Avian Surveys and Parasitism Control and Evaluation on Clark County Multiple Species Habitat Conservation Plan Properties – 2024 Final Project Report

SEPTEMBER 2024

PREPARED FOR

Desert Conservation Program

Clark County Department of Environment and Sustainability

PREPARED BY

SWCA Environmental Consultants

AVIAN SURVEYS AND PARASISTISM CONTROL AND EVALUATION ON CLARK COUNTY MULTIPLE SPECIES HABITAT CONSERVATION PLAN PROPERTIES – 2024 FINAL PROJECT REPORT

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2019-SWCA-1935A and 2023-SWCA-2325B

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EXECUTIVE SUMMARY

In 2024, 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) 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 2024.

SWCA conducted habitat assessments to determine suitability for flycatcher and cuckoo at each of the County's Riparian Reserve Units prior to the survey timeframe. Habitat assessments included desktop analysis of current aerial imagery, review of previous seasons' site descriptions, and on-site habitat observations. Habitat assessments occurred in April and May 2024 and resulted in a net reduction of 37.2 hectares (91.9 acres) of flycatcher survey area and 30.8 hectares (76.1 acres) of cuckoo survey area across all Riparian Reserve Units.

Surveys conducted in 2024 were completed between March 15 and August 2. During point-count surveys, surveyors detected three of the eight bird species covered by the Clark County Multiple Species Habitat Conservation Plan (MSHCP): Arizona Bell's vireo (*Vireo bellii arizonae*), blue grosbeak (*Passerina caerulea*), and phainopepla (*Phainopepla nitens*). Two additional MSHCP-covered avian species were detected during species-specific surveys at the Riparian Reserve Units: flycatcher and cuckoo. One additional MSHCP-covered species, vermilion flycatcher (*Pyrocephalus rubinus*), was incidentally detected during cuckoo surveys. The surveys also yielded three evaluation species: loggerhead shrike (*Lanius ludovicianus*), crissal thrasher (*Toxostoma crissale*), and LeConte's thrasher (*Toxostoma lecontei*). In total, 81 avian species were recorded across all the County's properties in 2024, and MSHCP-covered or evaluation species were observed at each property.

Flycatcher monitoring was conducted between May 15 and August 12, 2024, 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, 22 adult willow flycatchers were detected at Mesquite West and Mormon Mesa Parcel 5-A. The 22 individuals comprised eight pairs, five unpaired males, and one individual for which residency and breeding status could not be determined. Twelve confirmed nesting attempts were documented; seven of these attempts were successful. Four adult and 19 nestling flycatchers were newly banded in 2024; one adult banded in a previous year was recaptured. Of the 19 nestlings banded at Mesquite West, 17 were confirmed to have fledged. One additional nestling that was too small to be banded with the rest of the nest and therefore remained unbanded was also confirmed to have fledged.

SWCA conducted cowbird control at Mesquite West from May 7 through July 24, 2024. SWCA biologists performed targeted mist netting of adult and fledgling cowbirds over 16 mornings, totaling 28.5 net-hours. Male cowbirds were released, and females were euthanized. In total, 24 adult cowbirds (0.8 adults per net-hour) were captured, of which 14 were male. Ten 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*.

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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 (Muddy River, Mesquite, Bunkerville East, Bunkerville West, Riverside, Mormon Mesa, and Mormon Mesa South) (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 Riparian Reserve Unit for flycatcher and cuckoo. Vegetation ≥3 meters (m) (≥10 feet) tall is one of the characteristics of suitable flycatcher breeding habitat (Sogge et al. 2010). 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

[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*.

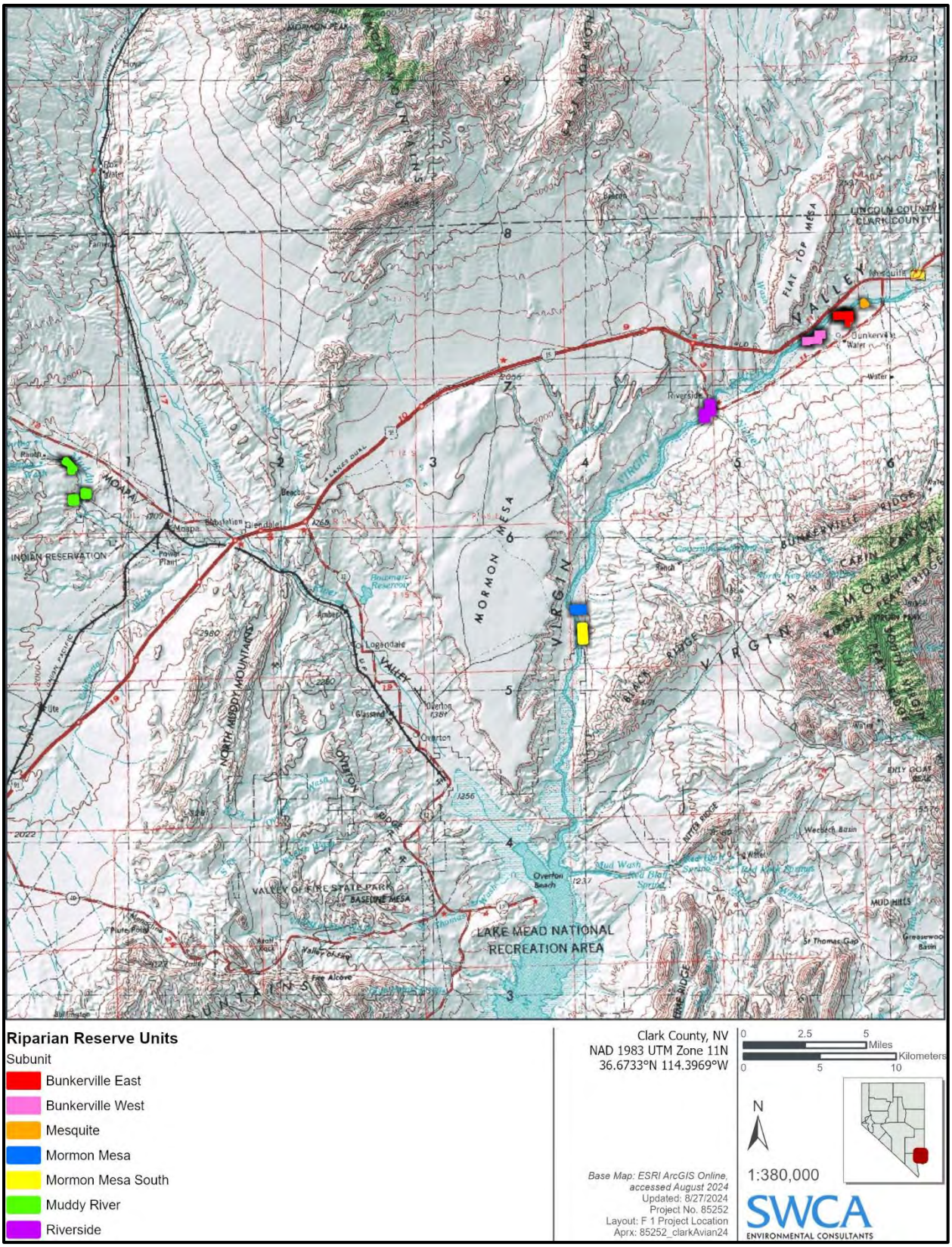

Figure 1. Riparian Reserve Unit locations.

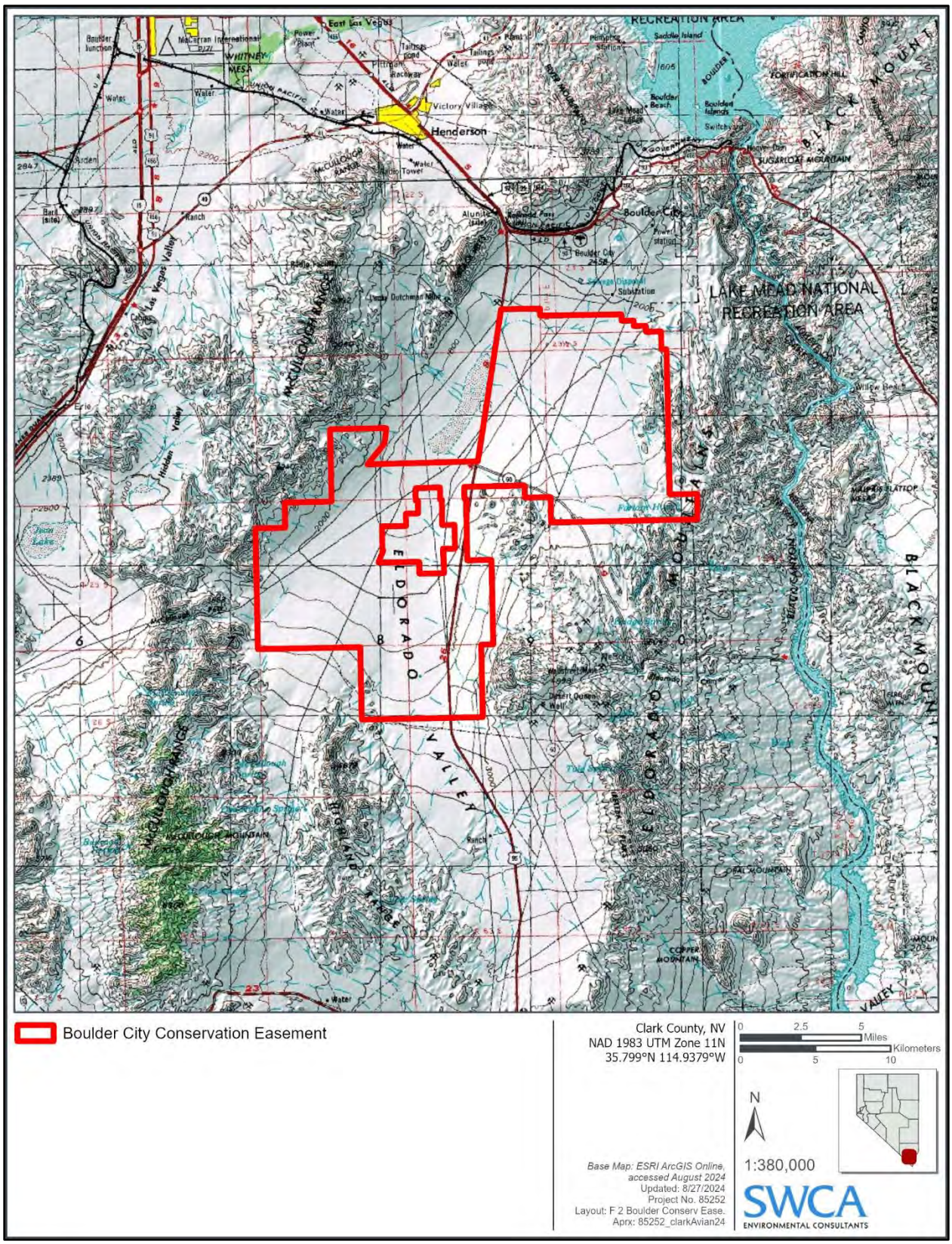

Figure 2. BCCE location.

descriptions of suitable habitat in Sogge et al. (2010), which specify that suitable flycatcher habitat consists of patches of vegetation ≥10 m (33 feet) wide and ≥4.5 m (15 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). Habitat with vegetation ≥4 m (13 feet) tall and ≥75% canopy closure was surveyed 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, 2023).

Work conducted by SWCA in 2024 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; and flycatcher monitoring at Mormon Mesa Parcel 5-A 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 an MSHCP (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 at 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 2023). The County contracted SWCA for continuation of this work beginning in 2024 under a new contract (County Project No. 2023-SWCA-2325B); the 2024 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 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 (15 feet) in height, high canopy closure (≥85%), vegetation with dense twig structure, and flight paths present within 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 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) in size (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). 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 of the Virgin River Riparian 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) in size 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 1 ha (3 acres) in size 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 multi-storied riparian woodlands dominated by willow (*Salix* spp.) or cottonwood (*Populus* spp.) adjacent to watercourses with less than 3 percent 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) in height 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 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, and Mormon Mesa subunits. 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) in height (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 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 and Riverside subunits. Surveys in 2018 yielded detections of several territorial flycatchers at the Bunkerville subunit. No cuckoo detections were recorded.

By 2019, the County had outlined 53.5 ha (132.2 acres) within the Muddy River, Bunkerville, 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 Bunkerville and Mormon Mesa subunits and nine cuckoo detections across the Muddy River, Bunkerville, and Mormon Mesa subunits. One cuckoo nest was incidentally located at Bunkerville Parcel 2-H 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 5-A cuckoo survey area in 2020.

County naming conventions evolved in 2020, and the Bunkerville subunit was split into Bunkerville East (Parcels 2-A through 2-G) and Bunkerville West (Parcels 2-I and 2-J). In addition, Parcel 2-H in the Bunkerville subunit was given a new title, Parcel 1-A, and was reassigned to its own Mesquite subunit. 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 (Muddy River, Mesquite, Bunkerville East, Bunkerville West, Riverside, and Mormon Mesa) in 2020. Surveys yielded several flycatcher territories at the Mesquite and Mormon Mesa subunits and five cuckoo detections across all Riparian Reserve Units.

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

1.2.1.2 HABITAT ASSESSMENTS

Prior to species-specific surveys for federally listed species in 2024, each Riparian Reserve Unit 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. The resulting adjusted survey areas were surveyed in 2024. These habitat assessments were conducted under County Project No. 2023-SWCA-2325B

1.2.1.3 FLYCATCHER MONITORING

SWCA has been conducting surveys and monitoring for flycatcher in southern Nevada since 2003, and SWCA has documented flycatcher nesting in Mesquite West for decades. Over the course of this work, SWCA documented consistently high rates of parasitism of flycatcher nests by cowbirds. Surveys and monitoring conducted for the County from 2017 through 2019 documented continued occupancy of Mesquite West by flycatcher throughout those years.

From 2013 through 2019, the Mesquite study area (which encompasses several sites, including Mesquite West) consistently yielded one of the lowest average productivity rates (0.45 fledgling per nest) of all the flycatcher study areas in southern Nevada (SWCA 2019b). Productivity at all southern Nevada sites 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 at Mesquite West.

Starting in 2020, SWCA was contracted by the County to perform flycatcher territory and nest monitoring at Mesquite West, a study site that includes Mesquite Parcel 1-A and adjacent habitat to the west (Mesquite West West). 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 impact on flycatcher nesting success at Mesquite West. SWCA contracted with the County to conduct flycatcher territory and nest monitoring at Mesquite Parcel 1-A in 2020, and the monitoring program was expanded to include all of Mesquite West in 2021; the entirety of Mesquite West has been monitored annually since 2021. Additionally, SWCA monitored flycatcher at Mormon Mesa Parcel 5-A from 2021 through 2023, following successful breeding within that parcel in 2020.

Nest monitoring results at Parcel 1-A in 2020 and Mesquite West in 2021 through 2023 showed varied results, with productivity ranging from 0 to 1.63 fledglings per nest (SWCA 2023). Territory and nest monitoring continued at Mesquite West and Mormon Mesa Parcel 5-A in 2024 under County Project No. 2019-SWCA-1935A.

1.2.1.4 BROWN-HEADED COWBIRD CONTROL

Brood 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 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 Nevada Department of Wildlife (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%) nest 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 brood parasitism (parasitism) on flycatcher nest success. Parasitism rates at Mesquite West under the combined-method cowbird treatment program in 2021, 2022, and 2023 were 50%, 22%, and 8%, respectively. This combined-method cowbird control program was continued in 2024 under County project number 2019-SWCA-1935A.

1.2.1.5 POINT-COUNT SURVEYS

In 2017, SWCA began conducting breeding bird point-count surveys for the County at 51 locations across the Riparian Reserve Units (SWCA 2017b). In 2018 and 2019, SWCA continued breeding bird point-count surveys at all or a subset of these locations as part of the comprehensive bird survey effort across all the County's properties (SWCA 2018a, 2019a). 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. Point-count surveys continued at all Riparian Reserve Units in 2024 under County project number 2023-SWCA-2325B.

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 has been amended twice: once in 2010 and once 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 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, 2023). Point-count surveys continued in 2024 under County project number 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) complete habitat suitability assessments for flycatcher and cuckoo at all Riparian Reserve Units; 3) conduct surveys for flycatcher and cuckoo where suitable habitat exists; 4) conduct flycatcher nest searching at Mesquite West and Mormon Mesa; 3) monitor all flycatcher nests found at Mesquite West and Mormon Mesa and record all successes and failures; 4) record instances of parasitism by cowbirds; and 5) conduct cowbird control at Mesquite West throughout the flycatcher breeding season.

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, 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).

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) in height (Figures 3–7).

2.2 Habitat Assessments

Habitat surveyed for flycatcher and cuckoo from 2017 through 2023 included all vegetation at least 3 m (10 feet) in height. Vegetation at least 3 m (10 feet) tall is one characteristic of suitable breeding habitat for flycatcher (Sogge et al., 2010). As required by County Project No. 2023-SWCA-2325A, habitat assessments were used to identify suitable habitat for flycatcher and cuckoo. Habitat suitability at each Riparian Reserve Unit was assessed for flycatcher and cuckoo in late April and early May 2024. Habitat was assessed by desktop analysis of current aerial imagery, 2023 site descriptions, and on-site vegetation assessments.

