. Of the 6,237 m of fence line recorded, 3,780 m (61%), 1,803 m (29%), and 654 m (10%) were designated as good, fair, and poor condition, respectively. Seventeen gates were recorded across both subunits. Of the 17 gates surveyed, 11 (64%), five (30%), and one (6%) were considered to be in good, fair, and poor condition, respectively. Cattle tracks were observed in Parcels 2-J and 2-M during the fence survey; no cattle were observed.

Justin Streit completed a nesting bird survey under WAF 002 at Bunkerville West Parcels 2-J and 2-M prior to cattail flattening in preparation for native vegetation planting at those parcels. Five nests were located during the survey. Three of the nests were determined to be inactive and were dismantled. The remaining two nests were verdin nests. Because verdin build an enclosed ball nest with a single entrance, an observer cannot see inside to determine nest activity. Each verdin nest was monitored for 30 minutes, and no activity was recorded at either nest. One nest was in a screwbean mesquite outside the proposed disturbance area; this nest was left in place. The other nest was in a tamarisk at the southern edge of the proposed disturbance area. A buffer, marked with blue flagging, was established around the nest tree, and the nest was left in place. Though neither nest was suspected to be active, the nests were left in place out of an abundance of caution to comply with Migratory Bird Treaty Act, which prohibits take of migratory bird species or their nests without permission from the USFWS.

M. Magdos completed two nesting bird surveys under WAF 003 on April 1. One survey was conducted at Bunkerville West Parcels 2-J and 2-M prior to tamarisk treatment activities. Two verdin nests that were discovered during the previous survey (covered under WAF 002) were monitored for 38 and 26 minutes, respectively. No activity was observed at either nest. No additional nests were located at the Bunkerville West subunit. The other survey was conducted at Muddy River Parcels A and B prior to California fan palm treatment activities. No nests were located, and no nesting behavior was observed near the trees scheduled for treatment.

4 EVALUATION/DISCUSSION OF RESULTS

This project builds on a baseline avian dataset for the County's MSHCP properties. Point-count surveys across the Riparian Reserve Units resulted in a total of 87 avian species detected, including nine MSHCP covered and evaluation species; one additional MSHCP covered species was detected both incidentally and during protocol-level surveys for federally listed species. Point counts across the BCCE yielded 25 total avian species, including two MSHCP evaluation species. Goals identified in both the Riparian Reserve Unit Management Plan (Clark County 2015) and the BCCE Management Plan (Clark County 2023) include managing these properties to protect MSHCP covered species. Baseline vegetation community and structure data for the MSHCP properties are necessary to inform habitat management interventions for managing avian species at these properties. This section includes a closer analysis of avian species presence and distribution for each set of connected parcels within the Riparian Reserve Units and at the BCCE, as well as a qualitative assessment of existing vegetation conditions therein.

4.1 Mesquite

4.1.1 Parcel 1-A

Portions of the eastern Mesquite Parcel 1-A boundary adjacent to Coyote Willows Golf Course consisted of standing, dead narrowleaf willows; these areas were removed from flycatcher and cuckoo surveys in 2024. An additional area of standing dead narrowleaf willows was observed in the southeastern quarter of the site where lack of water was first noted in 2023. Much of the vegetation at Mesquite Parcel 1-A was healthy and consisted of narrowleaf willows 4 to 7 m (13–23 feet) tall (Figure A-1); the remainder of the vegetation consisted primarily of tamarisk 4 to 6 m (13–20 feet) tall and patches of narrowleaf willows approximately 3 to 4 m (10–13 feet) tall. Some willows in the middle of the site began to show signs of water stress in July; yellow leaves fell off the trees if the trunk was jostled. Canopy closure was generally greater than 65%. A large patch of common reed was present along the northern boundary of the site. Vegetation along the southern edge of the site was dominated by tamarisk with an understory of mule-fat (*Baccharis salicifolia*). Canopy closure remained high in areas with healthy willows and tamarisk, and the temperature was noticeably cooler than in the surrounding area. The northwestern portion of this parcel contained the best habitat for flycatcher within the County's Riparian Reserve Units.

Throughout the breeding season, water from Pulsipher Wash ran generally from north to south throughout the northwestern quarter of Parcel 1-A; the wash can be seen entering Parcel 1-A from the north in Figure 3. In 2025, water was diverted from the eastern channel approximately 100 m (328 feet) north of the Parcel 1-A boundary. Water flowed through the northwest quarter of the site but generally did not extend to the southern and eastern portions of the site. Flows from Pulsipher Wash were intermittent, and soils in the northwestern quarter of the site remained damp to saturated on days when no flow entered the site from Pulsipher Wash. In portions of Parcel 1-A that receive regular water flow, canopy closure generally ranged from 75% to 90%. In the southern and eastern portions of Parcel 1-A, soils were generally dry to damp, and canopy closure was lower (65% to 80%) in some areas.

Hydrologic conditions within Parcel 1-A vary widely from year to year. Water conditions in 2025 were similar to those observed during May through July 2023; it appeared that water did not reach as far south when it entered through the western channel in 2023 and 2025 as it did when it entered through the eastern channel or both channels, as in 2024.

In recent years, habitat quality within Parcel 1-A has been assessed by the number of resident adult flycatchers within or adjacent to the parcel boundary (SWCA 2020, 2021, 2022, 2023a, 2024a). In 2019 and 2020, SWCA monitored only territories within or adjacent to the Parcel 1-A boundary. In 2021, under a County contract, SWCA began monitoring all of Mesquite West, a historic breeding site that has been monitored annually by the San Bernardino County Museum, SWCA (under various contracts) and NDOW biologists since 1996 (McKernan 1997; McLeod and Pellegrini 2013, 2014; NDOW, unpublished data). A shift in territory locations was observed from 2022 through 2025: as the number of individuals within or adjacent to Parcel 1-A decreased from nine to four, the number of individuals up to 150 m (492 feet) west of the Parcel 1-A boundary increased from two to nine (SWCA 2022, 2023a, 2024a). From 2003 through 2012, Mesquite West had anywhere from six to 30 resident adult flycatchers each year (McLeod and Pellegrini 2013). Though territory locations shifted from 2022 through 2025, the overall number of flycatchers observed (16 to 21 each year) was within the range of flycatchers observed from 2003 through 2012 (six to 30 each year) (McLeod and Pellegrini 2013; SWCA 2022, 2023a, 2024a).

While the shift in flycatcher territory locations from Mesquite Parcel 1-A to areas farther west in Mesquite West may indicate that habitat quality within Mesquite Parcel 1-A has decreased from 2022 through 2025, it may also be an indication that good quality habitat in other portions of Mesquite West has increased in those years. Before 2009, a large portion of northeastern Mesquite West contained several wet cattail marshes (McLeod and Pellegrini 2013). Hydrologic conditions in 2009 became more variable than in previous years as less frequent irrigation return flows inundated a smaller portion of the site. Hydrologic conditions remained variable in subsequent years, and as the cattail marshes began to dry, narrowleaf willows filled in these areas (McLeod et al. 2019). In 2025, 12 of the 17 resident flycatchers occupied territories in the areas where narrowleaf willows have filled in former cattail marshes (Figure 15; see Figure B-1).



Figure 15. Aerial image depicting locations of several dry cattail marshes at Mesquite West in 2010 (Google Earth).

