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Avian Surveys on MSHCP Properties 2019 Final Project Report

Prepared for

Desert Conservation Program
Clark County Department of Air Quality

Prepared by

SWCA Environmental Consultants

September 2019

AVIAN SURVEYS ON MSHCP PROPERTIES
FINAL PROJECT REPORT

Prepared for

Desert Conservation Program
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EXECUTIVE SUMMARY

In 2019, SWCA Environmental Consultants 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*) and yellow-billed cuckoo (*Coccyzus americanus*) at the Riparian Reserve Units.

All surveys were conducted between May 7 and August 2, 2019. The 2019 surveys detected six 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*), phainopepla (*Phainopepla nitens*), southwestern willow flycatcher, vermilion flycatcher (*Pyrocephalus rubinus*), and yellow-billed cuckoo. The surveys also detected three evaluation species: loggerhead shrike (*Lanius ludovicianus*), crissal thrasher (*Toxostoma crissale*), and LeConte's thrasher (*Toxostoma lecontei*). In total, 73 avian species were recorded across all the County's properties, and the MSHCP-covered and evaluation species, and their habitats were observed at each of these properties. However, opportunities for habitat restoration, creation, and enhancement exist at each property.

1.0 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 2000). This is accomplished, in part, through the management of a reserve system, which includes Riparian Reserve Units, as well as 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*), summer tanager (*Piranga rubra*), vermilion flycatcher (*Pyrocephalus rubinus*), and yellow-billed cuckoo (*Coccyzus americanus*). The other two MSHCP-covered bird species can occur away from desert riparian habitats: the phainopepla (*Phainopepla nitens*) is typically found in desert washes with mesquite (*Prosopis* spp.) or catclaw acacia (*Senegalia greggii*), and the American peregrine falcon (*Falco peregrinus*) can be found in almost any type of habitat (Clark County 2000). Two of the eight covered bird species are also protected under the ESA—the southwestern willow flycatcher, listed as endangered (U.S. Fish and Wildlife Service [USFWS] 1995), and the yellow-billed cuckoo, listed as threatened (USFWS 2014a). In addition to the eight covered species, several evaluation species can be found in a variety of desert habitats, including upland habitat, which comprise the vast majority of the BCCE.

The extent and quality of desert habitat, particularly riparian habitat, across the desert Southwest have been steadily diminishing for decades, threatened by urban and agricultural development, invasion of non-native 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 2019, the County solicited proposals to conduct continued avian surveys on its Riparian Reserve Units (Figure 1) and on the BCCE (Figure 2). SWCA Environmental Consultants (SWCA) was selected to conduct presence/absence surveys for both southwestern willow flycatcher and yellow-billed cuckoo across the Riparian Reserve Units: Muddy River, Virgin River Subunit 1 (Mormon Mesa), Virgin River Subunit 2 (Bunkerville), and Virgin River Subunit 3 (Riverside) (see Figure 1); as well as conduct avian point-counts at 45 previously surveyed locations at the Riparian Reserve Units and at the BCCE (see Figure 2). These surveys will build on baseline presence/absence and relative abundance data for all bird species on these properties, including any MSHCP-covered and evaluation avian species.

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).