An SWCA biologist assessed flycatcher habitat suitability on-site using the following common characteristics of flycatcher breeding habitat: dense tree or shrub cover ≥ 4.5 m (15 feet) in height, high canopy closure (≥85%), vegetation with dense twig structure, and flight paths present within the midstory

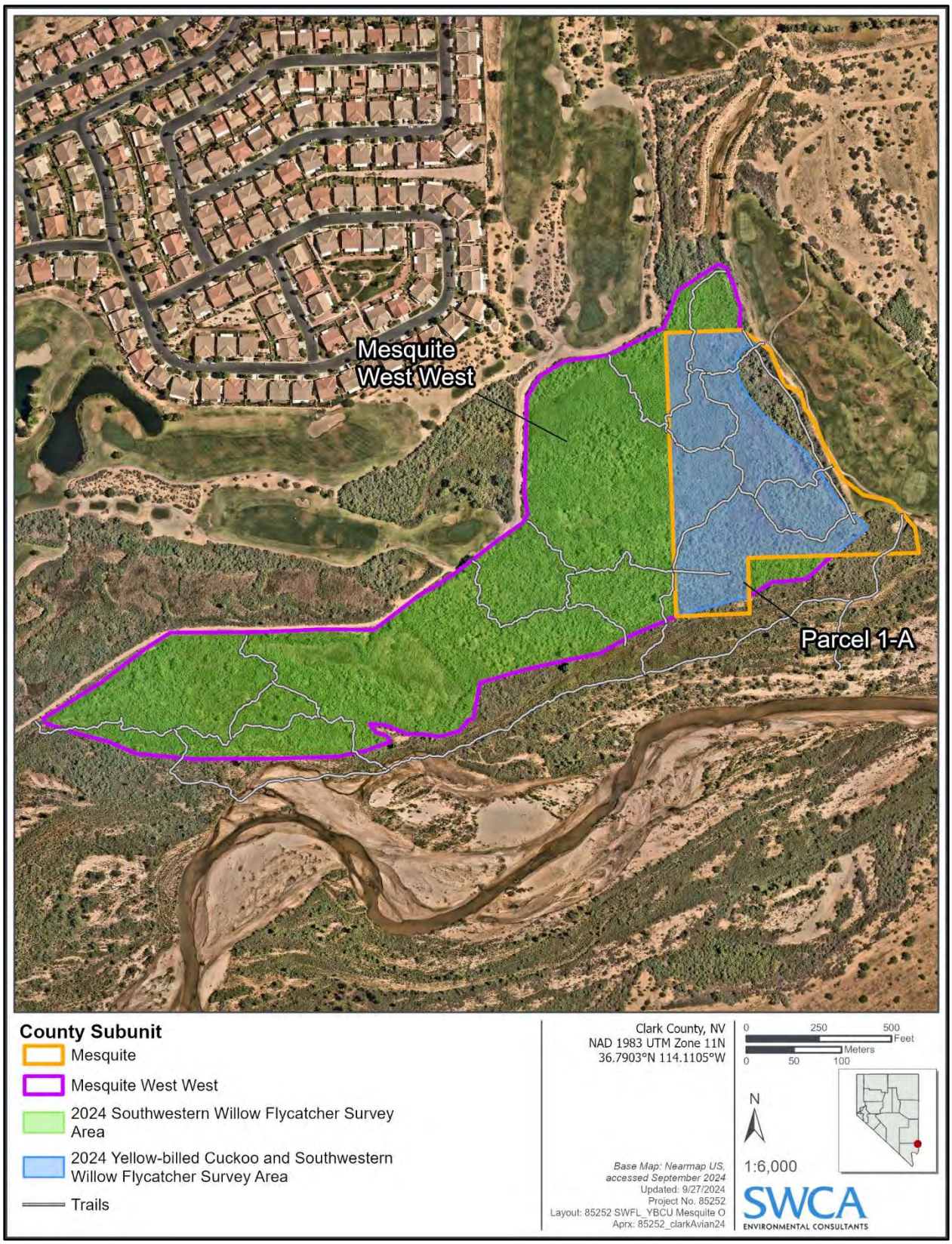

Figure 3. Yellow-billed cuckoo and southwestern willow flycatcher survey areas at the Mesquite Riparian Reserve Subunit.

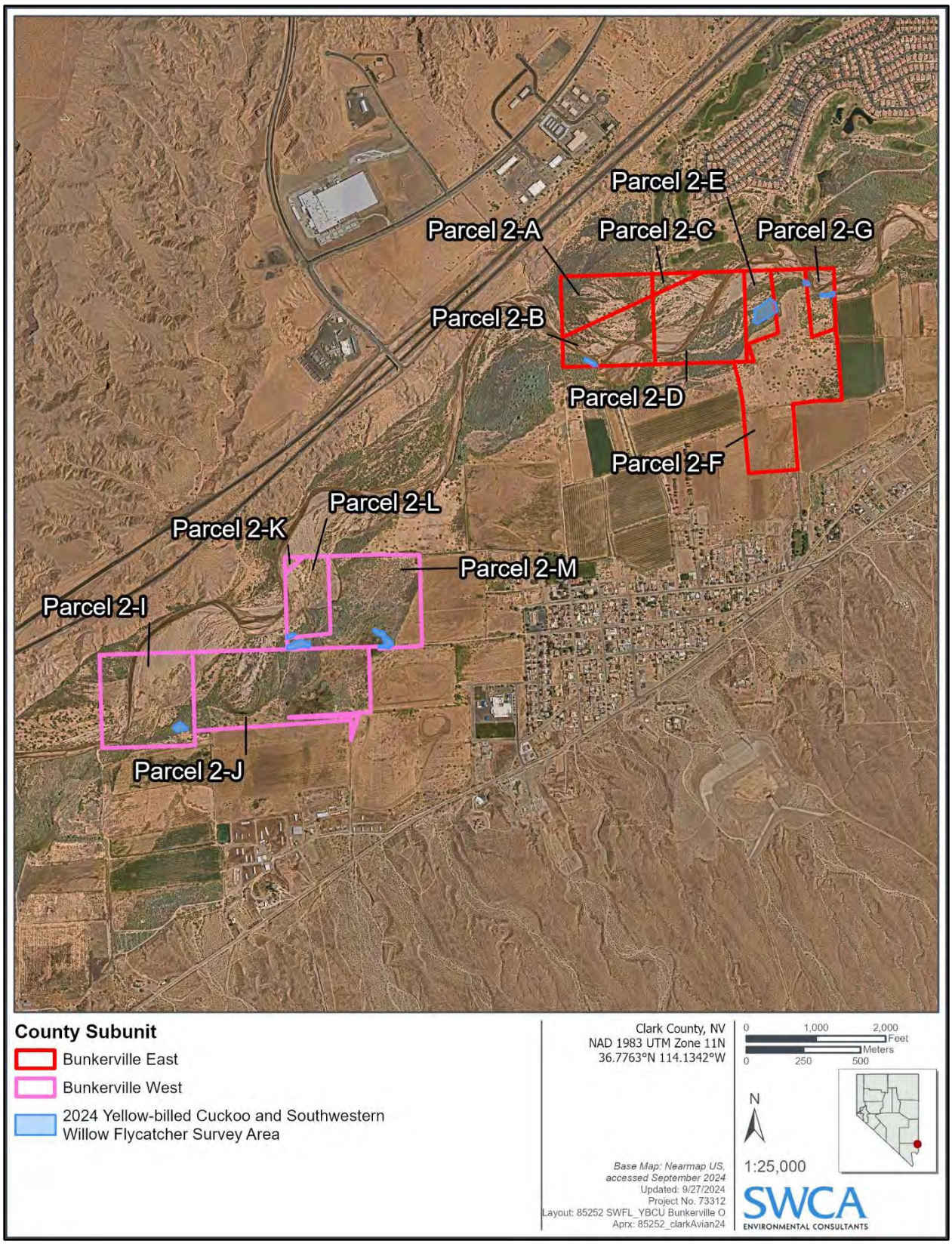

Figure 4. Yellow-billed cuckoo and southwestern willow flycatcher survey areas at the Bunkerville East and Bunkerville West Riparian Reserve Subunits.

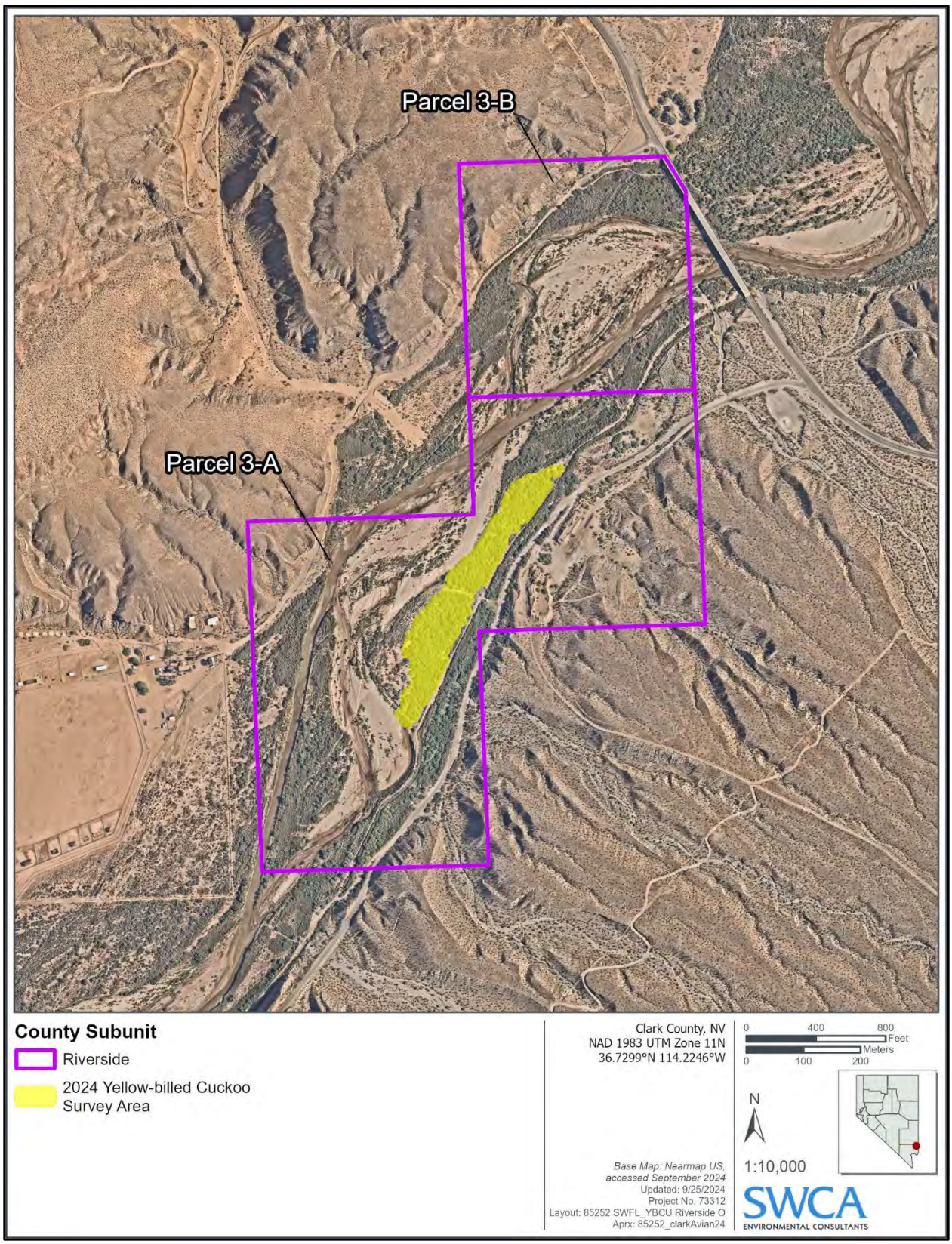

Figure 5. Yellow-billed cuckoo survey area at the Riverside Riparian Reserve Subunit.

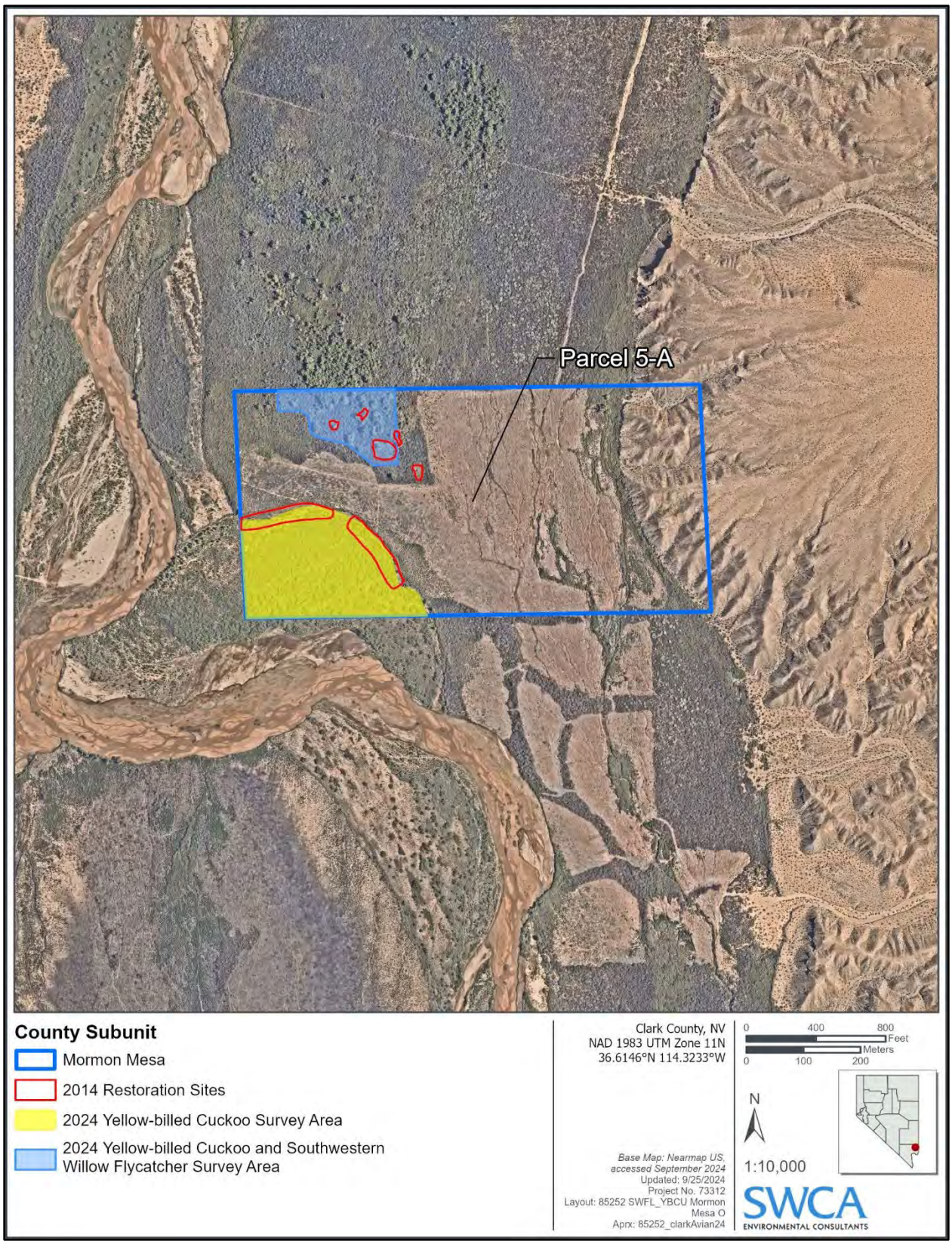

Figure 6. Yellow-billed cuckoo and southwestern willow flycatcher survey areas at the Mormon Mesa Riparian Reserve Subunit.

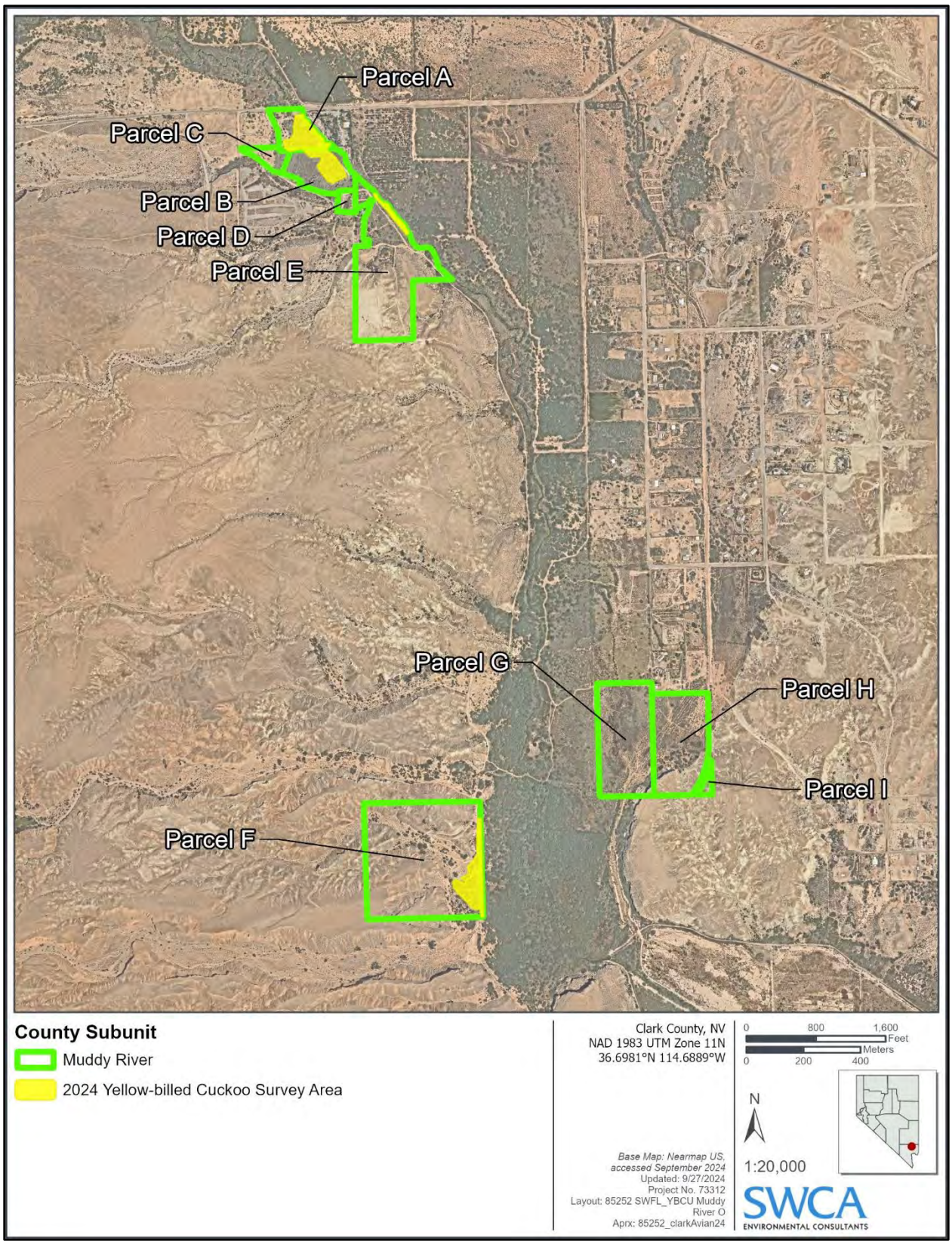

Figure 7. Yellow-billed cuckoo survey areas at the Muddy River Riparian Reserve Unit.