In addition to flycatcher, two other MSHCP covered species were detected at Parcel 1-A: summer tanager and cuckoo. Summer tanager was detected at one point-count location, and cuckoo was incidentally detected west of the Parcel 1-A boundary during flycatcher monitoring activities.

Yellow warbler, a Mojave riparian indicator species (GBBO 2010) though not an MSHCP covered species, was the species with the highest number of individuals recorded during point-count surveys within Mesquite Parcel 1-A in 2024, signifying that Parcel 1-A provided high-quality riparian woodland habitat. The point-count location surveyed in 2024 is within the northwest quarter of the site; this area receives irrigation return flows from Pulsipher Wash. In 2025, yellow warbler had the fifth highest number of individuals recorded in Parcel 1-A during point-count surveys; the four species with higher numbers of individuals detected were Lucy's warbler, yellow-breasted chat, mourning dove, and song sparrow. Odd-year point-count locations are positioned toward the southern boundary of the site; soils in these areas were dry throughout the season. The difference in species composition may, in part, be attributed to desertscrub habitat in the floodplain south of the parcel.

4.1.2 Mesquite West West

Most of the vegetation at Mesquite West West consisted of dense narrowleaf willows 4 to 7 m (13–23 feet) tall with interspersed tamarisk trees (Figure A-2). Some tamarisk-dominated areas were present along the northern boundary of the site (Figure A-3). A few 10-m-tall (33-foot-tall) Goodding's willows and Fremont cottonwoods (*Populus fremontii*) were scattered throughout the site. Several cattail and bulrush (*Schoenoplectus californicus*) marshes were also scattered throughout the site. Several small areas of dead narrowleaf willows and/or tamarisk were present in the eastern and central portions of the site. Vegetation along the southern edge of the site was dominated by tamarisk with an understory of mule-fat and occasional patches of common reed (*Phragmites australis*). A few emergent Russian olive

(*Elaeagnus angustifolia*), screwbean mesquite, and velvet ash (*Fraxinus velutina*) trees were scattered throughout this portion of the site. Canopy closure varied from 40% in the areas of dead narrowleaf willows to greater than 85% in areas of healthy willows. Hydrology at the site was influenced by fluctuating, irregular, irrigation return flows. Soils along an east-west-trending channel in the southwestern portion of the site were often damp with scattered puddles. Occasionally, the channel was inundated with up to 10 cm (4 inches) of water. A large beaver pond at the west end of the site contained up to 1 m (3 feet) of water throughout the season. Water levels outside the beaver pond varied throughout the season, and portions of the site retained damp soils into August. Tamarisk were green through early July but were turning brown by late July (Figure A-4; see Figure A-3).

4.2 Bunkerville East

Bunkerville East Parcels 2-A through 2-E are mostly within the active floodplain of the Virgin River, which experiences frequent high-flow events. These parcels therefore consisted largely of sandy bare ground dotted with small-diameter arrowweed (*Pluchea sericea*), tamarisk, and mule-fat (Figure A-5). Bunkerville East Parcels 2-F and 2-G are dominated by anthropogenically disturbed lands and include large areas that have been completely cleared of native vegetation. The areas of Parcels 2-F and 2-G that have not been disturbed by anthropogenic activities were generally dominated by 1- to 3-m-tall (3- to 10-foot-tall) mule-fat, tamarisk, screwbean mesquite, and intermittent arrowweed (Figure A-6). Any regrowth in this area was generally patchy tamarisk, arrowweed, and big saltbush (*Atriplex lentiformis*), 2 to 4 m (7–13 feet) tall, with little to no continuous canopy. A section of the southern portion of Bunkerville East Parcel 2-F was used for grazing horses (*Equus ferus caballus*). An approximately 110 × 110–m (361 × 361–foot) area in the southeastern portion of Parcel 2-F consisted of honey mesquite (*Prosopis glandulosa*) and screwbean mesquite (Figure A-7).

Parcels 2-A through 2-G lacked the multistoried canopy that is generally used by cuckoo, and although the minimum canopy height for breeding flycatcher is considered to be 3 m (10 feet) (Sogge et al. 2010), occupied flycatcher sites along the Virgin River in 2003 through 2011 had median canopy heights of 5 to 6 m (16–20 feet) (McLeod and Pellegrini 2013). There was generally very little continuous canopy at this height within Parcels 2-A through 2-G. Median canopy closure of occupied flycatcher sites along the Virgin River from 2003 to 2011 was > 90% (McLeod and Pellegrini 2013). Portions of the site exhibited canopy closure that reached 80% to 85%, but most of the site was much more open.

One small patch surveyed for flycatcher and cuckoo consisted of narrowleaf willows and tamarisk 2 to 4 m (7–13 feet) tall with emergent screwbean mesquite 6 m (20 feet) tall. Canopy closure was up to 75% (Figure A-8). This small patch was adjacent to the Virgin River and exhibited damp to saturated soils. Three other patches were surveyed for flycatcher and cuckoo: two patches consisted of 3- to 4-m-tall (10- to 13-foot-tall) narrowleaf willows with emergent Goodding's willows and mesquite with 75% canopy closure (Figure A-9), and one patch consisted of 3- to 5-m-tall (10- to 16-foot-tall) tamarisk with up to 50% canopy closure. The willow-dominated patches were adjacent to the Virgin River, while the tamarisk patch was approximately 120 m (394 feet) from the river with no other surface water present. In the willow patches, cattle browsing of willow saplings was noted on the north side of the survey areas, adjacent to the Virgin River (Figure A-10). In the tamarisk patch, most of the trees were yellow or completely defoliated in late May, resulting in decreased canopy closure as compared to previous years. Continued defoliation was noted in some tamarisk through July, while other tamarisk trees were refoliating by late June.

Parcels 2-A through 2-G contained very little vegetation that resembled typical flycatcher or cuckoo breeding habitat. In 2021, however, a cuckoo was recorded immediately south of Parcel 2-B in a patch of young narrowleaf willows; this area was not considered suitable cuckoo breeding habitat due to very small patch size. In 2024, a willow flycatcher was detected in the same area of young narrowleaf willows

south of Parcel 2-B where a cuckoo was detected in 2022. In 2025, one lone male flycatcher occupied a territory in this same patch of narrowleaf willows south of Parcel 2-B. One additional individual was detected in the same area as the territorial flycatcher on June 30. This individual was not detected during subsequent visits.

Two MSHCP covered species were recorded during point-count surveys at Bunkerville East Parcels 2-A through 2-G: Arizona Bell's vireo and blue grosbeak. Arizona Bell's vireo and blue grosbeak were each detected from two point-count locations. While blue grosbeak is considered a desert riparian obligate, the species is known to tolerate more open, scrubby habitat than can some of the other MSHCP riparian species (CCDCP and USFWS 2000). Two additional MSHCP covered species were detected: flycatcher was incidentally detected south of the site and summer tanager was incidentally detected during flycatcher monitoring activities. One evaluation species, crissal thrasher, was detected from two point-count locations. This species prefers dense, scrubby vegetation often near water but is not a riparian obligate.