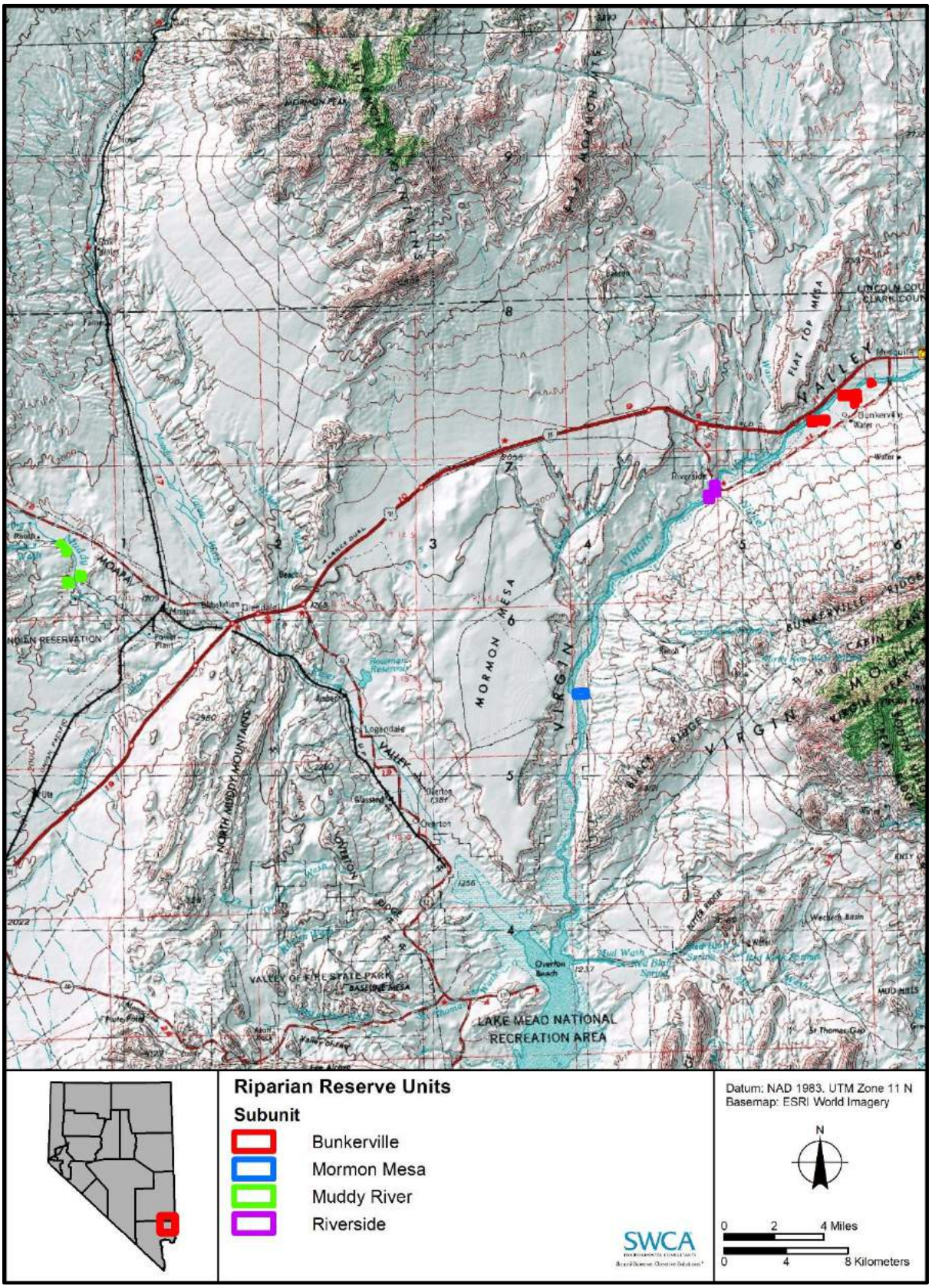

Figure 1. Riparian Reserve Unit locations.