(McLeod and Pellegrini 2013; McLeod et al. 2008; Sogge et al. 2010). The presence of surface water or saturated soil was considered but did not disqualify an area from survey; 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. Patch size was also considered when assessing suitability; flycatchers are rarely found in narrow strips of habitat less than 10 m (33 feet) wide (Sogge et al. 2010). Therefore, patches of habitat narrower than 10 meters (33 feet) wide were excluded from survey areas.

Cuckoos generally require much larger patches of habitat than do flycatchers, but some required vegetation characteristics are similar. Cuckoo home ranges are generally at least 40 ha (100 acres) in size and often exceed 80 ha (200 acres), with patches measuring at least 100 m (328 feet) wide (USFWS). Along the Muddy and Virgin Rivers, little habitat exists that meets these criteria. Breeding habitat is typically thought to include multi-storied riparian woodlands dominated by willow (*Salix* spp.) or cottonwood adjacent to watercourses with less than 3 percent slopes (USFWS 2020). Minimum canopy closure in optimal breeding sites is 65% (Laymon et al. 1997). In previous seasons, SWCA detected cuckoos mostly in Goodding's willow (*Salix gooddingii*) or narrowleaf willow (*Salix exigua*) habitat, though several detections were recorded in relatively dense mesquite. In 2024, 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 as cuckoo survey areas.

2.3 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 willow 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 2.5.2 and 2.5.3). No nest was mirror poled after 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. 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, pin-striped 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.

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 MP3 players and 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).

2.4 Data Management for Federally Listed Bird Surveys and Monitoring

For flycatcher and cuckoo surveys and flycatcher monitoring, biologists collected data on Samsung tablets or iPhones equipped with Field Maps for ArcGIS (Version 24.2.1) 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 2024 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.

2.5 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) in height 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 iPhones or 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 2024, 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 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; 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 30, then once per week through July 24. Starting target netting for cowbirds in early May allowed for five 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. 2018). 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 2024 followed methods used during the 2017 through 2023 point-count surveys (SWCA 2017b, 2018a, 2018b, 2019a, 2020, 2021, 2022, 2023), 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 2019, SWCA randomly selected 25 of the 51 previously established point-count locations across the 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 2024, SWCA conducted avian point-count surveys at the 30 even-year point-count locations. Prior to the commencement of surveys, biologists conducted a site reconnaissance to assess site conditions following winter and spring flooding and to identify any impediments to access. During the reconnaissance, biologists navigated to each survey point and marked each with flagging so that it could be easily located on subsequent visits.

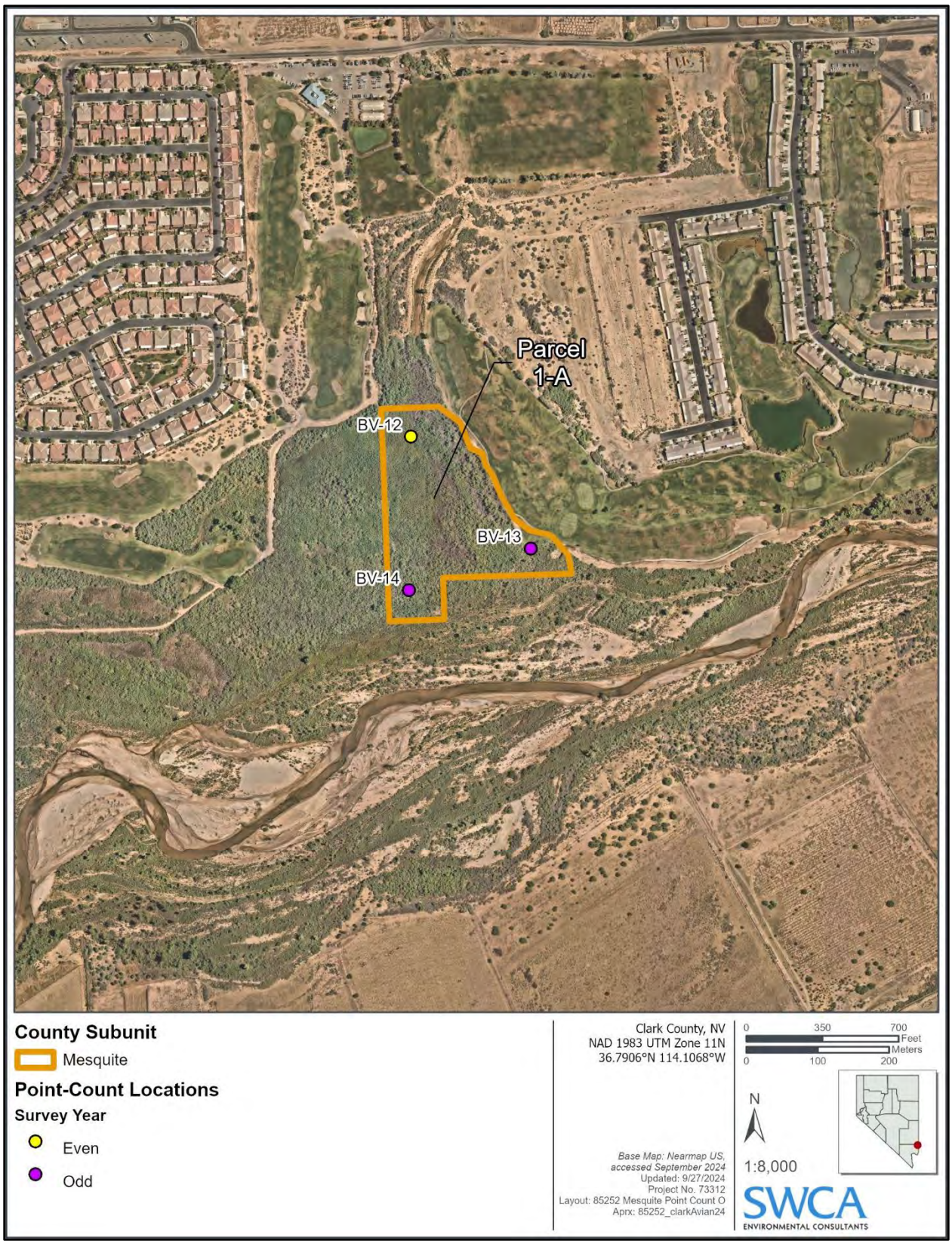

Figure 8. Point-count locations within the Mesquite Riparian Reserve Subunit.

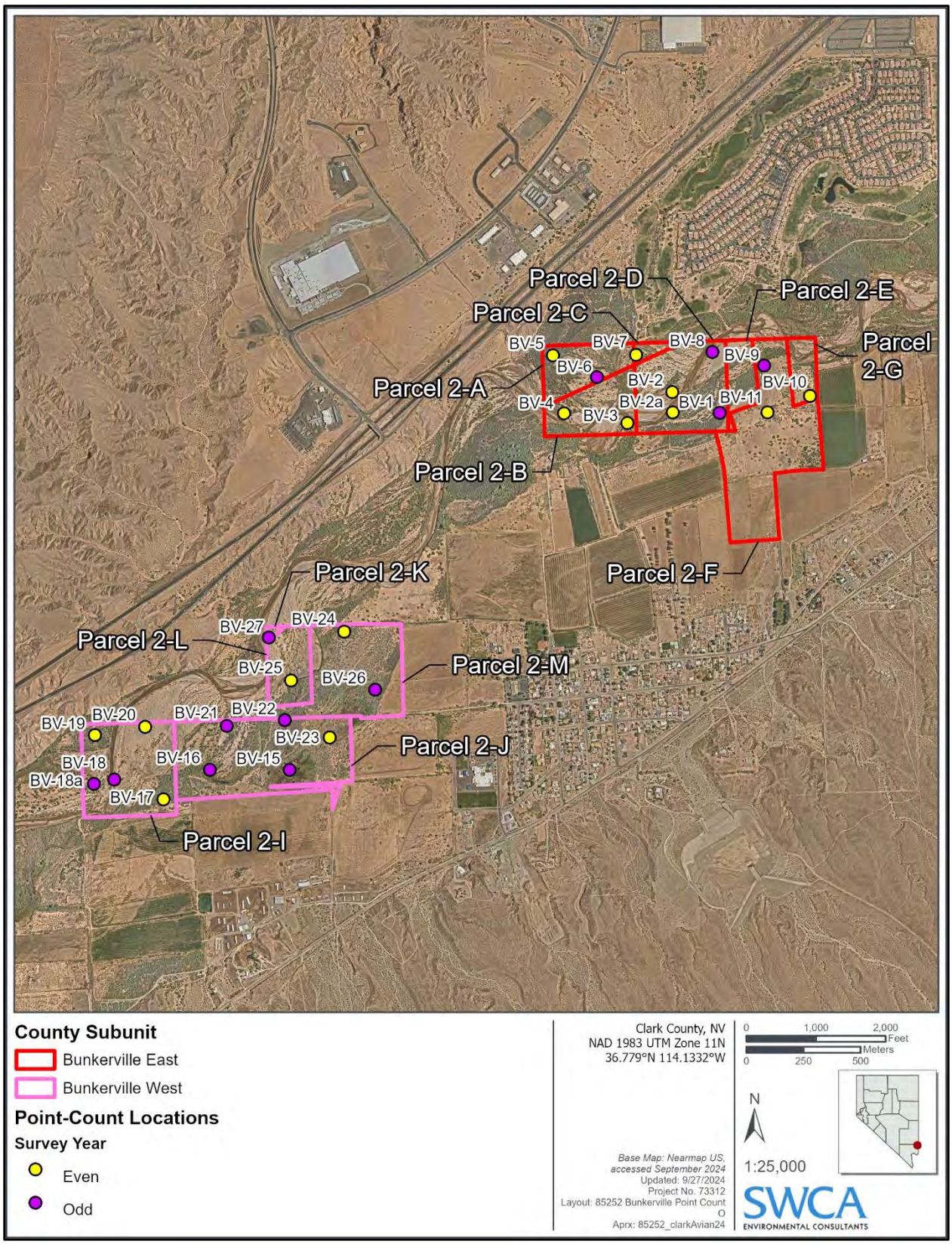

Figure 9. Point-count locations within the Bunkerville East and Bunkerville West Riparian Reserve Subunits.

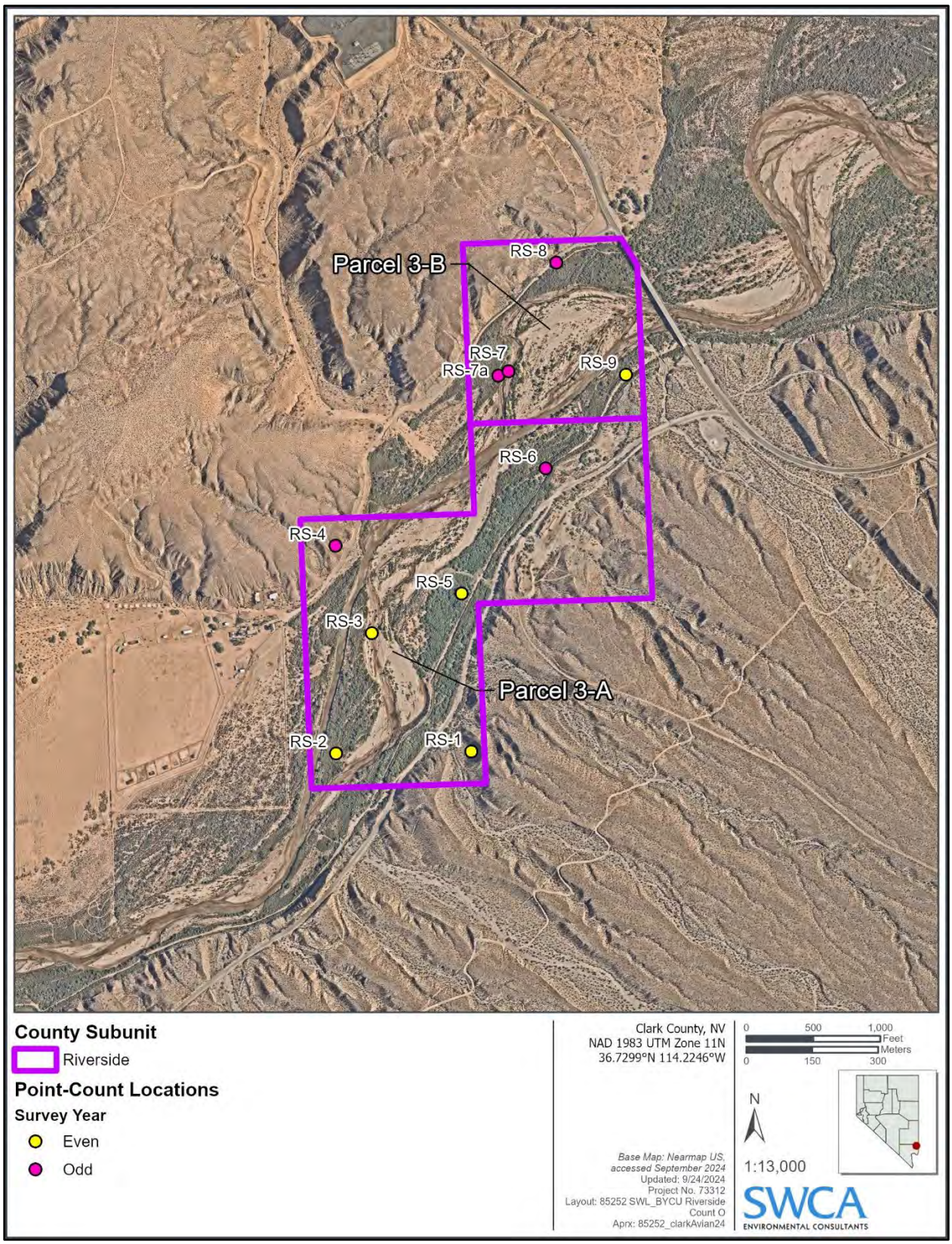

Figure 10. Point-count locations within the Riverside Riparian Reserve Subunit.

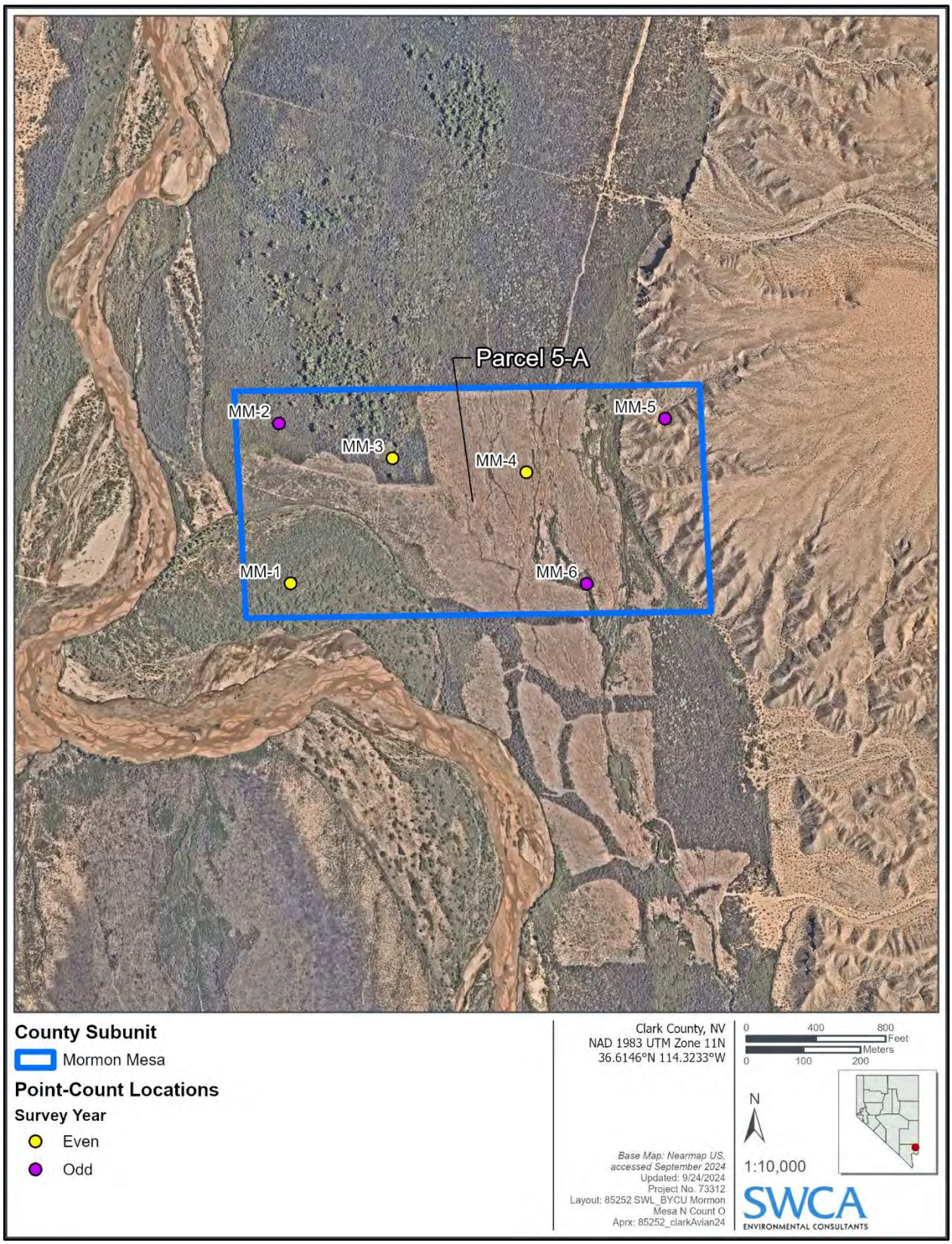

Figure 11. Point-count locations within the Mormon Mesa Riparian Reserve Subunit.