4.3 Bunkerville West

4.3.1 Parcels 2-I and 2-J

SWCA biologists have observed regular flooding adjacent to the Virgin River at Bunkerville West Parcels 2-I and 2-J, and some of the most abundant plants within these two parcels were small-diameter arrowweed and tamarisk less than 3 m (10 feet) tall (Figure A-11). Additionally, much of the area was relatively unvegetated in comparison to other riparian habitat in the desert Southwest. This is likely due, at least in part, to regular flood events, including flood events in the spring of 2019 and winter of 2022 to 2023.

Bunkerville West Parcels 2-I and 2-J hosted very few large native riparian trees, such as those used by flycatcher and cuckoo. Most of the mature riparian vegetation within these parcels consisted of tamarisk and screwbean mesquite 2 to 6 m (7–20 feet) tall without continuous canopy closure or nearby surface water. In 2023, much of the tamarisk appeared to be dead or dying due to defoliation by tamarisk leaf beetles (*Diorhabda* spp.) or herbicidal treatment by the National Park Service (Deuser 2019, 2023). While tamarisk can provide habitat for desert riparian bird species, much of the tamarisk at Bunkerville West Parcels 2-I and 2-J does not, due largely to its poor health at these two parcels. Tamarisk observed to be yellowing in late June 2025 were turning brown by mid-July (Figures A-12 and A-13).

Parcels 2-I and 2-J had flowing channels, a pond, and a wet meadow/wetland with emergent vegetation, all of which could support native riparian habitat in the future. The pond, which is in the southwestern portion of Parcel 2-J, was inundated throughout the season. The wet meadow is in the east half of Parcel 2-J and was vegetated largely by sedges (Cyperaceae family) and wetland grasses, with scattered Goodding's willows (Figure A-14). The wet meadow is unique within the County's reserve system and could be an area to target for riparian restoration. Efforts to exclude cattle from this area seem to have been successful in 2025; some cattle sign was observed in early June, but no cattle or sign was observed thereafter. The wet meadow was inundated throughout the season, with sedges in the meadow appearing green and lush (see Figure A-14).

One small area surveyed for flycatcher and cuckoo consisted of tamarisk up to 5 m (16 feet) in height with 80% canopy closure (see Figure A-12). A stream bed that had contained flowing water through the survey area in previous years was dry. This area was affected by tamarisk leaf beetles during the breeding season, with most tamarisk turning brown by mid-July (see Figure A-13).

No willow flycatchers or cuckoos were detected at Parcel 2-I or 2-J.

Two MSHCP covered bird species were recorded during point-count surveys at Bunkerville West Parcels 2-I and 2-J: blue grosbeak and vermilion flycatcher. Blue grosbeak was detected from three of the five point-count locations surveyed in 2025, while vermilion flycatcher was detected from one point-count location. One MSHCP evaluation bird species, crissal thrasher, was recorded from two of the five point-count locations.

4.3.2 Parcels 2-K Through 2-M

Bunkerville West Parcels 2-K, 2-L, and 2-M are immediately north of Bunkerville West Parcel 2-J (see Figure 4). Parcels 2-L and 2-M were characterized by isolated or narrow, or both, patches of riparian vegetation containing tamarisk, narrowleaf willows, and Goodding's willows. Patches of riparian vegetation were adjacent to areas that, in previous years, consisted of wet meadows, marshes, and open water features; these areas were damp to dry in 2025.

Three areas were surveyed for flycatcher and cuckoo. One survey area consisted of 8- to 12-m-tall (26- to 39-foot-tall) Goodding's willows with a 4- to 6-m-tall (13- to 20-foot-tall) narrowleaf willow and tamarisk understory. In 2023, results from a thermal refugia study conducted across all Riparian Reserve Units under County Project No. 2023-SWCA-2325B showed that this survey area exhibited daily maximum temperature and mean relative humidity more closely resembling flycatcher breeding habitat than any other area surveyed across the Riparian Reserve Units (SWCA 2023a). In previous seasons, this survey area intermittently contained standing water, which depended on flow in an adjacent irrigation channel, and canopy closure was 75% to 90% (Figure A-15). The water delivery system that serves the adjacent agricultural fields was altered between the 2024 and 2025 survey seasons. Before 2025, water was delivered to the agricultural fields surrounding the site via an open irrigation channel on the south border of the site, which overflowed and inundated this survey area. Between the 2024 and 2025 breeding seasons, the irrigation system to the fields surrounding the survey area was upgraded and an underground pipe was installed. No water flowed through the irrigation channel adjacent to the south end of the site, and no water flowed through the survey area in 2025. Soils in this survey area were dry and cracked, and the Goodding's and narrowleaf willow leaves were yellow and sparse; canopy closure was reduced to 35% to 45% (Figure A-16). The other two survey areas were adjacent to a pond in the southwest corner of the site. In 2024, the pond was drier than in recent years, with water levels being both lower at the start of the season and declining during the survey season. In 2025, no saturated soils or standing water were observed throughout the season. A survey area on the north side of the pond consisted of 3- to 5-m-tall (10- to 16-foot-tall) narrowleaf willows with 45% to 55% canopy closure. Foliage appeared sparse and small, and some narrowleaf willows were dead (Figure A-17). Some sapling narrowleaf willows were present along the south edge of the survey area; many of these saplings showed signs of cattle browsing (Figure A-18). The third survey area, on the south side of the pond, consisted of 3- to 5-m-tall (10- to 16-foot-tall) tamarisk and screwbean mesquite with 2-m-tall (7-foot-tall) arrowweed scattered throughout the patch. Canopy closure in small portions of this survey area approached 70% in May. In late June, most of the tamarisk was brown and/or defoliating, and canopy closure had declined.

Most mature vegetation at Parcels 2-K through 2-M outside surveyed areas consisted of tamarisk and screwbean mesquite 2 to 5 m (7–16 feet) tall with no continuous canopy closure or nearby surface water. Other vegetation in Parcels 2-K through 2-M consisted primarily of riparian scrub dominated by arrowweed, and soils in these areas were generally dry (Figure A-19). Bunkerville West Parcel 2-L does not currently provide breeding habitat for flycatcher or cuckoo.

In spring 2025, native vegetation, including screwbean mesquite, honey mesquite, cottonwood, ash (*Fraxinus* sp.), Goodding's willow, and narrowleaf willow, were planted at the Bunkerville West subunit (Goodwin 2025). Surveyors observed many of these plantings in Parcel 2-M. Some plantings appeared

dead, presumably due to the lack of water observed in 2025. Mesquite and cottonwood, which are better acclimated to drier conditions, appeared healthy.

No willow flycatchers or cuckoos were detected during surveys at these parcels.

Two MSHCP covered species were recorded at Bunkerville West Parcels 2-K through 2-M: blue grosbeak and phainopepla. Each was detected from one of two point-count locations surveyed in 2025. One evaluation species, loggerhead shrike, was incidentally detected.

4.4 Riverside

Much like Bunkerville West Parcels 2-I and 2-J, Riverside Parcels 3-A and 3-B were composed mostly of the open, scrubby habitat typically found in riparian areas that experience frequent flooding (Figures A-20 and A-21). The Riverside subunit was subjected to substantial seasonal runoff associated with above-average winter precipitation in the Virgin River watershed in 2019 and 2023. Each flood event removed portions of large, contiguous patches of tamarisk.

One area was surveyed for cuckoo. This area consisted of 3- to 5-m-tall (10- to 16-foot-tall) honey and screwbean mesquite (Figure A-22). One cuckoo was detected during a survey on June 25. This detection was recorded approximately 290 m (951 feet) northeast of detection locations from 2023 and 2024.