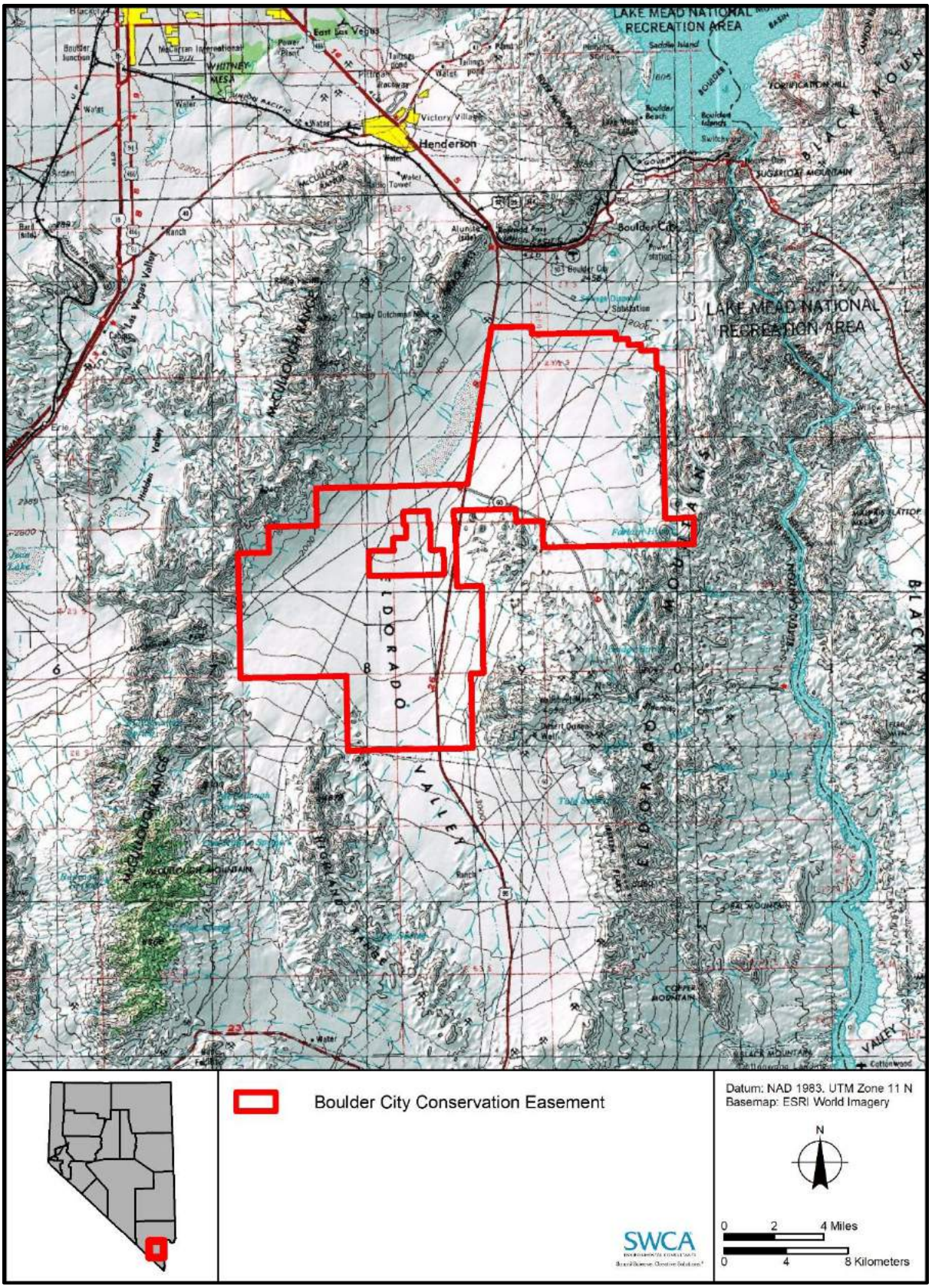

Figure 2. BCCE location.

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 covered bird species (including the two federally listed species) known to use this habitat. To date, the County has acquired approximately 243 ha (601 acres) of land along the Muddy and Virgin Rivers in northeastern Clark County, Nevada. Prior to 2017, the County acquired 115 ha (285 acres) along the Muddy and Virgin Rivers. SWCA conducted avian surveys at these parcels 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 127 ha (316 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). SWCA also conducted three rounds of breeding bird point-count surveys on the BCCE in 2018 (SWCA 2018b).

1.2.2 BCCE

Implementation of the MSHCP required the establishment of a conservation easement in the Eldorado Valley. This easement, known as the BCCE, was established in July of 1995 through an agreement between Clark County and Boulder City. 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 protection of the 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 2019).

1.3 Management Actions, Goals, and Objectives

The County's Riparian Reserve Unit Management Plan (Clark County 2015a) 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 County's BCCE Management Plan (Clark County 2019) 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 2019:78).

Management of species covered under the MSHCP and their habitats requires an in-depth understanding of baseline conditions within a given management unit. Collection of species' abundance and distribution data is a critical first step in monitoring of and conservation management efforts for the MSHCP-covered bird species found in Clark County. The short-term objective for this project is to establish a baseline record of all breeding bird species recorded on the County's reserve system properties. The long-term goal is to track changes in presence and relative abundance of all the MSHCP-covered bird species that use these properties in an effort to measure the success of management and restoration efforts conducted therein.

2.0 METHODS AND MATERIALS

2.1 Federally Listed Bird Surveys

The County outlined polygons within the Riparian Reserve Units that were targeted for 2019 southwestern willow flycatcher and yellow-billed cuckoo surveys (Figures 3–6). In total, the estimated survey area equaled 53.5 ha (132.2 acres). Within these polygons, surveys were completed in all areas that were dominated by trees or shrubs ≥ 3 m (9.8 feet) in height. Habitat suitability and the need for species-specific surveys were assessed during the site reconnaissance completed for point-count surveys. Any portions of the 53.5 ha (132.2 acres) identified in the County's solicitation that were devoid of woody vegetation ≥ 3 m (9.8 feet) in height (as a result of scouring, restoration events, etc.) were not surveyed during this survey season. These areas were described (e.g., species, height, and percent cover of the dominant vegetation), photographed, delineated in the field, and then delineated in ArcGIS. These areas will be reassessed for habitat suitability during subsequent survey years.

The southwestern willow flycatcher is one of four subspecies of willow flycatcher (Unitt 1987). It breeds in dense, mesic riparian habitats at scattered, isolated sites in New Mexico, Arizona, southern California, southern Nevada, southern Utah, southwestern Colorado, and, at least historically, extreme northwestern Mexico and western Texas (Unitt 1987). Factors contributing to the decline of southwestern willow flycatchers on their breeding grounds include loss, degradation, and/or fragmentation of riparian habitat; invasion of riparian habitat by non-native plants; and brood parasitism by brown-headed cowbirds (*Molothrus ater*). One of the last long-distance neotropical migrants to arrive in North America in spring, southwestern willow flycatchers typically arrive in May or June and depart in August (Sogge et al. 2010). They nest in a variety of habitats, but common characteristics of southwestern willow flycatcher breeding habitat include dense tree or shrub cover ≥ 3 m (9.8 feet) in height, vegetation with dense twig structure and high canopy closure, and proximity to surface water or saturated soil (McLeod and Pellegrini 2013; Sogge et al. 2010). Southwestern willow flycatchers nest in habitat patches ranging in size from 0.8 ha (2.0 acres) to several hundred hectares but are rarely found in narrow strips of habitat < 10 m (32.8 feet) wide (Sogge et al. 2010). During the nesting season, southwestern willow flycatchers occupy home ranges averaging less than 0.5 ha (1.2 acres) in size (Cardinal 2005). Willow flycatchers are generally monogamous, but rare cases of polygyny have been documented (Ehrlich et al. 1988). Migrant willow flycatchers are found in both spring and fall in a variety of habitats that are unsuitable for breeding. These migration stopover habitats, even though not used for breeding, are likely important for both reproduction and survival. Designated critical habitat for the southwestern willow 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 three Subunits of the Virgin River Riparian Reserve Unit.