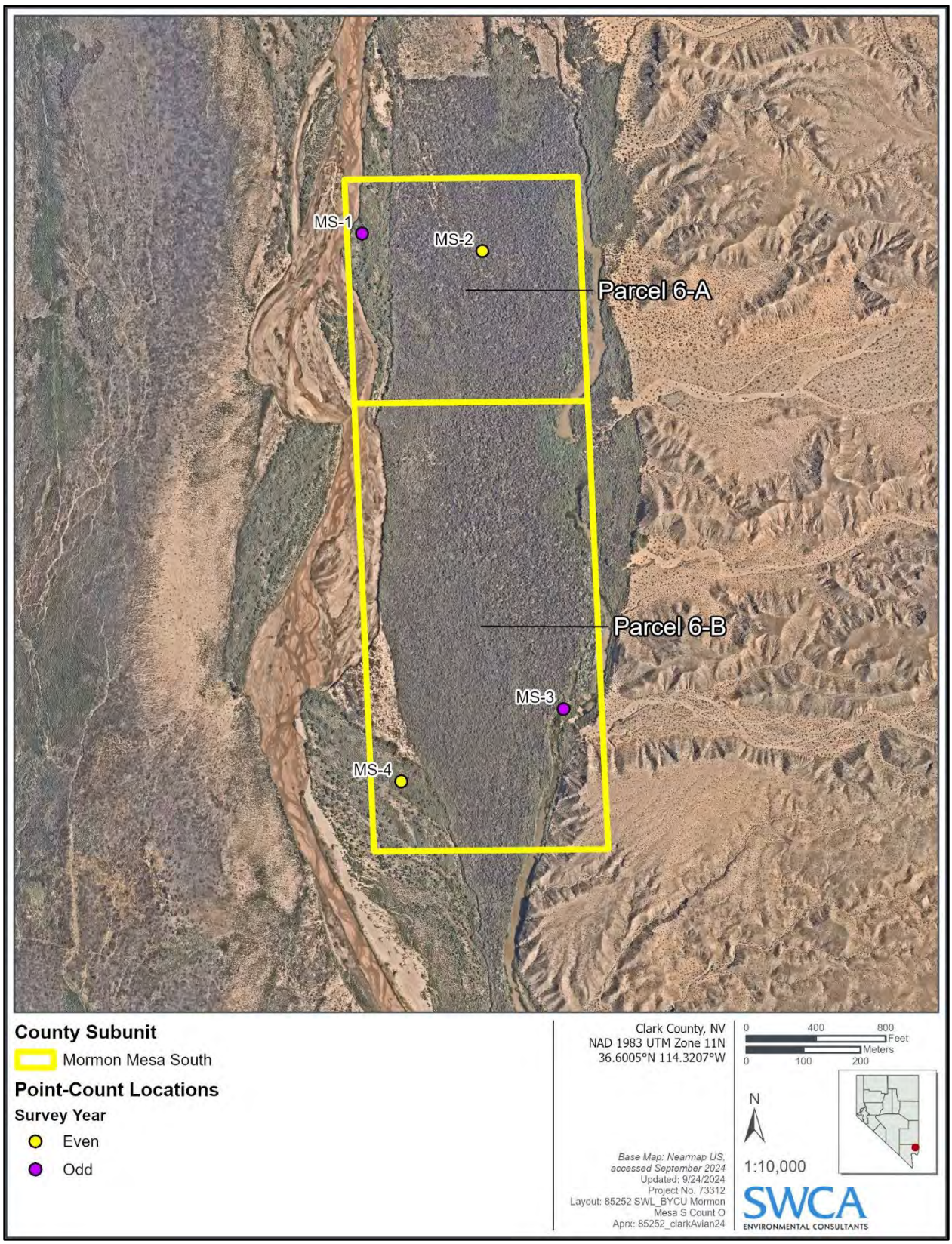

Figure 12. Point-count locations within the Mormon Mesa South Riparian Reserve Subunit.

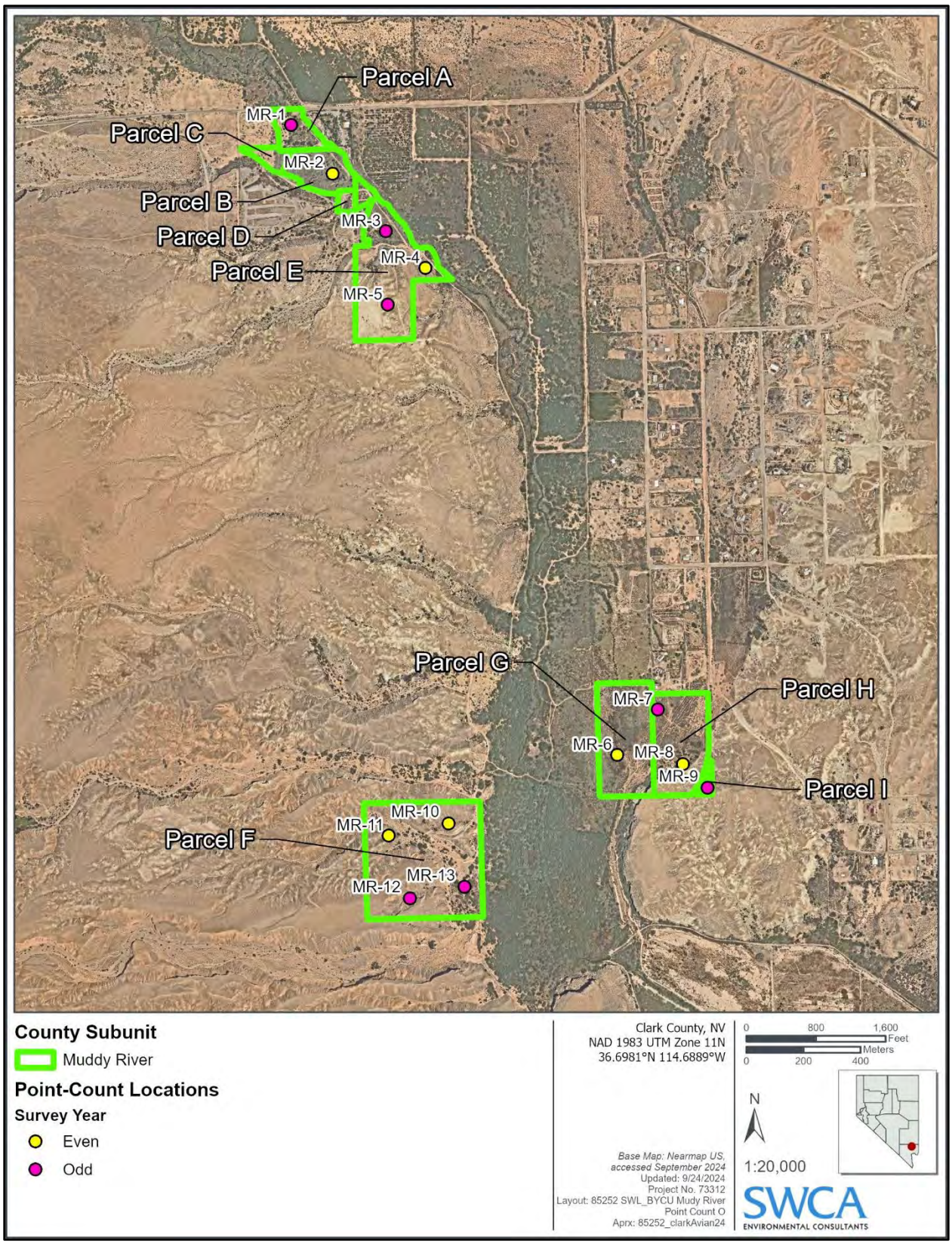

Figure 13. Point-count locations within the Muddy River Riparian Reserve Unit.

High water levels along the Virgin River made BV-20 inaccessible on the initial survey visit. This point was on a small island between two branches of the Virgin River, and the river was flowing too quickly for observers to cross safely in early May. The point location was accessible and surveyed when water levels receded less than 2 weeks later. One point-count location (BV-2) was repositioned due to flooding in May, and an alternate location (BV-2a) was used for the first round of surveys (see Figure 9). Flood water later receded, and BV-2 was accessible for the second and third rounds of point counts.

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 2022, and no field reconnaissance was completed prior to field surveys in 2024. Surveyors were able to access all 20 of the previously surveyed point-count locations without impediment, and all the original locations assigned to even-numbered years were used in 2024.

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 a group of point counts was completed was alternated 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).

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 pre-determined locations in all Riparian Reserve Units and the BCCE, 2) complete habitat assessments for flycatcher and cuckoo at Riparian Reserve properties, 3) conduct protocol-level presence/absence surveys for flycatcher and cuckoo where suitable habitat exists, 4) conduct flycatcher nest searching at the Mesquite West and Mormon Mesa sites, 5) monitor all flycatcher nests found at the Mesquite West and Mormon Mesa sites and record all successes and failures, 6) record instances of parasitism by cowbirds, and 7) conduct cowbird control at Mesquite West throughout the flycatcher breeding season, All above objectives were completed in 2024, and results of field efforts are presented here.

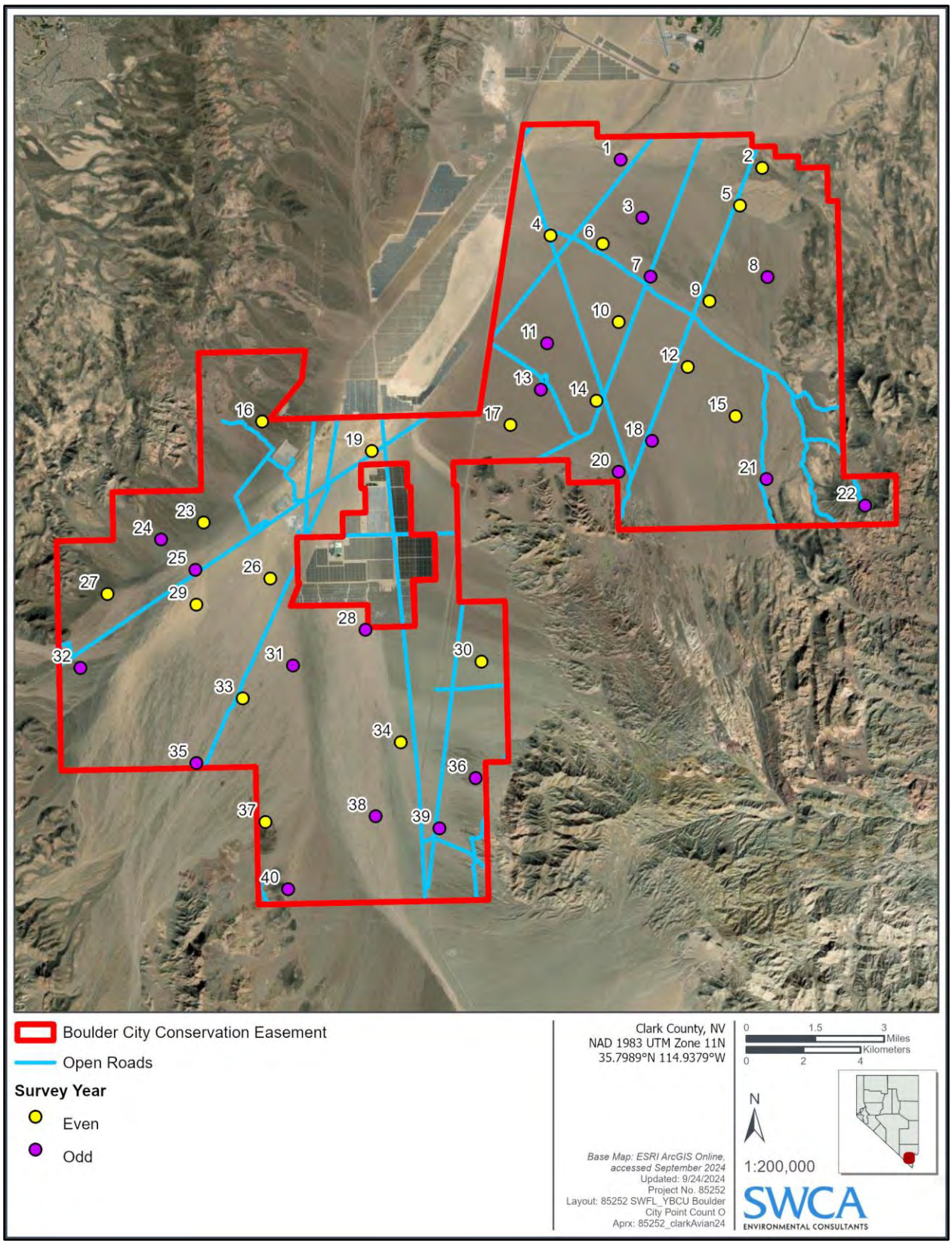

Figure 14. Point-count locations within the BCCE.

3.2 Habitat Assessments

Habitat assessments were conducted in late April and early May 2024 through a combination of desktop analysis of current aerial imagery, 2023 site descriptions, and on-site vegetation assessments. This section details results and justification for eliminated areas in each subunit.

3.2.1 Mesquite

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. Most of the site consisted of healthy narrowleaf willows and tamarisk. Water from Pulsipher Wash flowed north to south through the site intermittently, and soils remained damp to saturated on days when no flow entered the site from Pulsipher Wash. Canopy closure remained high in areas with healthy willows and tamarisk, and the habitat was noticeably cooler than the surrounding area. Following the habitat assessment, 0.3 ha (0.7 acre) of standing dead willows was removed from flycatcher and cuckoo survey areas, decreasing the survey area for each species from 4.0 ha (9.9 acres) to 3.7 ha (9.2 acres).

3.2.2 Bunkerville East

Most of the area previously surveyed for flycatcher and cuckoo was eliminated during an on-site habitat assessment in early May 2024 due to poor habitat quality, and one small survey area was added, resulting in a net reduction of 6.0 ha (14.8 acres) of surveyed habitat for each species. The survey areas for both flycatcher and cuckoo were decreased from 6.9 ha (17.0 acres) to 0.9 ha (2.2 acres). Areas eliminated during the early May habitat assessment mostly consisted of tamarisk ≤3.5 m (≤11.5 feet) tall or with ≤65% canopy closure. Much of the eliminated tamarisk habitat appeared to be exhibiting lower canopy closure than seen in previous years due to repeated defoliation by tamarisk leaf beetles (*Diorhabda* spp.). Another small, eliminated area consisted of tamarisk, honey mesquite (*Prosopis glandulosa*), and mule-fat with ≤50% canopy closure.

The small patch that was added to flycatcher and cuckoo areas in 2024 consisted of narrowleaf willows 3 to 4 m (10–13 feet) in height with 75% canopy closure. This small patch was adjacent to the Virgin River and exhibited damp to saturated soils.

3.2.3 Bunkerville West

3.2.3.1 PARCELS 2-I AND 2-J

Most of the habitat previously surveyed for flycatcher and cuckoo was eliminated as a result of a habitat suitability assessment in April 2024 due to poor habitat quality. Survey areas for both flycatcher and cuckoo decreased from 5.6 ha (13.9 acres) to 0.2 ha (0.4 acre). Eliminated areas included a <10-m-wide (<33-foot-wide) strip of 3- to 4-m- (10- to 13-foot-) tall tamarisk and mesquite, 5-m- (16-foot-) tall tamarisk and/or mesquite with <65% canopy closure, and an area in which tamarisk observed in previous seasons had been cut down.

3.2.3.2 PARCELS 2-K THROUGH 2-M

Most areas previously surveyed for flycatcher and cuckoo were eliminated during an on-site habitat suitability assessment in April 2024. Survey areas for both species decreased by 1.6 ha (3.9 acres), from 2.1 ha (5.3 acres) to 0.6 ha (1.4 acres). Eliminated areas consisted of stringers of narrowleaf willows ≤5 m (≤16 feet) wide and tamarisk ≤3.5 m (≤11.5 feet) tall or with <65% canopy closure.