The Riverside subunit did not contain vegetation that resembles typical cuckoo breeding habitat. The patch of narrowleaf willows along the irrigation ditch was not wide enough to provide suitable breeding habitat, and the patches of tamarisk were dry and open and did not provide the canopy closure required for cuckoo nesting habitat. However, cuckoos have been detected in the mesquite bosque in each of the last 3 years (2023–2025), indicating that the area may provide foraging habitat for cuckoo. While surface water at the Riverside subunit typically has been restricted to the active river channel and the irrigation ditch along the east side of the subunit, outflow from the irrigation ditch spilled into the northern third of the mesquite bosque in 2025, covering an approximately 50 × 100–m (164 × 328–foot) area in the northeastern portion of the survey area.

In addition to cuckoo, four MSHCP covered avian species were recorded at the Riverside subunit: Arizona Bell's vireo, blue grosbeak, flycatcher, and phainopepla. Arizona Bell's vireo, blue grosbeak, and phainopepla were each detected from two of the four point-count locations surveyed, while flycatcher was detected from one point-count location. Arizona Bell's vireo is a desert riparian obligate. This species can also occupy dense mesquite habitat, and Arizona Bell's vireos were regularly heard singing and seen foraging in screwbean and honey mesquite at the Riverside subunit. The MSHCP identifies blue grosbeak and phainopepla as capable of occupying habitat other than desert riparian, and blue grosbeak can occupy open riparian habitat (CCDCP and USFWS 2000). Phainopepla prefers shrub- or mesquite-dominated habitats and depends heavily on the berries of mistletoe (*Phoradendron* spp.) that grows on mesquite. Riverside Parcels 3-A and 3-B have a relatively abundant population of screwbean and honey mesquite compared to the other Riparian Reserve subunits. Flycatcher was detected in a mesquite bosque; this species does not nest in mesquite bosques but uses mesquite habitat during foraging or migration. One MSHCP evaluation species, crissal thrasher, was recorded from two of the four point-count locations surveyed in 2025.

4.5 Mormon Mesa

For several decades, Parcel 5-A in the Mormon Mesa subunit was largely dominated by monotypic tamarisk. However, much of this vegetation was dying or dead as the result of defoliation by tamarisk leaf beetles. In 2018 and 2020, the County masticated a total of 16.3 ha (40.3 acres) of dead tamarisk; these areas of masticated tamarisk were excluded from flycatcher and cuckoo survey areas (Figure A-23; see Figure 6). Narrow patches of mostly dead and dying tamarisk remained outside the masticated area along the eastern and southern boundary of the Mormon Mesa subunit, but these areas did not provide the vegetative or hydrologic conditions used by nesting flycatcher or cuckoo.

Flycatcher and cuckoo survey areas consisted of clumps of 3- to 5-m-tall (10- to 16-foot-tall) narrowleaf willows and tamarisk with scattered, emergent 8- to 14-m-tall (26- to 46-foot-tall) Goodding's willows (Figures A-24 and A-25). Many of the tamarisk over 3 m (10 feet) tall were dead, and some clumps had fallen over, creating large piles of deadfall under the Goodding's willows. Some areas surrounding the dead tamarisk had begun to fill in with 2-m-tall (7-foot-tall) arrowweed. Canopy closure ranged from 20% in areas consisting of only tamarisk to 85% in areas with willow overstory. Water levels in the Virgin River decreased throughout the season. Within the surveyed area, most of the site was damp in late May, with small areas of saturated soils throughout the site. Water levels on-site decreased throughout the season, and the site was dry to damp in July.

In addition to the above-described flycatcher and cuckoo survey area, an approximately 5-ha (13-acre) patch of screwbean mesquite and arrowweed shrubland was present in the southwest corner of this subunit (see Figure 6); this area was surveyed for cuckoo. Some of the mesquite trees in this area were dead or in poor condition.

Seven restoration plots are scattered throughout the northwest corner of the Mormon Mesa subunit; in 2014, the County cleared tamarisk and planted native vegetation within these plots (Figures A-26 and A-27). SWCA biologists first observed cattle within multiple restoration plots at the Mormon Mesa subunit in 2021. Cattle activity increased in 2022 through 2025 as access to the restoration plots became easier, and cattle and associated browsing and trampling of the vegetation were routinely recorded in and around the restoration plots in 2025 (Figures A-28 and A-29).

One flycatcher pair was detected approximately 55 m (180 feet) north of the Parcel 5-A boundary and another pair was detected 120 m (394 feet) north of the Parcel 5-A boundary. No flycatchers were detected within the Parcel 5-A boundary. Despite the lack of nesting attempts within the Parcel 5-A boundary in 2021 through 2025, the northwest corner of the parcel contained large Goodding's willows and small patches of narrowleaf willows and appeared suitable for flycatcher, providing similar canopy height and canopy closure to conditions recorded when nesting last occurred in the area in 2020. Within restoration area B, some narrowleaf willows have died and Goodding's willows have grown taller; dense branching structure at heights conducive to flycatcher nesting has been reduced. Hydrologic conditions were generally drier throughout the site in 2025 than in 2024, as well as drier than when nesting last occurred.

While tamarisk can provide habitat for desert riparian species, the dead or dying tamarisk at the Mormon Mesa subunit has less benefit to wildlife than does native vegetation or live tamarisk. The dying monotypic tamarisk stands at Mormon Mesa provide less concealment from predators and are relatively hot and dry compared to living vegetation. Reduced canopy closure results in decreased thermal protection for eggs and nestlings (McLeod 2019). McLeod and Pellegrini (2013) showed that occupied breeding habitat for flycatcher exhibited >90% median canopy closure along the Virgin River between 2003 and 2011. However, despite much of the subunit appearing to be in poor health, there are still patches of mature native vegetation that should be protected.

Two MSHCP covered species were recorded at the Mormon Mesa subunit: blue grosbeak and flycatcher. Blue grosbeak was detected from two of three point-count locations surveyed, while flycatcher was detected from one point-count location. In addition, flycatcher was detected during species-specific surveys, and one pair nested approximately 120 m (394 feet) north of the Parcel 5-A boundary. Two MSHCP evaluation bird species were detected: crissal thrasher and loggerhead shrike. Both species were detected from one of the three point-count locations.

4.6 Mormon Mesa South

A backwater slough, which appears to have been created by floods or American beaver (*Castor canadensis*) activity, or both, is present along the eastern edge of the site (Figure A-30). Portions of the site away from the point-count locations in Parcels 6-A and 6-B were not visited. As observed from the point-count locations and river edge, much of the vegetation in the site was similar to that of the Mormon Mesa subunit: dead or dying tamarisk 3 to 4 m (10–13 feet) tall, with 8- to 12-m-tall (26- to 39-foot-tall) Goodding's willows scattered in low numbers throughout the parcels (Figure A-31). Mesquite trees were present along the western edge of the parcels (Figure A-32). When last observed in 2024, narrow patches of 3- to 4-m-tall (10- to 13-foot-tall) narrowleaf willows, common reed, and cattails were present along the edge of the slough and provided canopy closure of less than 50%.