Multiple broadcast surveys for southwestern willow flycatcher conducted throughout the breeding season are needed to assess the presence and residency of the southwestern subspecies. Southwestern willow flycatcher surveys followed the standard 5-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 additional surveys between June 25 and July 17. The surveys were separated by a minimum of 5 days. To elicit responses from nearby southwestern willow flycatchers, surveyors stopped approximately every 30 m (98 feet) and broadcast 10–15 seconds of the southwestern willow flycatcher's primary song (*fitz-bew*) and call (*breet*). Field personnel watched for 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 conspecific vocalizations were broadcast, including *creets/breets*, *wee-oos*, *whitts*, *churr/kitters*, and a set of interaction calls given by a mated pair of flycatchers (per Lynn et al. 2003). These calls are frequently effective in eliciting a *fitz-bew* song, thereby enabling surveyors to positively identify willow flycatchers.

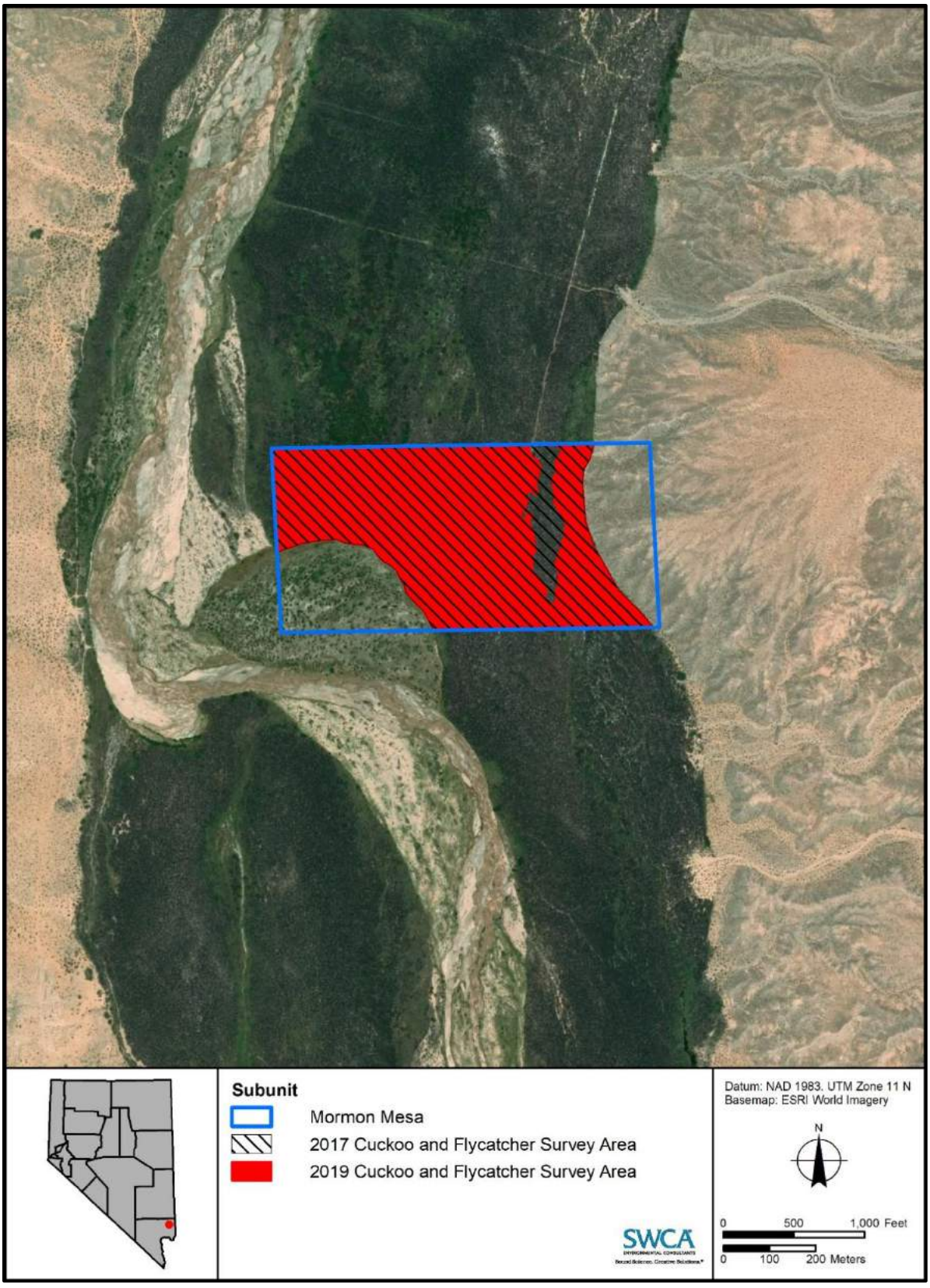

Figure 3. Southwestern willow flycatcher and yellow-billed cuckoo survey areas at the Mormon Mesa Riparian Reserve Subunit.