3.2.4 Riverside

An on-site habitat suitability assessment in April 2024 resulted in elimination of all previously surveyed flycatcher and cuckoo areas. Eliminated areas consisted of stringers of narrowleaf willows ≤5 m (≤16 feet) wide along an irrigation ditch, tamarisk ≤3.5 m (11.5 feet) tall, or tamarisk with ≤65% canopy closure. No suitable flycatcher habitat was delineated for surveys in 2024.

One 3.0-ha (7.2-acre) cuckoo survey area was added. This area consisted of 3- to 5-m- (10- to 16-foot-) tall honey and screwbean mesquite. The 3.6 ha (8.9 acres) of habitat previously surveyed for cuckoo was eliminated in 2024, resulting in a net reduction in cuckoo survey area from 3.6 ha (8.9 acres) to 3.0 ha (7.2 acres).

3.2.5 Mormon Mesa

Following a desktop habitat assessment in 2024, 2.5 ha (6.3 acres) was removed from flycatcher and cuckoo survey areas due to poor habitat quality. In 2023, vegetation at Mormon Mesa was described as mostly dead or dying tamarisk with scattered Goodding's willows throughout the parcel (SWCA 2023). Aerial imagery from July 1, 2023, was viewed on Clark County's OpenWeb (Clark County Geographic Information System Management Office 2024), and areas consisting of dead or dying tamarisk (grayish in color on aerial imagery) not adjacent to Goodding's willows were assumed not to have improved since 2023; these areas were eliminated from flycatcher and cuckoo surveys based on aerial imagery and site descriptions from previous years. Total flycatcher survey area decreased from 3.8 ha (9.4 acres) to 3.2 ha (7.8 acres), and cuckoo survey area decreased from 9.1 ha (22.5 acres) to 6.6 ha (16.3 acres).

3.2.6 Mormon Mesa South

After a desktop habitat assessment in 2024, all 14.0 ha (35.4 acres) of previously surveyed flycatcher and cuckoo habitat at Mormon Mesa South was eliminated due to poor habitat quality. Vegetation was described in 2023 as dead or dying tamarisk 3 to 4 m (10 to 13 feet) in height with a low number of 8- to 12-m- (26- to 39-foot-) tall Goodding's willow scattered throughout the parcels (SWCA 2023). This habitat was assumed not to have improved between 2023 and 2024 due to continued defoliation of tamarisk trees by tamarisk leaf beetles. Aerial imagery from July 1, 2023, was viewed on Clark County's OpenWeb to identify any areas of healthy tamarisk or possible new willow growth within the site; none were found. Most vegetation observed in aerial imagery of Mormon Mesa South appeared to be grayish in color, signifying dead or dying tamarisk, with areas of open soil between trees. The patches of 3- to 4-m- (10- to 13-foot-) tall narrowleaf willows present along the edge of the slough in 2023 were <5 m (<16 feet) wide; therefore, these areas were determined to be too narrow to provide suitable flycatcher habitat. No suitable flycatcher or cuckoo habitat was delineated for surveys in 2024.

3.2.7 Muddy River

An on-site habitat suitability assessment in late April 2024 resulted in elimination of all 3.5 ha (8.6 acres) of habitat previously surveyed for flycatcher due to poor habitat quality or small patch size. Areas away from the Muddy River consisted mainly of pine (*Pinus* spp.), oak (*Quercus* spp.), and big saltbush (*Atriplex lentiformis*); none of these species provide suitable habitat for breeding flycatcher. Several small patches of narrowleaf willows and velvet ash (*Fraxinus velutina*) were adjacent to the Muddy River. Narrowleaf willow and velvet ash are found in flycatcher breeding habitat, however, the areas that included these species were <5 m (<16 feet) wide and were eliminated from survey due to small patch size.

Swaths of big saltbush were eliminated from cuckoo survey areas in Parcels A through E. One new mesquite-dominated survey area was added in Parcel F, resulting in a net reduction of cuckoo habitat from 3.5 ha (8.6 acres) to 3.4 ha (8.5 acres).

3.3 Survey Effort

3.3.1 Federally Listed Bird Surveys

The five rounds of flycatcher surveys were completed by SWCA biologists Steve Dougill, MaKenna Magdos, Sarah Nichols, Jason Sigismondi, and Lauren Strong between May 21 and July 15, 2024 (Table 1). Each round of flycatcher surveys required from three to five observer-mornings. In 2024, 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 48.6 survey-hours (see Table 1). Flycatcher surveys concluded by 10:30 a.m. Descriptions of and rationale for areas excluded from surveys in 2024 are included in Section 3.2, and site photos 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), Mike Moon (under direct supervision of a permitted biologist), and Sarah Nichols between June 18 and August 2 (Table 2). Each cuckoo survey round required two or three observer-mornings. In 2024, SWCA surveyed 18.3 ha (45.3 acres) for cuckoo across all subunits (see Figures 3–7), and surveys required 34.9 survey-hours (see Table 2). Cuckoo surveys concluded by 11:00 a.m. or when the temperature reached 40ºC (104°F), whichever occurred first. Descriptions of and rationale for areas excluded from surveys in 2024 are included in Section 3.2, and site photos are presented in Appendix A.

3.3.2 Point-Count Surveys

The three rounds of point-count surveys were completed at the Riparian Reserve Units by S. Dougill, S. Nichols, J. Sigismondi, and John Mark Simmons between May 2 and July 1, 2024 (Table 3). Each round of point counts required five to seven full and/or partial observer- mornings to cover the Riparian Reserve Units. Weather conditions were favorable during all three survey rounds, with no precipitation and wind speeds ranging from 0 to 18 km (0 to 11 miles) per hour.

S. Nichols and J.M. Simmons completed three rounds of point-count surveys within the BCCE between March 15 and May 12, 2024 (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 recorded during eight point counts and wind speeds ranging from 0 to 32 km (0 to 20 miles) per hour.

3.4 Findings

3.4.1 Federally Listed Bird Surveys and Monitoring

3.4.1.1 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.

Table 1. Survey Dates and Effort for Southwestern Willow Flycatcher Surveys, 2024

Subunit	Mesquite		Bunkerville East	Bunkerville West		Mormon Mesa
Parcel(s)	**West West**	**1-A**	**2-A through 2-G**	**2-I and 2-J**	**2-K through 2-M**	**5-A**
First survey	May 23, 30	May 27	May 22	May 22	May 22	May 21
Second survey	June 9	June5	June 5	June 5	June 5	June 5
Third survey	June 17	June 20	June 13	June 13	June 13	June 13
Fourth survey	July 9	July 9	June 27	June 27	June 27	June 27
Fifth survey	July 15	July 15	July 10	July 10	July 10	July 10
Area surveyed (acres)	28.2	9.2	2.2	0.4	1.4	4.5
Total survey-hours	**17.0**	**7.5**	**7.3**	**2.9**	**6.1**	**7.8**

Table 2. Survey Dates and Effort for Yellow-billed Cuckoo Surveys, 2024

Subunit	Mesquite	Bunkerville East	Bunkerville West		Riverside	Mormon Mesa	Muddy River
Parcel(s)	**1-A**	**2-A through 2-G**	**2-I and 2-J**	**2-K through 2-M**	**3-A and 3-B**	**5-A**	**A through H**
First survey	June 19	June 19	June 19	June 19	June 19	June 18	June 25
Second survey	July 4	July 4	July 4	July 4	July 4	July 3	July 8
Third survey	July 18	July 17	July 17	July 17	July 17	July 16	July 21
Fourth survey	August 2	August 1	August 1	August 1	August 1	July 31	August 2
Area surveyed (acres)	9.2	2.2	0.4	1.4	7.2	16.3	8.6
Total survey-hours	**4.0**	**4.8**	**0.8**	**3.8**	**2.9**	**10.6**	**8.0**

Table 3. Survey Dates for Point-Count Surveys at the Riparian Reserve Units, 2024

Subunit	Mesquite	Bunkerville East	Bunkerville West		Riverside	Mormon Mesa	Mormon Mesa South	Muddy River
Parcel(s)	**1-A**	**2-A through 2-G**	**2-I and 2-J**	**2-K through 2-M**	**3-A and 3-B**	**5-A**	**6-A and 6-B**	**A through H**
First survey	May 6	May 6, 7	May 6, 7, 19	May 6	May 3	May 2	May 2	May 3
Second survey	May 20	May 20, 22	May 19, 22, 28	May 19	May 19	May 21	May 23	May 18
Third survey	June 12	June 8, 9; July 1	June 8, 9	June 9	June 8	June 7	June 7	June 12

In total, 26 adult willow flycatchers were detected during survey and monitoring activities at the Riparian Reserve Units in 2024 (Table 5). Twenty-two willow flycatchers were detected at monitored sites, and four were detected at survey-only sites; 20 were detected at Mesquite West (Appendix B: Figure B-1), two were detected at Bunkerville East Parcels A through G (Appendix B: Figure B-2), two were detected at Bunkerville West Parcels 2-K through 2-M (Appendix B: Figure B-3), and two were detected at Mormon Mesa Parcel 5-A (Appendix B: Figure B-4). Of the four individuals detected at survey-only sites, one was detected on May 22 when willow flycatchers are known to be flying north during migration. This individual was not detected during subsequent visits. The other three individuals detected at survey-only sites were detected during the last round of surveys on dates outside of known migration windows (i.e., between June 24 and July 17) and were presumed to be of the southwestern subspecies. Furthermore, one of these three individuals detected in July was banded, thereby confirming southwestern subspecies identification for this individual.

Table 4. Survey Dates for Point-Count Surveys at the BCCE, 2024

Survey Round	Dates
First	March 15, 16, 17, 18
Second	April 5, 6, 7
Third	May 10, 11, 12

Of the 22 adult willow flycatchers detected at monitored sites, 20 were detected at Mesquite West and two were detected at Mormon Mesa Parcel 5-A. Of the 20 adults detected at Mesquite West, 19 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. In 2024, the single floater at Mesquite West was detected only on June 20. This floater was confirmed to have been previously banded; therefore, this individual is of the southwestern subspecies. Both adults detected at Mormon Mesa Parcel 5-A were residents of the southwestern subspecies that were present for at least 7 days and occupied one breeding territory.

Of the 22 flycatchers detected at monitored sites, 17 (77%) were known to be banded. Four of the 17 banded adults were banded in 2024, and 13 were returning adults that had been banded in previous years. Of the 13 previously banded birds, 10 were individually identified by band combination while three could not be identified to individual. Of nine birds that had been previously detected as adults, all returned to Mesquite West where they had been most recently detected. One adult was detected for the first time since it was banded as a juvenile; this individual fledged from a nest at Mesquite West in 2022.

3.4.1.1.1 Mesquite West

Biologists spent 119.0 observer-hours on territory and nest monitoring at Mesquite West in 2024; activities included determining residency status, observing resident flycatchers, monitoring nests, and banding adults and nestlings. The 20 adults documented at Mesquite West in 2024 comprised seven pairs, five territorial, unpaired males, and one floater (see Table 5). The floater was determined to be of the southwestern subspecies due to having been previously color banded.

Four new adults were color banded (see Table 5). One adult banded in a previous year was 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. Two adults remained unbanded; band status could not be determined for the remaining two adults. Nineteen nestling flycatchers were newly banded in

Table 5. Details of Flycatchers and Willow Flycatchers Detected at All Riparian Reserve Properties, 2024

Subunit[*]	Parcel	Date Banded[†]	Federal Band No.[†]	Color Combination[‡]	Age[§]	Sex[¶]	Territory or Location[#]	Observation Status[**, ††]
MESQ	West[‡‡]	June 5, 2022	2940-35207	Xs:BMB(M)	5Y	F	01	RS
		May 27, 2020	2660-23165	MG(M):VI	A4Y	M	01	RS
		July 18, 2024	3010-42132	MB(M):EY	L	U	01	N
		July 18, 2024	2590-59240	Vs:DR(M)	L	U	01	N
		N/A	N/A	UB:UB	L	U	01	Not confirmed to have fledged
		July 19, 2022	2940-35234	Xs:YB(M)	A4Y	F	02	RS
		May 31, 2021	2660-23363	YV(M):EY	A5Y	M	02	RS
		July 2, 2024	1710-58921	GN:RDR(M)	L	U	02	N
		July 2, 2024	3010-42142	EY:MB(M)	L	U	02	N
		July 2, 2024	2590-59289	RYR(M):Vs	L	U	02	N
		July 2, 2024	2940-35267	KY(M):Xs	L	U	02	N
		July 13, 2021	2660-23395	WGW(M):EY	5Y	F	03	RS
		July 20, 2021	2660-23399	KBK(M):EY	A5Y	M	03	RS
		July 26, 2024	3010-42152	BMB(M):EY	L	U	03	N
		August 14, 2021	2590-53196	WRW(M):XX	4Y	F	04	RS
		June 27, 2019	2660-23228	MY(M):VI	6Y	M	04	RS
		July 1, 2024	2940-35269	DR(M):Xs	L	U	04	N
		July 1, 2024	1710-58975	WD(M):GN	L	U	04	N
		July 1, 2024	2590-59279	Vs:RDR(M)	L	U	04	N
		July 1, 2024	3010-42134	EY:MYM(M)	L	U	04	N
		August 4, 2024	1710-58919	GN:BMB(M)	L	U	04	N
		August 4, 2024	3010-42131	EY:MGM(M)	L	U	04	N
		N/A	N/A	UB:UB	L	U	04	RS
		INA	INA	Undetermined	AHY	F	05	
		July 1, 2024	1710-58927	WY(M):GN	AHY	M	05	N
		July 14, 2024	1710-58988	DW(M):GN	L	U	05	N; died
		July 14, 2024	2590-59300	Vs:BK(M)	L	U	05	N; died

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	F	06	RS
		July 18, 2024	1710-58977	GN:RD(M)	AHY	M	06	N
		July 1, 2024	2590-59277	Vs:YWY(M)	L	U	06	N
		INA	INA	UB:UB	L	U	06	Not confirmed to have fledged
		INA	INA	UB:UB	L	U	06	Not confirmed to have fledged
		July 18, 2024	2590-59241	Vs:DM(M)	AHY	F	07	N
		July 13, 2021	2660-23396	RYR(M):EY	4Y	M	07	R July 18
		July 14, 2024	3010-42155	EY:BMB(M)	L	U	07	N
		July 14, 2024	2590-59249	BK(M):Vs	L	U	07	N
		July 14, 2024	1710-58990	GN:BK(M)	L	U	07	N
		June 25, 2022	2940-35206	Xs:BW(M)	3Y	M	T08	RS; detected May 30–July 6
		INA	INA	Undetermined	AHY	M	T09	Detected May 27–June 7
		June 16, 2024	2590-59275	WY(M):Vs	SY	M	T10	N; detected June 9–July 20
		INA	INA	Banded	AHY	M	F12	RS; detected June 20
		N/A	N/A	UB:UB	AHY	M	T14	RS; detected July 6–18
		INA	INA	Banded	AHY	M	T15	RS; detected July 9–18
BUNK E	2-A	INA	INA	Undetermined	AHY	U	F01	Detected May 22
	2-G	INA	INA	Undetermined	AHY	U	F02	Detected July 10
BUNK W	2-M	INA	INA	Banded	AHY	U	F01	RS; detected July 17
		INA	INA	Undetermined	AHY	U	F02	Detected July 17
MOME	5-A	INA	INA	Banded	AHY	F	01	RS
		N/A	N/A	UB:UB	AHY	M	01	RS

[*] BUNK E = Bunkerville East, BUNK W = Bunkerville West, MESQ = Mesquite, and MOME = Mormon Mesa.

[†] 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, UB = unbanded, undetermined = presence of bands could not be determined, V = violet, 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 2024 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 2024: L = nestling, SY = 2 years, AHY = 2 years or older, 3Y = 3 years, 4Y = 4 years, A4Y = 4 years or older, 5Y = 5 years, A5Y = 5 years or older, and 6Y = 6 years.

[¶] 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.

Table 6. Summary of Flycatcher Nest Monitoring Results at All Study Areas, 2019–2024

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
	Total	**35**	**54**	**26 (48)**	**25 (46)**	**3 (6)**	**51**	**13 (25)**	**50**
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
	Total	**4**	**3**	**1 (33)**	**2 (67)**	**0**	**3**	**1 (33)**	**1**

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
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
Overall total		**39**	**57**	**27 (47)**	**27 (47)**	**3 (5)**	**54**	**14 (26)**	**51**

* 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.

2024 (see Table 5); 17 of the banded nestlings were confirmed to have fledged. In addition, one nestling that was too small to be banded with the rest of the nest and therefore remained unbanded was confirmed to have fledged.

Nests were confirmed for all seven pairs documented in 2024. Twelve confirmed nesting attempts were documented (see Appendix B: Figure B-1). All 12 nesting attempts were known to contain at least one flycatcher egg and were used in calculating nest success and productivity. Seven (58%) of these 12 nests were successful and fledged young, four (33%) failed, and the fate of one nest (8%) remained unknown (Table 6). Two females had one nesting attempt and five had two nesting attempts. In total, 18 fledglings were produced from 11 nests with known outcome. Productivity at Mesquite West was 1.64 young per nest in 2024, and fecundity was 2.83 young produced per female (Table 7).

Table 7. Flycatcher Nest Productivity and Fecundity at Mesquite West, 2019–2024

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¶	0.80 (0.58)
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)
Total	**50**	**51**	**0.98 (0.16)**	**32#**	**1.44 (0.29)**

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

† Fecundity calculations (number of young produced per female) 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 is unknown is not included in the fecundity calculation.