Like the tamarisk at the Mormon Mesa subunit, the dead or dying tamarisk at the Mormon Mesa South subunit has less benefit to wildlife than does native vegetation or live tamarisk. When last observed in 2024, the narrowleaf willows along the edge of the slough lacked the height, density, and areal extent of typical flycatcher or cuckoo breeding habitat.

One MSHCP covered species, Arizona Bell's vireo, was recorded at the Mormon Mesa South subunit. This species was recorded from one of two point-count locations surveyed. One evaluation bird species, crissal thrasher, was recorded from one of the two point-count locations.

4.7 Muddy River

Vegetation at the Muddy River Reserve Unit was highly diverse. Parcels A through E were dominated by horticultural plantings (e.g., pine [*Pinus* sp.], California fan palm, and oak [*Quercus* sp.]) (Figures A-33 and A-34), creosote bush (*Larrea tridentata*) scrubland, and big saltbush (Figure A-35); two areas were surveyed for cuckoo in these parcels. Parcel F was dominated almost completely by creosote bush scrub, with smaller patches of honey mesquite, particularly in the central and southeastern portions of the parcel (Figures A-36 and A-37). One area was surveyed for cuckoo in Parcel F; this area consisted of mesquite 3 to 5 m (10 – 16 feet) tall with ≥65% canopy closure. Parcels G through I were composed largely of very dense thickets of big saltbush and Mojave seablite (*Suaeda moquinii*) mixed with scattered honey mesquite and tamarisk (Figures A-38 and A-39). Although the Muddy River runs near the Muddy River Reserve Unit, it does not run through any of the southern parcels and only forms the eastern boundary of Parcels A through E. This portion of the Muddy River is deeply incised, and desert riparian vegetation, consisting of widely scattered tamarisk, narrowleaf willows, and velvet ash, was generally limited to within approximately 2 m (7 feet) of the riverbank (Figure A-40).

Four MSHCP covered bird species were recorded at the Muddy River Reserve Unit in 2024: American peregrine falcon, Arizona Bell's vireo, blue grosbeak, and phainopepla. Phainopepla was detected from three of the seven point-count location surveyed, while Arizona Bell's vireo was detected from two point-count locations, and American peregrine falcon and blue grosbeak were each detected from one point-count location. One cuckoo was detected during species-specific surveys; this was the first detection recorded in the mesquite bosque adjacent to Parcel F. One MSHCP evaluation bird species, crissal

thrasher, was recorded from three point-count locations. This species is typically found in dense cover within mesquite and riparian woodlands (Floyd et al. 2007). Most of the desert riparian obligates were not detected (e.g., flycatcher) or were detected in low numbers (e.g., song sparrow and yellow warbler) in the Muddy River Reserve Unit, which is not surprising given the lack of riparian habitat at this property.

4.8 Boulder City Conservation Easement

Mojave Desert scrub, which is co-dominated by creosote bush and burrobush (*Ambrosia dumosa*), is the dominant vegetation community across the Mojave Desert, and this community covers over 97% of the BCCE (Clark County 2023). Most point-count survey locations at the BCCE are within this habitat type (Figures A-41 and A-42). The remainder of the BCCE is composed of salt desert scrub (1.5%), mesquite/acacia (*Senegalia*) habitat (less than 1%), and previously disturbed habitat (Clark County 2023). A few survey points were in areas of dense cholla (*Cylindropuntia* spp.) or desert wash habitat (Figure A-43).

The BCCE Management Plan identified that no MSHCP covered avian species are known to occur within the BCCE (Clark County 2023). During the initial site reconnaissance and point-count surveys of the BCCE in 2018, biologists did not observe any habitat, including desert riparian habitat, that could be considered suitable breeding habitat for the MSHCP covered avian species. No MSHCP covered species were detected during point counts at the BCCE in 2025, though single phainopeplas were recorded at two of the point-count locations in 2019 and 2022. Two evaluation species, LeConte's thrasher and loggerhead shrike, are known to occur within the BCCE (Clark County 2023); loggerhead shrike was detected from six of the 20 point-count locations surveyed, and LeConte's thrasher was detected from two point-count locations (see Table 11). These two species have been recorded at the BCCE every year since 2018.

4.9 Timing of Brown-Headed Cowbird Netting

In addition to the cowbird netting conducted at Mesquite West, SWCA conducted cowbird netting in previous seasons at other study areas where flycatcher breeding was known to occur. Cowbird netting was conducted at two study areas (Key Pittman Wildlife Management Area [Key Pittman WMA] and Warm Springs Natural Area [Warm Springs]) in 2023, and five study areas (Key Pittman WMA, River Ranch, Meadow Valley Wash, Overton Wildlife Management Area [Overton WMA], and Warm Springs) in 2024. Netting at each study area began in mid-May and continued through July.

At Mesquite, netting occurred only once per week in 2021. In 2022 and 2023, the frequency of netting attempts was increased to twice per week in May, and netting started earlier than in 2021, allowing for five more netting attempts through May 31. In 2024 and 2025, the netting start date was earlier than in all previous years, allowing for one additional netting attempt through May 31. From 2021 through 2024, earlier start dates each year coincided with an increased proportion of females captured through May 31 at Mesquite (Table 13). Netting at all other study areas began in mid-May in 2023 and 2024. Data from each of these study areas showed that a substantial proportion (50% to 100%) of females were captured through May 31.

Table 1. Female Cowbird Captures Occurring Through May 31 at Southern Nevada Study Areas, 2021–2025

Study Area*	Year	Netting Start Date	Number of Netting Visits Through May 31	Number of Females Captured Through May 31	Total Number of Females Captured	% of Females Captured Through May 31
MESQ†	2021	May 15	2	4	14	29
MESQ†	2022	May 11	7	5	11	45
MESQ†	2023	May 9	7	2	4	50
MESQ†	2024	May 7	8	7	10	70
MESQ	2025	May 5	8	9	18	50
KEPI	2023	May 15	4	4	7	57
KEPI	2024	May 15	6	6	8	75
RIRA	2024	May 15	6	4	6	67
MVWA	2024	May 14	6	1	1	100
MUDD	2024	May 14	6	5	10	50
WMSP	2023	May 16	4	6	10	60
WMSP	2024	May 16	6	6	7	86

* KEPI = Key Pittman WMA, MESQ = Mesquite, MUDD = Overton WMA, MVWA = Meadow Valley Wash, RIRA = River Ranch, and WMSP = Warm Springs

† Data were collected under contract with the County (SWCA 2021, 2022, 2023a, 2024a).

4.10 Brown-Headed Cowbird Control and Southwestern Willow Flycatcher Nest Success

Following continued high parasitism rates and 100% failure of flycatcher nests at Mesquite West in 2020, SWCA implemented a target-netting program for cowbirds at Mesquite West in 2021; this program continued through 2025. The goal of this program was to reduce the incidence of parasitism on flycatcher nests and improve flycatcher nest success. SWCA was successful in target netting cowbirds in 2025, and female cowbirds were removed (Table 14). One cowbird egg was replaced with a fake egg in a nest that contained one cowbird egg and one flycatcher egg upon discovery. This nest was too high to safely reach without a step ladder, and the egg was left in place until the next visit, when the nest contained one cowbird egg and three flycatcher eggs, indicating that the flycatcher nest remained active despite the presence of the cowbird egg. The observer used a step ladder to access the nest, and the cowbird egg was replaced with a fake egg. Three sizes of fake eggs were available for the observer to compare with the real cowbird egg before placing the fake egg in the nest. The observer chose the fake egg closest in size to the real cowbird egg, and the nest remained active following egg replacement. This nest was successful, producing one flycatcher fledgling. No egg addling or nestling removal was necessary (see Table 14).