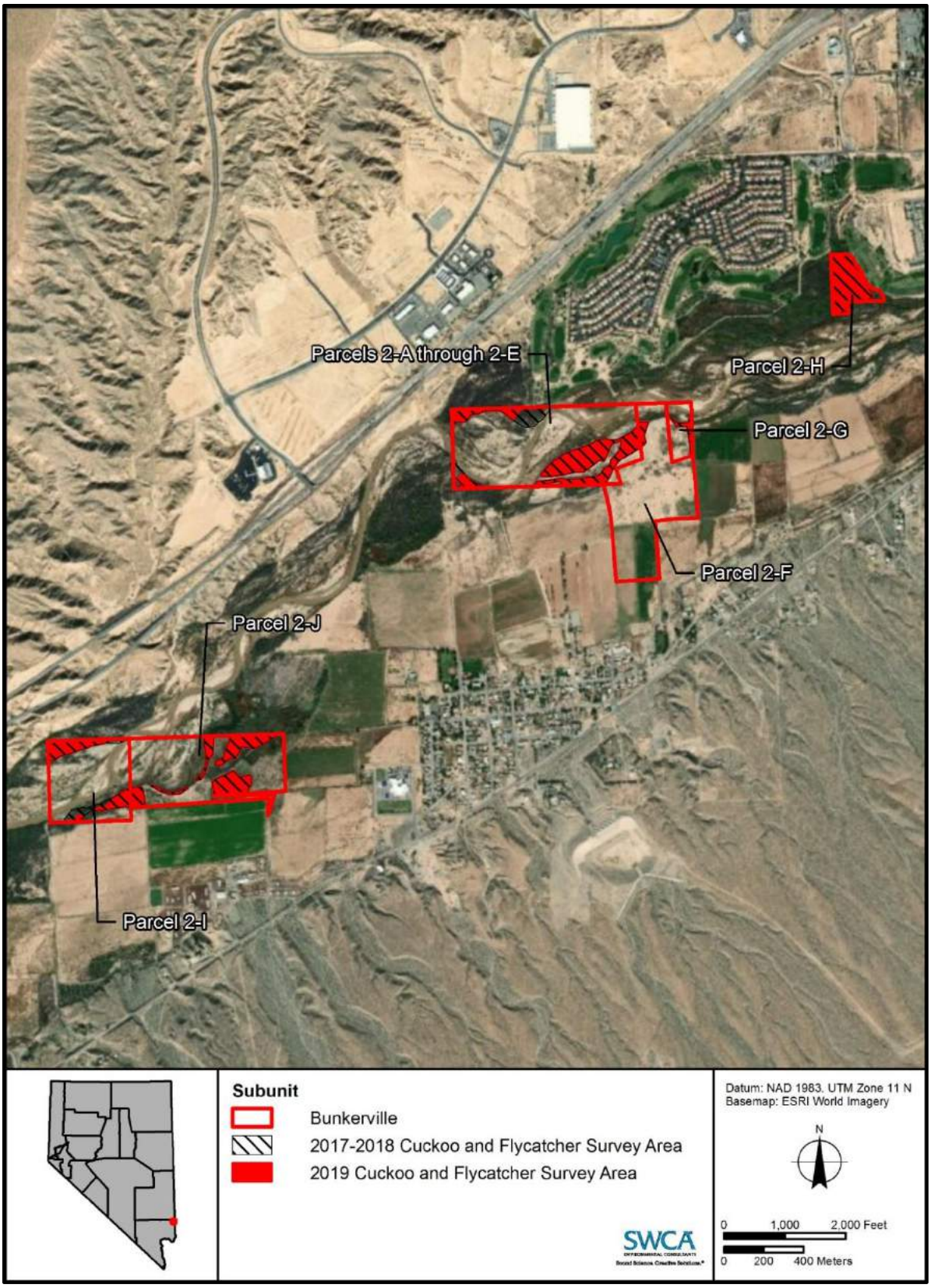

Figure 4. Southwestern willow flycatcher and yellow-billed cuckoo survey areas at the Bunkerville Riparian Reserve Subunit.