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

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

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

Four nest failures were documented at Mesquite West in 2024. Depredation was the cause of failure at three nests (75%), and desertion was the cause of failure for one nest (25%) Nests that were found empty or destroyed 2 days or more before their anticipated fledge date were considered to have been depredated. Nests that contained eggs or young and were no longer attended to by adults were considered deserted.

Eleven of the 12 nests documented in 2024 had a known parasitism status (see Table 6). The nest with unknown parasitism status was found during the incubation stage but was not mirror poled due to cowbird presence in the territory. The first time the nest was mirror poled, one flycatcher nestling was observed. The nest contents were not observed during the incubation; therefore, parasitism status could not be determined. One (9%) of 11 nests with flycatcher eggs and known parasitism status was brood parasitized by cowbirds. Nest 05A in Mesquite West West contained one flycatcher egg when the nest was located. Five days later, the nest contained one flycatcher egg and one cowbird egg, and the nest had sustained substantial damage. No activity was observed in the nest area, and the nest was deemed to have been deserted. Addling or replacement of the cowbird egg was not necessary.

3.4.1.1.2 Mormon Mesa

Biologists spent 9.9 observer-hours on territory and nest monitoring at Mormon Mesa Parcel 5-A in 2024; monitoring activities included determining residency status, observing resident flycatchers, and monitoring one flycatcher nest. Two adult flycatchers were documented at Mormon Mesa in 2024. The two adults composed one breeding pair. One adult was banded but the color combination could not be determined; one adult remained unbanded.

One nesting attempt was documented just north of Mormon Mesa Parcel 5-A in 2024 (see Appendix B: Figure B-4). This nest was deserted with one flycatcher egg; no flycatchers remained in the area after nest failure.

3.4.1.2 YELLOW-BILLED CUCKOO

Cuckoo surveys across the Riparian Reserve Units in 2024 resulted in three cuckoo detections. In addition, one incidental cuckoo detection was recorded at Mesquite West. One cuckoo detection was recorded at each of the following sets of parcels: Mesquite Parcel 1-A (Appendix B: Figure B-5), Bunkerville West Parcels 2-K through 2-M (Appendix B: Figure B-6), Riverside Parcels 3-A and 3-B (Appendix B: Figure B-7), and Muddy River Parcels A through H (Appendix B: Figure B-8). Only one detection occurred at each of these sets of parcels; therefore, no possible or probable breeding territories were detected (Halterman et al. 2016). No cuckoo detections were recorded at Bunkerville Parcels 2-A through 2-G, Bunkerville Parcels 2-I and 2-J, or Mormon Mesa Parcel 5-A in 2024.

3.4.2 Brown-headed Cowbird Control

Cowbird netting was conducted at Mesquite West over a period of 12 weeks, beginning May 7 and ending July 24 (Table 8). Netting occurred on 16 mornings, with a total of 33 separate net set-ups totaling 28.5 net-hours. No individual netting attempt lasted more than 1 hour. One to three nets were set up each morning, beginning at first light and ending by 10:00 a.m. In total, 24 cowbirds were captured: 14 males and 10 females (0.8 adults per net-hour). No males were recaptured. Biologists used a small mammal guillotine to decapitate the 10 female cowbirds immediately following extraction from the net.

Of the 10 female cowbirds captured at Mesquite West, 7 (70%) were captured between May 7 and May 30 (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 (SWCA 2023b). At Key Pittman Wildlife Management Area in Lincoln County, 57% of female cowbirds captured during the 2023 season were captured between May 15 and May 26. At Warm Springs Natural Area in Clark County, 60% of females captured during the 2023 season were captured between May 16 and 25. 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.

3.4.3 Point-Count Surveys

In total, 76 avian species were recorded across all the County's properties during 2024 point-count surveys, and MSHCP-covered species were observed at each property. Five additional species were detected during federally listed bird surveys but were not detected during point counts; two of these species were those targeted during species-specific surveys (flycatcher and cuckoo), and three were incidentally detected.

Table 8. Number of Brown-headed Cowbirds Netted by Date at Mesquite West, 2024

Sex	May 07	May 09	May 13	May 15	May 19	May 23	May 27	May 30	June 07	June 12	June 16	June 28	July 02	July 09	July 20	July 24	Total
Male	1	0	0	0	1	1	1	1	2	2	0	2	1	0	1	1	14
Female	0	1	0	0	1	2	2	1	1	0	1	0	0	0	1	0	10
Total	**1**	**1**	**0**	**0**	**2**	**3**	**3**	**2**	**3**	**2**	**1**	**2**	**1**	**0**	**2**	**1**	**24**

Table 9. Number of Detections and Breeding Codes for MSHCP-Listed Avian Species Recorded at the Riparian Reserve Units, 2024

Subunit	Mesquite	Bunkerville East	Bunkerville West	Riverside	Mormon Mesa	Mormon Mesa South	Muddy River
Parcel(s)	**1-A**	**2-A through 2-G**	**2-I through 2-M**	**3-A and 3-B**	**5-A**	**6-A and 6-B**	**A–H**
Arizona Bell's vireo	3 (PO)	3 (PO)	5 (PO)	20 (PO)	5 (PO)	7 (PO)	3 (PO)
Blue grosbeak	–	6 (PO)	4 (PO)	4 (PO)	X	–	1 (PO)
Crissal thrasher	–	6 (PO)	2 (PO)	2	X	X	6 (PO)
Loggerhead shrike	–	I*	–	–	I	–	–
Phainopepla	–	1	–	1	–	–	X
Southwestern willow flycatcher	S*	S	S	–	S*	–	–
Vermilion flycatcher	–	I	–	–	–	–	I
Yellow-billed cuckoo	I†	–	S	S	–	–	S

Note: X = species recorded at that unit during point counts but never within 100 m (328 feet) of a point-count location; CO = Breeding confirmed—adult observed carrying nesting material, adult at a nest, or a fledgling observed; PO = breeding possible—individual(s) singing in appropriate habitat at that unit 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.

* 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 less than 20 meters west of Parcel 1-A (within the Mesquite West West boundary).

3.4.3.1 RIPARIAN RESERVE UNITS

3.4.3.1.1 MSHCP-Listed Species

Of the eight avian species covered by the MSHCP, three were recorded during the 2024 point-count surveys: Arizona Bell's vireo, blue grosbeak, and phainopepla. Two additional MSHCP-covered avian species were detected during species-specific surveys at the Riparian Reserve Units: flycatcher and cuckoo. One additional MSHCP-covered species, vermilion flycatcher, was incidentally detected during cuckoo surveys (Table 9).

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 parcels in the Bunkerville, Riverside, Mormon Mesa, Mormon Mesa South, and Muddy River subunits. Loggerhead shrike (*Lanius ludovicianus*) was detected incidentally at the Bunkerville and Mormon Mesa 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 in 2024. Loggerhead shrike fledglings were observed at Bunkerville 2-A through 2-G, confirming breeding for this species. Arizona Bell's vireo, blue grosbeak, and crissal thrasher were suspected of breeding at various other Riparian Reserve Units (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 in 2024 for any of the other MSHCP-listed species.

3.4.3.1.2 Non-MSHCP-Listed Species

During the three rounds of point-count surveys in 2024, biologists recorded 65 non-MSHCP-listed avian species across all the Riparian Reserve Units (Table 10). 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 65 non-MSHCP species detected during point-count surveys, eight were recorded at each of the seven subunits: black-tailed gnatcatcher (*Polioptila melanura*), cowbird, Gambel's quail (*Callipepla gambelii*), Lucy's warbler (*Leiothlypis luciae*), mourning dove (*Zenaida macroura*), northern rough-winged swallow (*Stelgidopteryx serripennis*), verdin (*Auriparus flaviceps*), and yellow-breasted chat (*Icteria virens*). Although some species (e.g., western tanager [*Piranga ludoviciana*], Wilson's warbler [*Cardellina pusilla*], 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 in 2024.

Table 10. Number of Detections and Breeding Codes for Non-MSHCP-Listed Avian Species Recorded at the Riparian Reserve Subunits, 2024

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*	–	26 (CO)	20 (PO)	7 (PO)	2 (PO)	3	30 (PO)
Anna's hummingbird	*Calypte anna*	1 (PO)	4 (PO)	1 (PO)	–	–	–	–
Ash-throated flycatcher	*Myiarchus cinerascens*	–	–	1	–	4 (PO)	3	1
Barn swallow	*Hirundo rustica*	–	–	–	2	–	–	–
Bewick's wren	*Thryomanes bewickii*	–	1	–	–	2 (PO)	–	15 (PO)
Black-headed grosbeak	*Pheucticus melanocephalus*	–	–	1 (PO)	3 (PO)	–	–	–
Black-tailed gnatcatcher	*Polioptila melanura*	1	13 (CO)	3 (PO)	4 (PO)	2	2 (CO)	8 (PO)
Black-throated sparrow	*Amphispiza bilineata*	–	–	–	2	–	–	–
Blue-gray gnatcatcher	*Polioptila caerulea*	–	–	–	–	1	2	–
Broad-tailed hummingbird	*Selasphorus platycercus*	–	1	–	–	–	–	–
Brown-crested flycatcher	*Myiarchus tyrannulus*	–	–	–	–	2 (PO)	–	–
Brown-headed cowbird	*Molothrus ater*	1 (CO)*	10	5 (PO)	20 (PO)	2	2	4
Bullock's oriole	*Icterus bullockii*	–	2	1	–	X	–	4 (PO)
Canada goose	*Branta canadensis*	X	–	3	1	–	–	–
Canyon wren	*Catherpes mexicanus*	–	–	–	–	–	–	3 (PO)
Cassin's vireo	*Vireo cassinii*	–	–	–	1	–	–	–
Cedar waxwing	*Bombycilla cedrorum*	–	2	–	–	–	–	–
Cliff swallow	*Petrochelidon pyrrhonota*	–	2	80	1	–	–	–
Common raven	*Corvus corax*	–	–	–	–	1	–	6 (CO)
Common yellowthroat	*Geothlypis trichas*	3 (PO)	1	2 (PO)	1 (PO)	2 (PO)	–	–
Cooper's hawk	*Accipiter cooperii*	–	2	–	–	–	–	–
Costa's hummingbird	*Calypte costae*	–	–	1	–	–	–	30 (PO)
Dusky flycatcher	*Empidonax oberholseri*	–	–	–	–	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)
Eurasian collared-dove	*Streptopelia decaocto*	–	1	–	1	–	–	7 (PO)
Gambel's quail	*Callipepla gambelii*	3 (PO)	25 (CO)*	21 (PO)	6 (PO)	4	2	29 (PO)
Gray flycatcher	*Empidonax wrightii*	–	–	–	–	1	–	1
Great blue heron	*Ardea herodias*	–	2	1	–	–	–	–
Greater roadrunner	*Geococcyx californianus*	–	–	–	1 (PO)	1 (PO)	–	–
Great-tailed grackle	*Quiscalus mexicanus*	–	3 (PO)	–	1	–	–	–
Green-tailed towhee	*Pipilo chlorurus*	–	1	–	–	–	–	–
Hooded oriole	*Icterus cucullatus*	–	–	–	–	–	–	2
Horned lark	*Eremophila alpestris*	–	–	1	–	–	–	–
House finch	*Haemorhous mexicanus*	1 (CO)	9 (PO)	–	8 (PO)	–	4 (PO)	12 (PO)
House sparrow	*Passer domesticus*	–	–	–	–	–	–	26 (CO)
Indigo bunting	*Passerina cyanea*	–	–	–	–	I	–	–
Killdeer	*Charadrius vociferus*	–	10 (PO)	5	–	–	–	–
Ladder-backed woodpecker	*Dryobates scalaris*	–	6	4	1	–	1	1
Lark sparrow	*Chondestes grammacus*	–	–	–	–	7	–	–
Lazuli bunting	*Passerina amoena*	–	11 (PO)	9 (PO)	8 (PO)	2 (PO)	–	3 (PO)
Lesser goldfinch	*Spinus psaltria*	–	22 (PO)	4	–	–	–	2
Long-billed dowitcher	*Limnodromus scolopaceus*	–	5	–	–	–	–	–
Lucy's warbler	*Leiothlypis luciae*	2 (PO)	19 (PO)	8 (PO)	19 (PO)	9 (CO)	12 (PO)	13 (CO)
Mourning dove	*Zenaida macroura*	1 (CO)*	16 (PO)	4 (PO)	7 (PO)	4 (PO)	10 (PO)	18 (PO)
Northern mockingbird	*Mimus polyglottos*	–	–	2 (PO)	1 (PO)	–	–	–
Northern rough-winged swallow	*Stelgidopteryx serripennis*	1	26	22	5	16 (CO)	1	3
Pine siskin	*Spinus pinus*	–	2	–	–	–	–	–
Red-tailed hawk	*Buteo jamaicensis*	–	–	–	1	–	–	1
Red-winged blackbird	*Agelaius phoeniceus*	–	11 (PO)	8 (PO)	11 (PO)	3 (PO)	3	–

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)
Rock wren	*Salpinctes obsoletus*	–	–	–	1	–	–	4 (PO)
Ruby-crowned kinglet	*Corthylio calendula*	–	–	–	1	–	–	–
Say's phoebe	*Sayornis saya*	–	–	–	–	–	–	1 (PO)
Song sparrow	*Melospiza melodia*	6 (PO)	7 (PO)	4 (PO)	4	6 (PO)	–	1
Turkey vulture	*Cathartes aura*	–	–	1	–	–	–	–
Verdin	*Auriparus flaviceps*	1 (PO)	23 (PO)	12 (PO)	20 (CO)	9 (CO)	6 (PO)	6
Violet-green swallow	*Tachycineta thalassina*	–	1	–	–	–	–	–
Warbling vireo	*Vireo gilvus*	–	–	–	1	–	–	–
Western kingbird	*Tyrannus verticalis*	–	–	3 (PO)	–	1	–	3 (PO)
Western tanager	*Piranga ludoviciana*	–	–	–	4	–	–	2
Western wood-pewee	*Contopus sordidulus*	–	–	–	–	–	–	3 (PO)
White-crowned sparrow	*Zonotrichia leucophrys*	–	1	–	–	–	1	–
White-faced ibis	*Plegadis chihi*	–	–	I	–	–	–	–
White-winged dove	*Zenaida asiatica*	1 (PO)	–	–	–	–	–	3 (PO)
Wilson's warbler	*Cardellina pusilla*	–	–	–	2	–	–	–
Woodhouse’s scrub-jay	*Aphelocoma woodhouseii*	–	–	–	–	–	–	2
Yellow warbler	*Setophaga petechia*	9 (PO)	5 (PO)	10 (PO)	12 (PO)	3 (PO)	4 (PO)	–
Yellow-breasted chat	*Icteria virens*	8 (PO)	4 (PO)	7 (PO)	12 (PO)	7 (PO)	2 (PO)	2 (PO)
Yellow-rumped warbler	*Setophaga coronata*	–	1	–	4	1	2	–

Note: X = species recorded at that unit during point counts but never within 100 m (328 feet) of a point-count location; CO = Breeding confirmed—adult observed carrying food or nesting material, adult at a nest, or a fledgling observed; PO = breeding possible—individual(s) singing in appropriate habitat at that unit during the breeding season. I = species recorded incidentally during surveys or monitoring for federally listed birds but not during point-count surveys. 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.

Breeding was confirmed for black-tailed gnatcatcher, cowbird, common raven (*Corvus corax*), Gambel's quail, house finch (*Haemorhous mexicanus*), house sparrow (*Passer domesticus*), Lucy's warbler, mourning dove, northern rough-winged swallow, and verdin, for which biologists observed a fledgling, an adult carrying food, an adult at a nest, or eggs in a nest. Additionally, 26 other 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 38 species recorded during point-count surveys, while the Mesquite subunit yielded the lowest species richness, with 15 species recorded. The five most commonly detected species across all the Riparian Reserve Units were Gambel's quail, Abert's towhee (*Melozone aberti*), cliff swallow (*Petrochelidon pyrrhonota*), Lucy's warbler, and verdin.

3.4.3.2 BCCE

3.4.3.2.1 MSHCP-Listed Species

None of the eight MSHCP-covered bird species were recorded during point-count surveys in the BCCE in 2024. Two evaluation bird species were recorded: loggerhead shrike and LeConte's thrasher (*Toxostoma lecontei*). Loggerhead shrike was detected from three point-count locations, and LeConte's thrasher was detected from four point-count locations (Table 11). While breeding could not be confirmed for either species in 2024, 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, 2024

Common Name	Scientific Name	Total Detections	Detections within 100 m	Breeding Codes
Loggerhead shrike	*Lanius ludovicianus*	3	2	–
LeConte's thrasher	*Toxostoma lecontei*	4	2	PO

Note: A dash indicates no detections of the species.

3.4.3.2.2 Non-MSHCP-Listed Species

SWCA biologists recorded 17 avian species not listed under the MSHCP across the BCCE point-count locations over all three rounds of point-count surveys in 2024 (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 these 17 species recorded during point-count surveys, 14 were recorded within 100 m (328 feet) of a point-count location. The two most commonly detected species at the BCCE, regardless of distance from surveyor as well as within 100 m (328 feet) of a point-count location, were horned lark (*Eremophila alpestris*) and black-throated sparrow (*Amphispiza bilineata*) (see Table 12).

Although some of the species detected at the BCCE in 2023 were likely migrating through the area on their way to breeding grounds farther north or at higher elevations (e.g., sage thrasher [*Oreoscoptes montanus*] and tree swallow [*Tachycineta bicolor*]), most of these species are known to breed in the Mojave Desert and may have bred or attempted to breed within the BCCE boundary in 2024.