Table 14. Cowbird Control by Method Used, Cowbird Parasitism, and Flycatcher Productivity at Mesquite West, 2019–2025

Year	Parasitism Rate (%)	Cowbird Control Method*				Nest Success (%)
		Target Netting (no. females removed)	Egg Addling (no. CE† addled)	Egg Replacement (no. CE† replaced with fake egg)	Nestling Removal (no. CN‡ removed)	
2019	50	–	–	–	–	44
2020	40	–	1	–	0	0
2021	50	14	3	–	0	33
2022	22	11	1	1	1	78
2023	8	4	0	1	0	46
2024	9	10	0	0	0	58
2025	13	18	0	1	0	50

* A dash within a specific cowbird control method indicates that SWCA was not permitted to conduct that method in that year; thus, the method was not practiced.

† CE = cowbird egg.

‡ CN = cowbird nestling.

Prior to the implementation of cowbird target netting in 2021, the parasitism rate of flycatcher nests at Mesquite West was 50% in 2019 and 40% in 2020 (see Table 14). Data from Mesquite West in 2016 through 2020 show a range in parasitism rate from 40% to 67%, with an average of 55% (Table 15) (SWCA 2019b, 2020). In 2021, despite the implementation of the combined-method cowbird control program, 50% of flycatcher nests at Mesquite West were parasitized. This parasitism rate seemed to indicate that cowbird control efforts were initially unsuccessful in reducing parasitism rates. The combined-method cowbird control program continued, and in 2022, 22% of flycatcher nests were parasitized. In 2023, the parasitism rate at Mesquite West reached an all-time low of 8%. In 2024 and 2025, the parasitism rate remained low (9% and 13%, respectively). The parasitism rate during years (2021–2025) when combined-method cowbird control was implemented ranged from 8% to 50% and averaged 20%. Though the benefit of cowbird netting was not immediately seen in the parasitism data, cowbird control seems to be successful in lowering the rate at which flycatcher nests are parasitized at Mesquite West.

Nest success at Mesquite West in 2016 through 2020, prior to implementation of the cowbird netting program, ranged from 0 to 44%, with an average of 16% (SWCA 2019b, 2020). During the first year of cowbird netting in 2021, flycatcher nest success was 33%. In 2022, nest success was 78%, and the number of successful nests (seven) in 2022 was higher than in the previous 3 years combined (see Table 6). Nest success was 46% in 2023, 58% in 2024, and 50% in 2025. The range in nest success since the cowbird netting program was implemented was 33% to 78%, with an average of 53%. Though the nest success rate has been variable, success rates during the combined-method cowbird control program were higher than the rates observed prior to the implementation of the combined-method cowbird control program.

Table 15. Cowbird Parasitism Rates, Nest Success, Number of Fledglings, and Fecundity at Mesquite West, 2016–2025

	Year	No. Nests	% Parasitism	% Nest Success	Productivity	Fecundity
Pre-netting	2016*	4	50.00	25.00	1.33	2.00
	2017*	8	66.67	12.50	0.17	0.2
	2018†	5	66.67	0	0.00	0
	2019	9	50.00	44.44	0.63	1.00
	2020	6	40.00	0	0.00	0
Netting	2021	8	50.00	33.33	0.50	1.00
	2022	11	22.22	77.78	1.63	1.83
	2023	13	8.33	46.15	0.85	1.38
	2024	12	9.09	58.33	1.64	2.83
	2025	10	12.50	50.00	0.80	1.00
Pre-netting period mean (SE)‡			54.67 (5.23)	16.39 (8.41)	0.43 (0.25)	0.64 (0.39)
Netting period mean (SE) ‡			20.43 (7.80)	53.12 (7.37)	1.08 (0.23)	1.61 (0.34)

Note: Number of nests includes all nesting attempts. Percent parasitism is calculated using only nests for which contents could be determined. Percent nest success is calculated using only nests in which at least one flycatcher egg was laid. Productivity indicates the average number of confirmed fledglings per nest that contained flycatcher eggs and had a known outcome. Fecundity indicates the average number of young fledged over the breeding season per female for which all nest outcomes were known. Data for the pre-netting period (2016–2020) are from the NDOW (unpublished data) and SWCA.

* Irregular monitoring was completed by the NDOW.

† Irregular monitoring was completed by the NDOW, and surveys were completed by the County.

‡ SE = standard error

In 2016 through 2020, prior to the implementation of cowbird target netting in 2021, productivity at Mesquite West ranged from 0 to 1.33 fledglings per nest and averaged 0.43 fledging per nest. In years (2021–2025) when combined-method cowbird control was implemented, productivity ranged from 0.50 to 1.64 fledglings per nest and averaged 1.08 fledglings per nest.

Fecundity at Mesquite West in 2016 through 2020 ranged from 0 to 2.00 fledglings per female, with an average of 0.64 fledgling per female (see Table 15) (SWCA 2019b, 2020). During years (2021–2025) when combined-method cowbird control was implemented, fecundity ranged from 1.00 to 2.83 fledglings per female (see Table 15) and averaged 1.61 fledglings per female. An average annual fecundity of approximately 2.0 is required for a population to be self-sustaining (SWCA 2019b).

Comparisons of parasitism rates, flycatcher nest success, productivity, and fecundity were calculated; for each test, $P < 0.05$ was used to reject the null hypothesis. Flycatcher nest success (one-tailed Fisher's exact test, $P = 0.008$), productivity (two-sample t-test assuming unequal variances, degrees of freedom [*df*] = 8, $t = 1.91$, $P = 0.046$), and fecundity (two-sample t-test assuming unequal variances, $df = 8$, $t = 1.87$, $P = 0.049$) were significantly higher across the 5 years in which combined-method cowbird control was conducted (2021–2025) than in the previous 5-year period when no cowbird netting occurred (2016–2020) at Mesquite West; cowbird parasitism (one-tailed Fisher's exact test, $P = 0.002$) was significantly lower across the same 5-year cowbird netting period (2021–2025) than during the previous 5 years (2016–2020). An odds ratio of 4.0 was calculated using the Fisher's exact test using nest success data; this odds ratio indicates that a nest was 4.0 times more likely to be successful during the netting period than during the 5-year pre-netting period. An odds ratio of 5.4 was calculated using the Fisher's exact test using parasitism data; this odds ratio indicates that parasitism was 5.4 times more likely to occur during the 5-year pre-netting period than during the netting period.

Data from the cowbird netting period (2021–2025) were also compared to data across all pre-netting years (2003–2020) in which flycatcher monitoring at Mesquite West was conducted by SWCA or the NDOW. Nest success (one-tailed Fisher's exact test, $P = 0.04$) and fecundity (two-sample t-test assuming unequal variances, $df = 6$, $t = 2.10$, $P = 0.04$) were significantly higher during the netting period than the 2003 through 2020 pre-netting period. Though average productivity was higher in 2021 through 2025 (1.08 fledglings per nest) than in 2003 through 2020 (0.64 fledglings per nest), the difference was not significant (two-sample t-test assuming unequal variances, $df = 7$, $t = 1.67$, $P = 0.07$). Parasitism (one-tailed Fisher's exact test, $P = 0.006$) was significantly lower during the netting period than during the 2003 through 2020 pre-netting period.