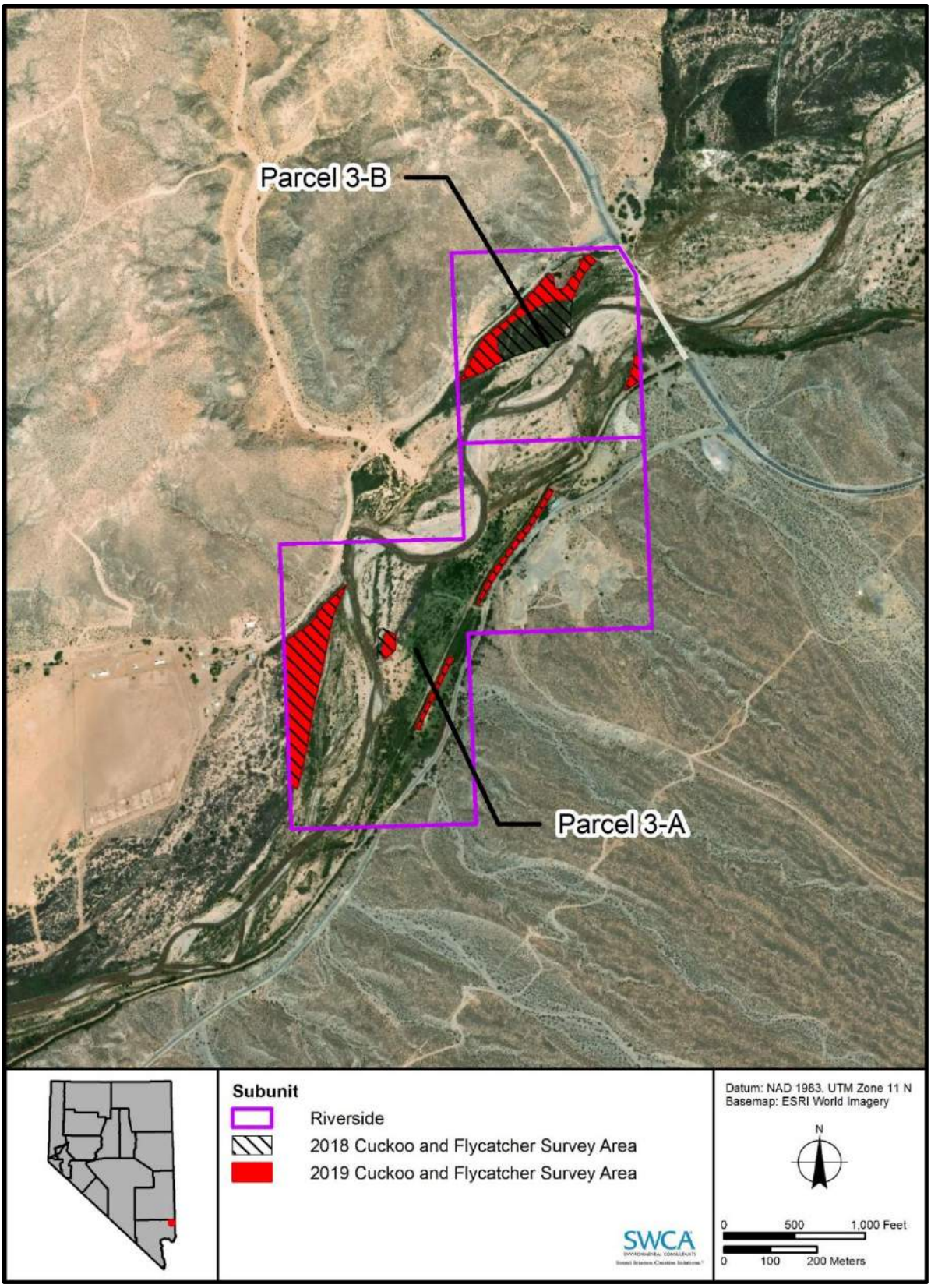

Figure 5. Southwestern willow flycatcher and yellow-billed cuckoo survey areas at the Riverside Riparian Reserve Subunit.