Table 12. Number of Detections and Breeding Codes for Non-MSHCP-Listed Species Recorded at the BCCE during Point-Count Surveys, 2024

Common Name	Scientific Name	Total Detections	Detections within 100 m	Breeding Codes*
American kestrel	*Falco sparverius*	1	0	–
Ash-throated flycatcher	*Myiarchus cinerascens*	2	2	–
Barn swallow	*Hirundo rustica*	3	3	–
Black-throated sparrow	*Amphispiza bilineata*	50	39	CO
Brewer's sparrow	*Spizella breweri*	6	6	PO
Cactus wren	*Campylorhynchus brunneicapillus*	5	4	PO
Common raven	*Corvus corax*	26	3	–
Horned lark	*Eremophila alpestris*	56	47	CO
House finch	*Haemorhous mexicanus*	3	3	–
Ladder-backed woodpecker	*Dryobates scalaris*	1	0	–
Mourning dove	*Zenaida macroura*	3	2	PO
Northern rough-winged swallow	*Stelgidopteryx serripennis*	3	1	–
Red-tailed hawk	*Buteo jamaicensis*	4	2	–
Rock wren	*Salpinctes obsoletus*	6	5	PO
Sage thrasher	*Oreoscoptes montanus*	3	1	–
Tree swallow	*Tachycineta bicolor*	12	12	–
Turkey vulture	*Cathartes aura*	1	0	–

Note: CO = Breeding confirmed—adult observed carrying food or fledgling(s) observed; PO = breeding possible—individual(s) singing in appropriate habitat at that unit during the breeding season. A dash indicates no detections of the species.

Confirmation of breeding was recorded for three species not listed under the MSHCP: black-throated sparrow and horned lark. Four other 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.

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 69 avian species detected, including four MSHCP-covered and evaluation species; two additional MSHCP-covered and evaluation species were incidentally detected and two were detected during protocol-level surveys for federally listed species in 2024. Two additional non-MSHCP-listed species were detected incidentally during flycatcher or cuckoo surveys. Point counts across the BCCE yielded 19 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

Most of the vegetation at Mesquite Parcel 1-A consisted of narrowleaf willows 4 to 7 m (13–23 feet) in height (Appendix A: Figure A-1); the remainder of the vegetation consisted primarily of tamarisk 4 to 6 m (13–20 feet) in height and patches of narrowleaf willows approximately 3 to 4 m (10–13 feet) in height. In portions of Parcel 1-A that receive regular water flow, canopy closure generally ranged from 80% to 95%. Throughout the breeding season, water from Pulsipher Wash ran generally from north to south throughout most of Parcel 1-A; the wash can be seen entering Parcel 1-A from the north in Figure 3.

Hydrologic conditions within Parcel 1-A vary widely from year to year. In the northern two-thirds of the site, soils remained damp to saturated on days when there were no flows entering the parcel via Pulsipher Wash. During the 2024 season, water flowed toward Parcel 1-A from the north through the eastern of two humanmade channels before splitting into both channels prior to entering the north end of Parcel 1-A. Water conditions in 2024 were similar to those observed in August 2023; it appeared that more water flowed into the site and reached farther south when it entered through both channels than when it entered through only the western channel, as it did in May through July 2023. Approximately 40 m (131 feet) north of Parcel 1-A, the water was diverted by a naturally incised stream bank to the west away from the channel along the eastern edge of the site. At the point where water was diverted to the west, the Pulsipher Wash channel was incised approximately 0.5 m (18 inches) (Appendix A: Figure A-2). This diversion pushed the water through a historical flycatcher breeding area (last occupied in 2021) before the water spread south into Parcel 1-A. The historical flycatcher breeding area consisted of standing dead narrowleaf willow in 2024 (Appendix A: Figures A-3 and A-4).

Standing, dead narrowleaf willows were also present along the eastern boundary of the site and in areas farther south in Parcel 1-A where lack of water was noted in narrowleaf willow patches in 2023 (Appendix A: Figure A-5). Although some soils in the southern third of the site that were dry and cracked in 2023 were damp in 2024, woody vegetation in the areas with damp soils was mostly dead (Appendix A: Figures A-6 and A-7); these areas were removed from flycatcher and cuckoo survey areas in 2024 (see Section 3.2.1). Despite these areas of standing, dead narrowleaf willows, the western portion of this parcel contained the best habitat for flycatcher within the County's Riparian Reserve Units.

Habitat quality within Parcel 1-A was evidenced by the presence of multiple flycatcher territories (see Section 3.3.1 and Appendix B: Figure B-1). Parcel 1-A occupies most of the eastern portion of a larger site known as Mesquite West, which has been monitored annually by SWCA (under various contracts) and NDOW biologists since 2003 (McLeod and Pellegrini 2013, 2014; NDOW, unpublished data). From 2003 through 2012, Mesquite West had anywhere from six to 30 resident adult flycatchers each year (McLeod and Pellegrini 2013).

In addition to flycatcher, two other MSHCP-covered species were detected at Parcel 1-A in 2024: Arizona Bell's vireo and cuckoo. Arizona Bell's vireo was detected at the single point-count location surveyed in 2024, and cuckoo was incidentally detected just 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 most commonly detected species detected during point-count surveys within Mesquite Parcel 1-A in 2024, signifying that the ecosystem at Parcel 1-A was healthy.

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) in height with interspersed tamarisk trees. A few 10-m- (33-foot-) tall Goodding's willows were scattered throughout the site. Several cattail (*Typha* sp.) 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 (*Baccharis salicifolia*) and occasional patches of common reed (*Phragmites australis*). Several emergent Russian olive (*Eleagnus angustifolia*), screwbean mesquite, and velvet ash trees were scattered throughout this portion of the site. Canopy closure varied from 40% in the areas of dead narrowleaf willows to greater than 90% in areas of healthy willow. Hydrology at the site was influenced by fluctuating, but regular, irrigation return flows. A large beaver pond at the west end of the site contained up to 1 m (3 feet) of water, with the deepest water level observed in August. Water levels outside of the beaver pond varied throughout the season and at least half of the site retained damp soils into August.

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 (Appendix A: Figure A-8). Bunkerville 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- (3- to 10-foot-) tall mule-fat, tamarisk, screwbean mesquite, and intermittent arrowweed (Appendix A: Figures A-9 and A-10). Any regrowth in this area was generally patchy tamarisk, arrowweed, and big saltbush, 2 to 4 m (7–13 feet) in height, with little to no continuous canopy. A section of the southern portion of Bunkerville Parcel 2-F was being used for growing alfalfa (*Medicago sativa*) and grazing cattle (*Bos taurus*) and horses (*Equus ferus caballus*).

Parcels 2-A through 2-G contained very little vegetation that resembled typical flycatcher or cuckoo breeding habitat, and neither species was recorded within these parcels through 2020. In 2021, however, a cuckoo was recorded immediately south of Parcel 2-B in a patch of young narrowleaf willows. In 2023, a cuckoo flew into Goodding's willows in Parcel 2-F in response to playback. The areas where cuckoos were detected were not suitable cuckoo breeding habitat due to very small patch size. In 2022, one willow flycatcher was detected in a sparsely vegetated patch of tamarisk in Parcel 2-D.

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 was added to flycatcher and cuckoo survey areas in 2024; this patch consisted of narrowleaf willows 3 to 4 m (10–13 feet) in height with 75% canopy closure (Appendix A: Figure A-13) (see Section 3.2.2). This small patch was adjacent to the Virgin River and exhibited damp to saturated soils. Three other patches were surveyed for flycatcher and cuckoo in 2024: two patches consisted of 2- to 4-m- (7- to 13-foot-) tall narrowleaf willows with emergent Goodding's willows and mesquite with 75%

canopy closure (Appendix A: Figure A-14), and one patch consisted of 4- to 5-m- (13- to 16-foot-) tall tamarisk with up to 80% 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.

Two willow flycatchers were detected during species-specific surveys at Bunkerville East in 2024: one individual was detected on May 22 and one individual was detected on July 10. The individual detected on July 10 was presumed to be of the southwestern subspecies based on date of detection outside of a known migration window (i.e., between June 24 and July 17). Both willow flycatchers responded briefly to playback and did not exhibit territorial behavior; no further flycatcher surveys were conducted, and neither individual was detected during cuckoo surveys on subsequent visits to the site in July and August.

Three MSHCP-covered species were recorded during point-count surveys at Bunkerville Parcels 2-A through 2-G: Arizona Bell's vireo, blue grosbeak, and phainopepla. Blue grosbeak was detected from all seven point-count locations surveyed within this set of parcels in 2024, while Arizona Bell's vireo was detected from four point-count locations, and phainopepla was detected from one point-count location. 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). One additional MSHCP-covered species, vermilion flycatcher, was incidentally detected during a cuckoo survey. Two evaluation species were detected in 2024: crissal thrasher and loggerhead shrike. Crissal thrasher was recorded from five of the seven point-locations within these parcels in 2024. This species prefers dense, scrubby vegetation often near water but is not a riparian obligate. Loggerhead shrike was incidentally detected during a cuckoo survey.

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 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 (Appendix A: Figure A-15). 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 Parcels 2-I and 2-J host very few large native riparian trees, such as those used by flycatcher and cuckoo. Most mature riparian vegetation within these parcels consisted of tamarisk and screwbean mesquite 2 to 5 m (7–16 feet) tall (Appendix A: Figure A-16) 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 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 Parcels 2-I and 2-J does not, due largely to its poor health at these two parcels.

Parcels 2-I and 2-J have flowing channels, a pond, and a wet meadow/wetland with emergent vegetation, all of which could support native riparian habitat in the future. The wet meadow is in the east half of Parcel 2-J and is composed largely of sedges (Cyperaceae family) and wetland grasses, with scattered Goodding's willows (Appendix A: Figure A-17). Tamarisk that were present in the wet meadow in recent years had been cut down before the habitat assessment in late April 2024 (Appendix A: Figure A-18). 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 have been partially successful; some cattle sign was

observed at Parcels 2-I and 2-J in June and July 2024. The wet meadow was damp at the beginning of the season, with sedges in the meadow appearing mostly brown (see Appendix A: Figure A-17).

As a result of the habitat suitability assessment in April 2024, most of the habitat previously surveyed for flycatcher and cuckoo was eliminated due to poor habitat quality. Eliminated areas included a <10-m- (<33-foot-) wide strip of 3- to 4-m- (10- to 13-foot-) tall tamarisk and mesquite, 5-m- (16-foot-) tall tamarisk and/or mesquite with <65% canopy closure, and an area in which tamarisk observed in previous seasons had been cut down (Appendix A: Figures A-19 and A-20). A total of 5.5 ha (13.5 acres) was eliminated from flycatcher and cuckoo survey areas.

One small (0.2-ha [0.4-acre]) survey area remained after the habitat suitability assessment in 2024 (see Section 3.2.3.1). This area consisted of tamarisk up to 6 m (20 feet) in height with 80% canopy closure (Appendix A: Figure A-21). A stream flowed through the survey area with soils away from the stream being dry. This area was affected by tamarisk leaf beetles during the breeding season, with most tamarisk turning brown by early July. No willow flycatchers were detected at Parcels 2-I and 2-J in 2024.

Two MSHCP-covered bird species were recorded during point-count surveys at Bunkerville 2-I and 2-J: Arizona Bell's vireo and blue grosbeak. Each was detected from three of the four point-count locations surveyed in 2024. One MSHCP evaluation bird species, crissal thrasher, was recorded from two of the four point-count locations.

4.3.2 Parcels 2-K through 2-M

Bunkerville 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 are characterized by isolated or narrow, or both, patches of riparian vegetation containing tamarisk, narrowleaf willows, and Goodding's willows adjacent to wet meadows, marshes, and open water features (Appendix A: Figures A-22 and A-23).

A habitat suitability assessment in April 2024 eliminated most areas previously surveyed for flycatcher and cuckoo (see Section 3.2.3.2). Eliminated areas consisted of strings of narrowleaf willows ≤5 m (≤16 feet) wide, sparse tamarisk with <65% canopy closure, or tamarisk ≤3.5 m (≤11.5 feet) tall (Appendix A: Figures A-24 and A-25). A total of 1.6 ha (3.9 acres) was eliminated from flycatcher and cuckoo survey areas.

Three survey areas remained after the habitat suitability assessment. One survey area consisted of 8- to 12-m- (26- to 39-foot-) tall Goodding's willows with a 4- to 6-m- (13- to 20-foot-) tall narrowleaf willow and tamarisk understory and 75% to 90% canopy closure (Appendix A: Figures A-26 and A-27). This survey area intermittently contained standing water, which depended on flow in an adjacent irrigation channel. 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 (Appendix A: Figure A-28). A survey area on the north side of the pond consisted of 3- to 5-m- (10- to 16-foot-) tall narrowleaf willows with 75% to 80% canopy closure. By early July, early leaf abscission was observed in the willows, the remaining foliage appeared sparse and small, and canopy closure in the willows was reduced to 60% (Appendix A: Figure A-29). The third survey area, on the south side of the pond, consisted of 3- to 5-m- (10- to 16-foot-) tall tamarisk and screwbean mesquite with 2-m- (7-foot-) tall arrowweed scattered throughout the patch. Canopy closure in small portions of this survey area approached 80% in April.

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 in 2024 (Appendix A: Figures A-30 and A-31). Marshes in the southern portion of Parcel 2-L were dry in 2024, with sapling tamarisk and cattails filling in some of the previously marshy habitat (Appendix A: Figure A-32). Bunkerville Parcel 2-L does not currently provide breeding habitat for flycatcher or cuckoo.

In 2023, as part of a thermal refugia study under County Project No. 2019-SWCA-1935A, an iButton datalogger was placed in Bunkerville Parcel 2-M in vegetation that resembled flycatcher breeding habitat but was unoccupied. SWCA biologists had identified this area in previous years as having structure that appeared suitable for breeding flycatchers. Of the data recorded by 10 dataloggers placed in habitat unoccupied by flycatchers, maximum temperature and mean relative humidity recorded at this location were the most similar to those recorded at flycatcher nest locations (SWCA 2023), further suggesting that this area resembles flycatcher breeding habitat.

No flycatchers were detected during surveys at these parcels in 2024, however two willow flycatchers were incidentally detected during a cuckoo survey on July 17 in the southeast corner of Parcel 2-M in the patch described above (see Appendix A: Figures A-26 and A-27). Surveyors observed one individual to be banded, thereby confirming southwestern subspecies identification; although the second adult was not seen, it was assumed to be of the southwestern subspecies based on date of detection. In past seasons, SWCA biologists have confirmed band combinations of flycatchers detected in areas away from the territories held by the individuals during the breeding season. Males appear to prospect for new habitat at the end of the breeding season and have been observed singing in habitat that was previously occupied by another individual or that appeared to be suitable but was not occupied during the breeding season. It is possible that the banded individual detected at Parcel 2-M occupied a territory at Mesquite West during the breeding season, however observers were unable to confirm the band combination of this individual to determine whether it had been detected previously in the season.

One cuckoo was also detected during surveys at the southeast corner of Parcel 2-M. Although Parcels 2-L and 2-M are not currently occupied nesting habitat for flycatcher or cuckoo, the willow patch in the southeast portion of Parcel 2-M shows promise as flycatcher habitat. Future restoration actions, including fencing of the willow habitat and changes in vegetation and water management, could improve the habitat potential for cuckoo and flycatcher in Parcels 2-K through 2-M.

In addition to flycatcher and cuckoo, two MSHCP-covered species were recorded at Bunkerville Parcels 2-K through 2-M: Arizona Bell's vireo and blue grosbeak. Arizona Bell's vireo was detected from one of two point-count locations surveyed in 2024, while blue grosbeak was detected from both point-count locations. One evaluation species, crissal thrasher, was detected from both point-count locations.

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 (Appendix A: Figures A-33 and A-34). 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.

A habitat suitability assessment in April 2024 resulted in elimination of all previously surveyed flycatcher and cuckoo areas (see Section 3.2.4). Eliminated areas consisted of stringers of narrowleaf willows ≤5 m (≤16 feet) wide along an irrigation ditch, tamarisk ≤3.5 m (11.5 feet) tall, or tamarisk with ≤65% canopy closure (Appendix A: Figures A-35 and A-36).

One 3.0-ha (7.2-acre) cuckoo survey area was added. This area consisted of 3- to 5-m- (10- to 16-foot-) tall honey and screwbean mesquite (Appendix A: Figure A-37). One cuckoo was detected during a survey on July 4. This detection was recorded in the same general location as detections from 2023.

In addition to cuckoo, three MSHCP-covered avian species were recorded at the Riverside subunit: Arizona Bell's vireo, blue grosbeak, and phainopepla. Arizona Bell's vireo was detected from all five point-count locations surveyed in 2024, while blue grosbeak was detected from two point-count locations and phainopepla 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 mistletoe (*Phoradendron* spp.) berries that grow 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 Units. One MSHCP evaluation species, crissal thrasher, was recorded from two of the five point-count locations surveyed in 2024.

The Riverside subunit does not currently contain vegetation that resembles typical flycatcher or cuckoo breeding habitat. The patch of narrowleaf willows along the irrigation ditch is generally not wide enough to provide suitable breeding habitat, and the patches of tamarisk are dry and open and do not have the saturated soils typical of flycatcher breeding habitat. Surface water at the Riverside subunit is restricted to the active river channel and the irrigation ditch along the east side of the subunit.

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 (Appendix A: Figure A-38; 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. Following a desktop habitat assessment in 2024, 2.5 ha (6.3 acres) was removed from flycatcher and cuckoo survey areas due to poor habitat quality (see Section 3.2.5). Areas removed from flycatcher and cuckoo survey areas consisted of dead or dying tamarisk or tamarisk ≤3.5 m (11.5 feet) in height or with <65% canopy closure (Appendix A: Figures A-39 and A-40).