The statistical significance of these metrics provides evidence that the combined-method cowbird control program plays a role in reducing parasitism rates in Mesquite West, as well as increasing nest success, productivity, and fecundity.

5 CONCLUSION

All eight MSHCP covered and three MSHCP evaluation bird species were recorded at the County's reserve system properties in 2025. Intensive flycatcher monitoring and cowbird control were continued. Some notable conclusions about this year's efforts and the habitats at the County's properties are listed below.

- Flycatcher monitoring resulted in documentation of eight pairs at Mesquite West, all of which were confirmed to be nesting. These eight nesting pairs had 10 nesting attempts, five of which were successful and produced eight fledglings.
- SWCA successfully target netted 35 adult cowbirds (18 female, 17 male) at Mesquite West; the female cowbirds were subsequently euthanized.
- Combined-method cowbird control began in 2021; the parasitism rate of flycatcher nests at Mesquite West was 50% in that year. Combined-method cowbird control continued in 2022 through 2025, and the parasitism rates were 22%, 8%, 9%, and 13%, respectively. The 8% parasitism rate in 2023 was the lowest parasitism rate ever recorded by SWCA at the site. Flycatcher nest success (one-tailed Fisher's exact test, $P = 0.008$), productivity (two-sample t-test assuming unequal variances, $P = 0.046$), and fecundity (two-sample t-test assuming unequal variances, $P = 0.049$) were significantly higher during the 5-year period in which combined-method cowbird control was conducted than during the previous 5-year period when no cowbird netting occurred; cowbird parasitism (one-tailed Fisher's exact test, $P = 0.002$) was significantly lower across the same 5-year period than during the previous 5 years. The statistical significance of these metrics provides evidence that the combined-method cowbird control program has reduced parasitism rates in Mesquite West, as well as increased flycatcher nest success, productivity, and fecundity.
- Five flycatcher nests failed at Mesquite West. Depredation was the cause of failure for three (60%) of these nests. Many animals are known to depredate bird nests, including several avian species (such as cowbirds), snakes, raccoons, and small rodents. The species of nest predators that depredated flycatcher nests at Mesquite West are unknown.
- Flycatcher monitoring at Mormon Mesa resulted in documentation of one female that consecutively paired with two different males and had one nesting attempt. This nest failed, and the female did not attempt to renest.
- Four cuckoo detections were recorded at the Riparian Reserve Units: two detections occurred during cuckoo surveys, and two cuckoos were incidentally detected. One cuckoo detection was

recorded for the first time at Muddy River Parcel F. This individual was in the mesquite bosque adjoining the eastern border of Parcel F.

- Cattle exclusion from portions of Bunkerville West Parcels 2-J and 2-M appeared to be successful in 2025. Some tracks and scat were observed within the parcels during the Bunkerville West fence survey in February. During subsequent surveys, most observations were recorded outside of the areas where efforts have been made to exclude cattle from potentially suitable flycatcher habitat or areas where native vegetation was recently planted. Continued cattle exclusion efforts at this patch of vegetation would prevent further destruction of narrowleaf willow habitat and allow for habitat maintenance, enhancement, and restoration.
- Microclimate data collected in 2023 showed that conditions in a portion of Bunkerville West Parcel 2-M were similar to those recorded at flycatcher nests. Two flycatchers were detected in this area in 2024. Between the 2024 and 2025 breeding seasons, the method of irrigation to the fields surrounding Bunkerville West Parcels 2-I and 2-J and Parcels 2-K through 2-M was changed from an open ditch to an underground pipe. Before 2025, overflow from the open ditch flowed into the southeast corner of Parcel 2-M in the area where microclimate was similar to that of flycatcher nesting habitat. In 2025, the ditch was dry, and no water flowed into this portion of Parcel 2-M. Soils were dry and cracked, and vegetation displayed yellow, water-stressed leaves and sparse canopy closure.
- Biologists recorded two MSHCP evaluation species at the BCCE in 2025: LeConte's thrasher and loggerhead shrike. Although breeding of LeConte's thrasher could not be confirmed within the BCCE during recent point-count surveys, this species is known to breed at the BCCE as several active nests were incidentally recorded in 2019 and 2020.

Aggressive efforts are likely required to restore, create, and enhance additional habitat for most of the MSHCP avian species at the County's Riparian Reserve Units. Continued monitoring of avian populations before, during, and after the restoration process is needed to document restoration success within the County's properties. Recommendations to achieve these objectives are detailed in the following section.

6 RECOMMENDATIONS

The following recommendations are based on observations from the 2025 avian surveys and factors discussed in this report. These actions would support the County's long-term goals for the Riparian Reserve Units and the BCCE in Clark County:

- As directed by the *Clark County Desert Conservation Program Riparian Reserve Units Management Plan* (Clark County 2015), the County should continue to purchase parcels along the Virgin and Muddy Rivers, particularly available parcels adjacent to the existing Riparian Reserve Units (if possible), and attempt to purchase parcels along the Meadow Valley Wash.
- Tamarisk that has been killed or has suffered substantial dieback from tamarisk leaf beetles provides little benefit to avian species that require at least some degree of canopy closure for nesting. The County should begin or continue the removal of dead or dying tamarisk from all its Riparian Reserve subunits, provided that tamarisk removal is immediately followed by planting of native vegetation, such as willow and Fremont cottonwood, in suitable areas (SWCA 2017c).
- Additional native species plantings, such as those planted in early 2025 at Bunkerville West, should be considered and are encouraged around existing native habitats. To protect native plants, any plantings, particularly willows, should be protected with the installation of cattle exclusion fencing.

- Coordination with the City of Mesquite, Coyote Willows Golf Course, and Casablanca Golf Course may be beneficial in directing more water flow into Mesquite Parcel 1-A. A human-caused diversion was observed in 2025; water in Pulsipher Wash was diverted from the eastern channel to the west approximately 100 m (328 feet) north of the Parcel 1-A boundary. Surface water was limited to the northwest quarter of the site, and areas outside the northwest quarter were generally damp to dry. A 2024 flycatcher nesting area along the west-central border of Parcel 1-A that was inundated and muddy in 2024 was dry in 2025.
- Cattle have been observed at all the Riparian Reserve subunits except Muddy River; they should be inhibited from foraging on native plantings, wherever practicable. Cattle exclusion fencing should be erected in any area where native trees are newly planted or planned for planting. At parcels where fencing already exists, such as portions of Mormon Mesa and Bunkerville West Parcels 2-J and 2-M, the County should make sure that all fences and gates are maintained and in proper working order. At Mormon Mesa, cattle have bypassed incomplete or ineffective fencing; maintenance of existing fencing and erection of additional perimeter fencing could prevent future breaches into the parcel.
- The County could plant facultative species such as honey and screwbean mesquite in floodplain areas that lack the hydrology required to support facultative wetland species like willow or cottonwood. Portions of the Riparian Reserve Units are susceptible to scouring floods, as evidenced by conditions recorded in 2019 and 2023. Any restoration plan should take this into account by limiting plantings in flood-prone areas or taking steps to protect planted areas from floods. The potential to create mature habitats at these sites may be limited by the flood risk.
- Because the Virgin River Riparian Reserve Unit is within designated critical habitat for flycatcher, restoration plans should be designed in coordination with the USFWS.
- Avian point counts and species-specific surveys should be continued to help build on baseline data and to track changes in avian populations throughout the land management, restoration, and post-implementation processes. These surveys should use the protocols established for this project to ensure datasets are standardized and comparable.
- Continued target netting concentrated during the early part of the flycatcher breeding season may ensure that a significant portion of the female cowbirds removed from the site are removed prior to the onset of the flycatcher nesting period and may result in continued higher flycatcher nest success, productivity, and fecundity.
- Breeding habitat for the MSHCP covered bird species is currently limited or non-existent within the BCCE. Habitat for phainopepla could be created or enhanced with the establishment of more mesquite/acacia habitat, as long as that habitat also includes mistletoe, a required food source for phainopepla. One phainopepla was recorded at the BCCE during both the 2019 and 2022 point counts.