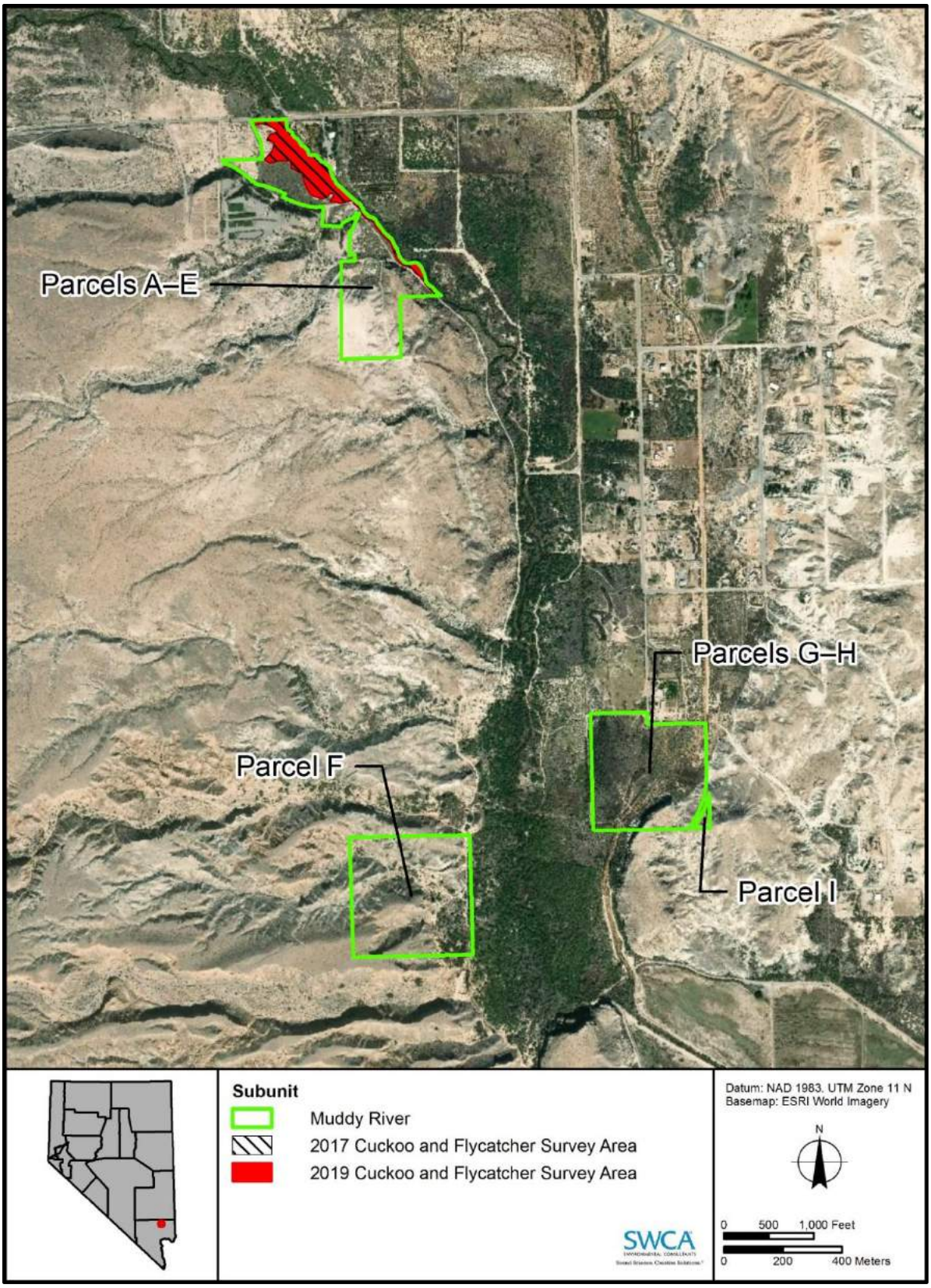

Figure 6. Southwestern willow flycatcher and yellow-billed cuckoo survey areas at the Muddy River Riparian Reserve Unit.

The yellow-billed cuckoo was historically widespread and locally common along rivers throughout the western United States (USFWS 2013b). The decline of the western yellow-billed cuckoo population is largely the result of riparian loss, degradation, and fragmentation. Yellow-billed cuckoos are late neotropical migrants, arriving on their breeding grounds around mid-June and departing by mid-September. Typical breeding habitat is low- to moderate-elevation riparian woodlands at least 20 ha (98.8 acres) in size and with a multilayered canopy (USFWS 2014a). Yellow-billed cuckoos are also known to nest in early to mid-successional riparian habitats (USFWS 2014b). Yellow-billed cuckoos have not been found nesting in isolated patches < 1 ha (2.5 acres) in size or in linear habitats < 10–20 m (32.8–65.6 feet) wide, but they may use these habitats during migration and early in the breeding season (Halterman et al. 2015). Critical habitat for the yellow-billed cuckoo has not yet been designated, but proposed critical habitat includes riparian areas along the Virgin River in Nevada, including the Bunkerville, Mormon Mesa, and Riverside Subunits.

Cuckoos vocalize infrequently, have a short breeding cycle, and occupy home ranges varying from 20 to 40 ha (49.4 to 98.8 acres) in size (Halterman et al. 2015). 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 or absence of cuckoos, and survey results can be used to estimate the number of possible and probable breeding territories (Halterman et al. 2015).

Yellow-billed cuckoo surveys followed the standard 4-survey protocol described by Halterman et al. (2015). One survey was completed between June 15 and 30, two surveys were completed between July 1 and 31, and one survey was completed between August 1 and 15. Surveys were separated by 12–15 days. Surveyors stopped every 100 m (328 feet) and listened for 1 minute for spontaneously calling yellow-billed cuckoos, then broadcast a series of five cuckoo contact calls (*kuk/kowlp*), spaced 1 minute apart, to listen and watch for cuckoo responses between each set of broadcast calls; the total time spent at each survey point was approximately 6 minutes.