Remaining flycatcher and cuckoo survey areas consisted of clumps of 3- to 4-m- (10- to 13-foot-) tall narrowleaf willows and tamarisk with scattered, emergent 8- to 14-m- (26- to 46-foot-) tall Goodding's willows (Appendix A: Figures A-41 and A-42). Most of the tamarisk over 3 m (10 feet) tall was 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- (7-foot-) tall arrowweed. Canopy closure ranged from 30% to 75%. Water levels in the Virgin River decreased throughout the season. Within the surveyed area, most of the site was inundated with over 10 centimeters (4 inches) of water in late May. Water levels on-site decreased throughout the season, and the site was dry to muddy in July and August.

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 11); this area was surveyed for cuckoo. Some of the mesquite trees in this area were dead or in poor condition with less foliage volume than was observed in previous years.

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 (Appendix A: Figures A-43 and A-44). SWCA biologists first observed cattle within multiple restoration plots at the Mormon Mesa subunit in 2021. Cattle activity increased in 2022 through 2024 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 2024 (Appendix A: Figures A-45 and A-46).

Large Goodding's willows and small patches of narrowleaf willows were present in the northwest corner of Parcel 5-A. In 2024, one pair of flycatchers nested in a patch of narrowleaf willows just north of the Parcel 5-A boundary. Despite the lack of nesting attempts within the Parcel 5-A boundary from 2021 through 2023, this habitat still appears suitable for flycatcher, as canopy height, canopy closure, and hydrologic conditions do not appear to have changed appreciably since nesting last occurred in 2020.

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 unit appearing to be in poor health, there are still patches of mature native vegetation that should be protected.

Three MSHCP-covered species were recorded at the Mormon Mesa Riparian Reserve Unit: Arizona Bell's vireo, blue grosbeak, and flycatcher. Arizona Bell's vireo was detected from two of the three point-count locations surveyed in 2024, while blue grosbeak was detected from one point-count location. Flycatcher was detected during species-specific surveys, and one pair nested just north of the Parcel 5-A boundary. Two MSHCP evaluation bird species were detected in 2024: crissal thrasher and loggerhead shrike. Crissal thrasher was detected from one of the three point-count locations, and loggerhead shrike was incidentally detected during a cuckoo survey.

4.6 Mormon Mesa South

In late 2021, the County acquired two parcels, 6-A and 6-B, approximately 0.8 km (0.5 mile) south of Mormon Mesa subunit Parcel 5-A. These parcels compose the Mormon Mesa South subunit. SWCA surveyed 14.3 ha (35.4 acres) of potential flycatcher and cuckoo habitat in 2022 and 2023. After a desktop habitat assessment in 2024, all flycatcher and cuckoo survey areas were eliminated due to poor habitat quality; no flycatcher or cuckoo surveys were performed at Mormon Mesa South in 2024 (see Section 3.2.6).

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 (Appendix A: Figure A-47). As observed in 2023, much of the vegetation in the site was similar to that of Mormon Mesa subunit Parcel 5-A: dead or dying tamarisk 3 to 4 m (10–13 feet) in height, with 8- to 12-m- (26- to 39-foot-) tall Goodding's willows scattered in low numbers throughout the parcels (Appendix A: Figure A-48). Narrow patches of 3- to 4-m- (10- to 13-foot-) tall narrowleaf willows, common reed, and cattails were present along the immediate edge of the slough (see Appendix A: Figure A-47).

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. The narrowleaf willows along the edge of the slough stand approximately 3 to 4 m (10 to 13 feet) in height and provide canopy

closure of less than 50%. The height and density of these small areas of narrowleaf willows are not suitable for flycatcher or cuckoo.

One MSHCP-covered species, Arizona Bell's vireo, was recorded at the Mormon Mesa South Riparian Reserve Unit. This species was recorded from both point-count locations surveyed in 2024. 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 Riparian Reserve Unit is highly diverse. Parcels A–E are dominated by horticultural plantings (e.g., pine, California fan palm [*Washingtonia filifera*], and oak) (Appendix A: Figures A-49 and A-50), creosote bush (*Larrea tridentata*) scrubland, and big saltbush (Appendix A: Figures A-51 and A-52). Parcel F is dominated almost completely by creosote bush scrub, with smaller patches of honey mesquite, particularly in the central and southeastern portions of the parcel (Appendix A: Figures A-53 and A-54). Parcels G–I are composed largely of very dense thickets of big saltbush and Mojave seablite (*Suaeda moquinii*) mixed with scattered honey mesquite and tamarisk (Appendix A: Figures A-55 and A-56). Although the Muddy River runs near the Muddy River Riparian Reserve Unit, it does not run through any of the southern parcels and only forms the eastern boundary of Parcels A–E. This portion of the Muddy River is deeply incised, and desert riparian vegetation, consisting of widely scattered tamarisk and velvet ash, is generally limited to within approximately 2 m (7 feet) of the riverbank.

An on-site habitat suitability assessment in late April 2024 resulted in elimination of all 3.5 ha (8.6 acres) of habitat previously surveyed for flycatcher due to poor habitat quality or small patch size (see Section 3.2.7). Swaths of big saltbush were eliminated from cuckoo survey areas in Parcels A through E, and one new mesquite-dominated survey area was added in Parcel F. The newly added cuckoo survey area consisted of mesquite 3 to 5 m (10–16 feet) tall with ≥65% canopy closure.

Four MSHCP-covered bird species were recorded at the Muddy River Riparian Reserve Unit in 2024: Arizona Bell's vireo, blue grosbeak, phainopepla, and vermilion flycatcher. Arizona Bell's vireo and blue grosbeak were each detected from two of the six point-count locations surveyed in 2024, and phainopepla was detected from one of the six point-count locations. Vermilion flycatcher was incidentally detected during a cuckoo survey. One cuckoo was detected during species-specific surveys, but the estimated location of the bird was at the Warm Springs Natural Area, north of the County's property. One MSHCP evaluation bird species was recorded from all six point-count locations surveyed during in 2024: crissal thrasher. This species is typically found in dense cover within mesquite and riparian woodlands (Floyd et al. 2007). Most of the desert riparian obligates (e.g., flycatcher and yellow warbler) were not detected in the Muddy River Riparian Reserve Unit in 2024, which is not surprising given the lack of riparian habitat at this property.

4.8 BCCE

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 (Appendix A: Figures A-57 and A-58). 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 (Appendix A: Figures A-59 and A-60).

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 2024, 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) and were each recorded from several points within the BCCE during point-count surveys in 2024 (see Table 11). These two species have been recorded at the BCCE every year since 2018.

4.9 Brown-headed Cowbird Control and Flycatcher Nest Success

Following continued high brood 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 2024. The goal of this program was to reduce the incidence of brood parasitism on flycatcher nests and improve nest success of flycatcher. SWCA was successful in target netting cowbirds in 2024 and removed 10 female cowbirds (Table 13). No egg addling, egg replacement, or nestling removal was necessary in 2024 (see Table 13).

Table 13. Brown-headed Cowbird Control by Method Used, Brown-headed Cowbird Parasitism, and Flycatcher Productivity, 2019–2024

Year	Parasitism Rate (%)	Brown-headed 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

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

† CE = brown-headed cowbird egg.

‡ CN = brown-headed 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 13). Data from 2016 through 2020 show a range in parasitism rate from 33% to 67%, with an average of 50% (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, the parasitism rate remained low (9%). The parasitism rate during years (2021–2024) when combined-method cowbird control was implemented ranged from 8% to 50% and averaged 22%. Though the benefit of cowbird netting was not immediately seen in 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 17% (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 and 58% in 2024. The range in nest success since the cowbird netting program was implemented is 33% to 78%, with an average of 54%. 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.

Prior to the implementation of cowbird target netting in 2021, fecundity at Mesquite West in 2016 through 2020 ranged from 0 to 1.0 young produced per female, with an average of <1.0 (SWCA 2019b, 2020). During years (2021–2024) when combined-method cowbird control was implemented, fecundity ranged from 1.0 to 2.8 young produced per female (see Table 7) and averaged 1.8 young produced per female. An average annual fecundity of approximately 2.0 is required for a population to be considered self-sustaining (SWCA 2019b).

5 CONCLUSION

Six MSHCP-covered and three MSHCP evaluation bird species were recorded at the County's reserve system properties in 2024. Intensive flycatcher monitoring and cowbird control were continued in 2024. 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 seven pairs at Mesquite West, all of which were confirmed to be nesting. These seven nesting pairs had 12 nesting attempts, seven of which were successful and produced 18 fledglings.
- SWCA successfully target netted 24 adult cowbirds (10 female, 14 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 2024, and the parasitism rates were 22%, 8%, and 9%, respectively. Not only was the 8% parasitism rate in 2023 lower than the rates observed in 2019 (50%) and 2020 (40%), prior to implementation of combined-method cowbird control, it was also the lowest parasitism rate ever recorded by SWCA at the site. The 9% parasitism rate in 2024, along with results from 2022 and 2023, suggest that combined-method cowbird control may play a role in reducing parasitism rates at Mesquite West.
- Four flycatcher nests failed at Mesquite West. Depredation was the cause of failure for three (75%) 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 pair and one nesting attempt. This nest failed, and the pair did not attempt to renest.
- Four cuckoo detections were recorded at the Riparian Reserve Units in 2024: three detections occurred during cuckoo surveys, and one cuckoo was incidentally detected. In 2023, cuckoo detections were recorded for the first time at Bunkerville Parcels 2-K through 2-M and Riverside

3-A and 3-B. In 2024, two of the cuckoo detections were recorded at these locations and in the same areas.

- Though it appeared that cattle were successfully excluded from portions of Bunkerville Parcels 2-J and 2-M in 2023, signs of cattle were observed in both areas in 2024. In addition to there being trails through the habitat, cattle presence was evident by several young narrowleaf willows having been recently knocked down in the apparently suitable flycatcher habitat at Bunkerville Parcel 2-M. Cattle exclusion 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 Parcel 2-M were similar to those recorded at flycatcher nests; two flycatchers were detected in this area on July 17, 2024. Protection of this habitat is important in maintaining habitat characteristics that could attract flycatchers to the area again in the future.
- 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.
- Biologists recorded two MSHCP evaluation species at the BCCE in 2024: 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 2024 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 tamarisk from all its Riparian Reserve Units, particularly these dead or dying stands, provided that tamarisk removal is immediately followed by planting of native vegetation, such as willow and Fremont cottonwood (*Populus fremontii*), in suitable areas (SWCA 2017c).
- Native species plantings 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.

- 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 Parcel 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 higher flycatcher productivity and fecundity.

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APPENDIX A

Site Photos

Figure A-1. Typical narrowleaf willow habitat at Mesquite Parcel 1-A, 2023.

Figure A-2. Pulsipher Wash channel incised at diversion point, Mesquite 1-A, 2024.

Figure A-3. Dead narrowleaf willows in Mesquite 1-A; previously occupied flycatcher habitat, 2024.

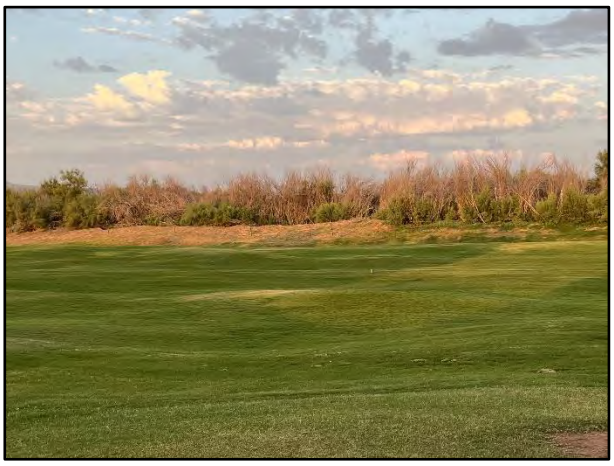

Figure A-4. Overview of standing dead willows in previously occupied flycatcher habitat, Mesquite 1-A, 2024.

Figure A-5. Standing dead narrowleaf willows along eastern boundary of Mesquite 1-A, 2024.

Figure A-6. Dry, cracked soils in central portion of Mesquite 1-A, 2023.

Figure A-7. Previously dry Mesquite 1-A area was damp; standing dead willows with cattails, 2024.

Figure A-8. Sandy soil with small-diameter tamarisk and arrowweed, Bunkerville Parcel 2-C, 2024.

Figure A-9. Typical mesquite and arrowweed habitat, Bunkerville East Parcels 2-A through 2-G, 2024.

Figure A-10. Typical tamarisk and arrowweed habitat, Bunkerville Parcels 2-A through 2-G, 2024.

Figure A-11. Tamarisk in various stages of defoliation, Bunkerville Parcel 2-D, 2024.

Figure A-12. Large swath of 40% defoliated tamarisk, Bunkerville Parcel 2-E, 2024.

Figure A-13. Narrowleaf willow survey area added at Bunkerville 2-F and 2-G, 2024.

Figure A-14. Narrowleaf willow and tamarisk survey area, Bunkerville Parcel 2-G, 2024.

Figure A-15. Sandy soil with tamarisk and arrowweed saplings, Bunkerville 2-I and 2-J, 2024.

Figure A-16. Typical mesquite and tamarisk habitat, Bunkerville 2-I and 2-J, 2024.

Figure A-17. Meadow with emergent Goodding's willows, Bunkerville 2-I and 2-J, 2024.

Figure A-18. Tamarisk stump remaining after cutting, Bunkerville 2-I and 2-J, 2024.

Figure A-19. Tamarisk with 50% canopy closure, Bunkerville 2-I and 2-J, 2024.

Figure A-20. Previously surveyed area with cut tamarisk, Bunkerville 2-I and 2-J, 2024.

Figure A-21. View of survey area from edge: healthy tamarisk, Bunkerville 2-I and 2-J, 2024.

Figure A-22. Tamarisk and mesquite adjacent to cattail marsh, Bunkerville 2-K through 2-M, 2024.

Figure A-23. Tamarisk adjacent to cattail marsh, Bunkerville 2-K through 2-M, 2024.

Figure A-24. Narrowleaf willow adjacent to dry marsh, Bunkerville 2-K through 2-M, 2024.

Figure A-25. Sparse tamarisk with low canopy closure, Bunkerville 2-K through 2-M, 2024.

Figure A-26. Goodding's willow in survey area, Bunkerville 2-K through 2-M, 2024.

Figure A-27. Narrowleaf willow in survey area, Bunkerville 2-K through 2-M, 2024.

Figure A-28. Pond with damp, cracked soil, Bunkerville 2-K through 2-M, April 2024.

Figure A-29. Canopy closure in willow survey area, Bunkerville 2-K through 2-M, 2024.

Figure A-30. Typical arrowweed/scrub habitat at Bunkerville 2-K through 2-M, 2024.

Figure A-31. Typical arrowweed/tamarisk habitat at Bunkerville 2-K through 2-M, 2024.

Figure A-32. Dry marsh filling in with sapling tamarisk; Bunkerville 2-K through 2-M, 2024.

Figure A-33. Typical scrub habitat at Riverside 3-A and 3-B, 2024.

Figure A-34. Typical arrowweed/tamarisk habitat at Riverside 3-A and 3-B, 2024.

Figure A-35. Narrow strip of narrowleaf willows, Riverside 3-A and 3-B, 2024.

Figure A-36. Tamarisk with low canopy closure, Riverside 3-A and 3-B, 2024.

Figure A-37. Overview of mesquite survey area, Riverside 3-A and 3-B, 2024.

Figure A-38. Masticated tamarisk area at Mormon Mesa Parcel 5-A, 2024.

Figure A-39. Dead and dying tamarisk at Mormon Mesa 5-A, 2024.

Figure A-40. Dead and dying tamarisk in the southeastern restoration area, Mormon Mesa 5-A, 2024.

Figure A-41. Narrowleaf willow and tamarisk habitat at Mormon Mesa 5-A, 2024.

Figure A-42. Tamarisk and Goodding's willow habitat at Mormon Mesa 5-A, 2024.

Figure A-43. Example habitat within Mormon Mesa 5-A restoration plot, 2019.

Figure A-44. Example habitat within Mormon Mesa 5-A restoration plot, 2019.

Figure A-45. Browsed and trampled ground cover within Mormon Mesa 5-A restoration plot, 2024.

Figure A-46. Browsed and trampled ground cover within Mormon Mesa 5-A restoration plot, 2024.

Figure A-47. Backwater slough along Mormon Mesa South eastern boundary, 2023.

Figure A-48. Dead and dying tamarisk at Mormon Mesa South, 2024.

Figure A-49. Horticultural plantings at Muddy River, 2024.

Figure A-50. Horticultural plantings at Muddy River, 2024.

Figure A-51. Big saltbush–dominated area at Muddy River, 2023.

Figure A-52. Big saltbush–dominated area at Muddy River, 2024.

Figure A-53. Creosote bush habitat in Muddy River Parcel F, 2024.

Figure A-54. Honey mesquite habitat in Muddy River Parcel F, 2024.

Figure A-55. Scrub habitat typical of Muddy River Parcels G through I, 2024.

Figure A-56. Scrub habitat typical of Muddy River Parcels G through I, 2024.

Figure A-57. Mojave Desert scrub habitat at BCCE point-count location 6, 2024.

Figure A-58. Mojave Desert scrub habitat at BCCE point-count location 15, 2024.

Figure A-59. Dense cholla at BCCE point-count location 33, 2024.

Figure A-60. Desert wash habitat at BCCE point-count location 37, 2024.