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APPENDIX A

Site Photographs



Figure A-1. Typical narrowleaf willow habitat, Mesquite Parcel 1-A, June 26, 2025.



Figure A-2. Typical narrowleaf willow and tamarisk habitat, Mesquite West, July 4, 2025.



Figure A-3. Overview of green tamarisk-dominated habitat, Mesquite West, July 3, 2025.



Figure A-4. Overview of brown tamarisk-dominated habitat, Mesquite West, July 22, 2025.



Figure A-5. Sandy soil with small-diameter tamarisk and arrowweed, Bunkerville Parcel 2-C, June 25, 2025.



Figure A-6. Tamarisk and arrowweed habitat, Bunkerville Parcel 2-F, June 25, 2025.



Figure A-7. Honey and screwbean mesquite habitat, Bunkerville Parcel 2-F, July 10, 2025.



Figure A-8. Tamarisk and narrowleaf willow habitat, Bunkerville Parcel 2-B, June 30, 2025.



Figure A-9. Narrowleaf and Goodding's willow habitat, Bunkerville Parcel 2-G, June 30, 2025.



Figure A-10. Cattle-browsed narrowleaf willow at river's edge, Bunkerville Parcel 2- G, June 30, 2025.



Figure A-11. Arrowweed and tamarisk habitat, Bunkerville Parcel 2-J, June 26, 2025.



Figure A-12. Yellowing tamarisk, Bunkerville Parcel 2-J, June 30, 2025.



Figure A-13. Browning tamarisk with arrowweed, Bunkerville Parcel 2-J, July 10, 2025.



Figure A-14. Sedges and Goodding's willow in wet meadow, Bunkerville Parcel 2-I, June 26, 2025.



Figure A-15. Overview of Goodding's and narrowleaf willow patch, Bunkerville Parcel 2-M, June 21, 2022.



Figure A-16. Overview of Goodding's and narrowleaf willow patch, Bunkerville Parcel 2-M, June 30, 2025.



Figure A-17. Sparsely foliaged narrowleaf willows with arrowweed foreground, Bunkerville Parcel 2-L, June 30, 2025.



Figure A-18. Cattle-browsed sapling narrowleaf willows at marsh edge, Bunkerville Parcel 2-M, June 25, 2025.

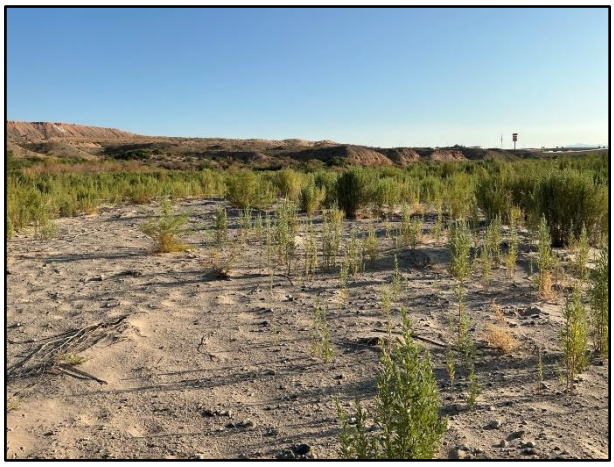

Figure A-19. Arrowweed scrub habitat with dry soils, Bunkerville Parcel 2-K, June 26, 2025



Figure A-20. Riparian scrub habitat, Riverside Parcel 3-B, June 25, 2025.



Figure A-21. Riparian scrub habitat, Riverside Parcel 3-A, July 10, 2025.



Figure A-22. Honey and screwbean mesquite survey area, Riverside Parcel 3-A, July 10, 2025.



Figure A-23. Masticated tamarisk area at Mormon Mesa Parcel 5-A, June 22, 2025.



Figure A-24. Goodding's willow and tamarisk survey area, Mormon Mesa Parcel 5-A, July 8, 2025.



Figure A-25. Tamarisk habitat with emergent Goodding's willow, Mormon Mesa Parcel 5-A, June 27, 2025.



Figure A-26. Example habitat within Mormon Mesa Parcel 5-A restoration plot, May 23, 2017.



Figure A-27. Example habitat within Mormon Mesa Parcel 5-A restoration plot, June 21, 2017.



Figure A-26. Browsed ground cover within Mormon Mesa Parcel 5-A restoration plot, June 9, 2025.



Figure A-27. Browsed ground cover within Mormon Mesa Parcel 5-A restoration plot, June 22, 2025.



Figure A-28. Backwater slough along Mormon Mesa South eastern boundary, May 15, 2022.



Figure A-29. Dead or dying tamarisk at point-count location, Mormon Mesa South Parcel 6-B, June 27, 2025.



Figure A-30. Mesquite and tamarisk habitat at point-count location, Mormon Mesa South Parcel 6-A, June 27, 2025.



Figure A-31. Palm and pine plantings, Muddy River Parcel E, July 11, 2025.



Figure A-32. Oak plantings, Muddy River Parcel E, July 11, 2025.



Figure A-33. Saltbush-dominated area, Muddy River Parcel A, June 29, 2025.



Figure A-34. Creosote scrub habitat, Muddy River Parcel F, June 29, 2025.



Figure A-35. Honey mesquite habitat, Muddy River Parcel F, June 26, 2025.



Figure A-36. Saltbush and tamarisk habitat, Muddy River Parcel H, June 29, 2025.



Figure A-37. Saltbush habitat, Muddy River Parcel H, June 29, 2025.



Figure A-38. Velvet ash and narrowleaf willow habitat along the Muddy River, Muddy River Parcel E, July 11, 2025.



Figure A-39. Creosote bush and burrobush habitat, BCCE, April 22, 2025.



Figure A-40. Creosote bush and burrobush habitat, BCCE, April 24, 2025.



Figure A-41. Cholla habitat, BCCE point-count location 35, April 23, 2025.



Figure A-42. Fence in good condition, Bunkerville Parcel 2-M, February 14, 2025.



Figure A-43. Fence in fair condition, Bunkerville Parcel 2-J, February 14, 2025.



Figure A-44. Fence in poor condition, Bunkerville Parcel 2-M, February 14, 2025.



Figure A-45. Gate in good condition, Bunkerville Parcel 2-F, February 14, 2025.



Figure A-42. Gate in fair condition, Bunkerville Parcel 2-J, February 14, 2025.



Figure A-43. Gate in poor condition, Bunkerville Parcel 2-F, February 14, 2025.