If willow flycatchers or yellow-billed cuckoos were detected, the observer recorded the location of the bird, the type of detection, and any other pertinent notes. The surveyor then proceeded at least 40 m (131.2 feet) beyond any detected flycatcher and 300 m (984.3 feet) beyond a cuckoo before resuming the survey to avoid double-counting individuals. All surveys commenced before sunrise when it was light enough for observers to walk safely. Surveys were concluded by 10:30 a.m. PDT for southwestern willow flycatcher and by 11:00 a.m. PDT or when the temperature reached 40°C for yellow-billed cuckoo. No surveys were conducted if winds exceeded 3 on the Beaufort scale (19.3–30.6 km [12–19 miles] per hour).

Starting points for southwestern willow flycatcher and yellow-billed cuckoo surveys varied between surveys. All survey data, including survey locations, start and stop times, and the location(s) and behavior of all flycatchers and cuckoos detected, were recorded using a Samsung or Panasonic tablet paired with a Geode external GPS receiver, which is capable of submeter accuracy and provides real-time data corrections in the field. Standard southwestern willow flycatcher and yellow-billed cuckoo survey summary forms were also completed. All surveys were completed by personnel authorized under a USFWS 10(a)1(A) permit (#TE028605-7) and a Nevada Department of Wildlife (NDOW) permit (#495754).

In addition to completing cuckoo and flycatcher surveys, SWCA recorded qualitative site descriptions for each parcel. Field personnel 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.

2.2 Point-Count Surveys

Surveys conducted for this study followed methods used during the 2017 and 2018 point-count surveys (SWCA 2017b, 2018a, 2018b), which applied established point-count protocols and drew from methods described by the Great Basin Bird Observatory (GBBO) for its Habitat-based Monitoring Program for Breeding Birds of Nevada (GBBO 2003) and the *Handbook of Field Methods for Monitoring Landbirds* (Ralph et al. 1993).

In 2019, SWCA randomly selected 25 of the 51 previously surveyed point-count locations across the Riparian Reserve Units; these points were surveyed in 2019 and will be surveyed in odd-numbered years going forward (i.e. 2021, 2023), while the remaining points will be surveyed in even-numbered years (i.e. 2020, 2022) (Figures 7–10). Prior to the commencement of surveys, SWCA project manager and lead biologist Justin Streit conducted a site reconnaissance to re-familiarize himself with the project parcels and identify any impediments to access. During the reconnaissance, Mr. Streit navigated to each survey point using a handheld GPS unit capable of 5-m accuracy. Each point was marked with flagging so that it could be easily located on subsequent visits. Access routes were flagged, as needed, to facilitate efficient travel between survey points. Above average winter precipitation yielded abnormally high water levels along the Virgin River throughout the spring of 2019. During the reconnaissance of the Riparian Reserve Units, the lead biologist noted that two of the riparian point-count locations would not be accessible due to inundation by the active river channel, which necessitated that these point-count locations be repositioned.

Accordingly, point-count location Bunkerville (BV)-18 was moved approximately 90 m (295 feet) west of the original location to 754172 East (E), 4073006 North (N) (Universal Transverse Mercator [UTM] North American Datum 1983 [NAD83] Zone 11N) (BV-18a) (see Figure 8). Two survey rounds were completed at BV-18a before the original BV-18 could be accessed for the final round of surveys. Riverside (RS)-7 was also inundated due to flooding in 2019 and was relocated 25 m (82.0 feet) southwest of the original location (see Figure 9). The coordinates for the new location, RS-7a, are 747896 E, 4068812 N (UTM NAD83 Zone 11N). All three survey rounds in 2019 were conducted at RS-7a. Per the scope of work for this project, these two new point-count locations were situated at least 200 m (656.2 feet) from any other point-count location within that parcel.

In 2019, SWCA randomly selected 20 of the 40 previously surveyed point-count locations at the BCCE; these 20 points were surveyed in 2019 and will be surveyed in subsequent odd-numbered years (i.e. 2021, 2023), while the remaining 20 will be surveyed in even-numbered years (i.e. 2020, 2022) (Figure 11). As it was anticipated that conditions at the BCCE had not changed dramatically since 2018, no field reconnaissance was completed prior to field surveys at that property in 2019. Surveyors were able to access all 20 of the previously surveyed point-count locations without impediment, thereby negating the need to move or alter any of the predetermined survey locations.

Each surveyor followed standard unlimited-radius point-count procedures, with surveys starting at sunrise and concluding by 10:00 a.m. PDT (GBBO 2003; Ralph et al. 1993). Consecutive surveys at a given point were separated by a minimum of 7 days. The order in which point-counts were completed was alternated between each round of surveys so that a given point was not always surveyed at the same time of day.

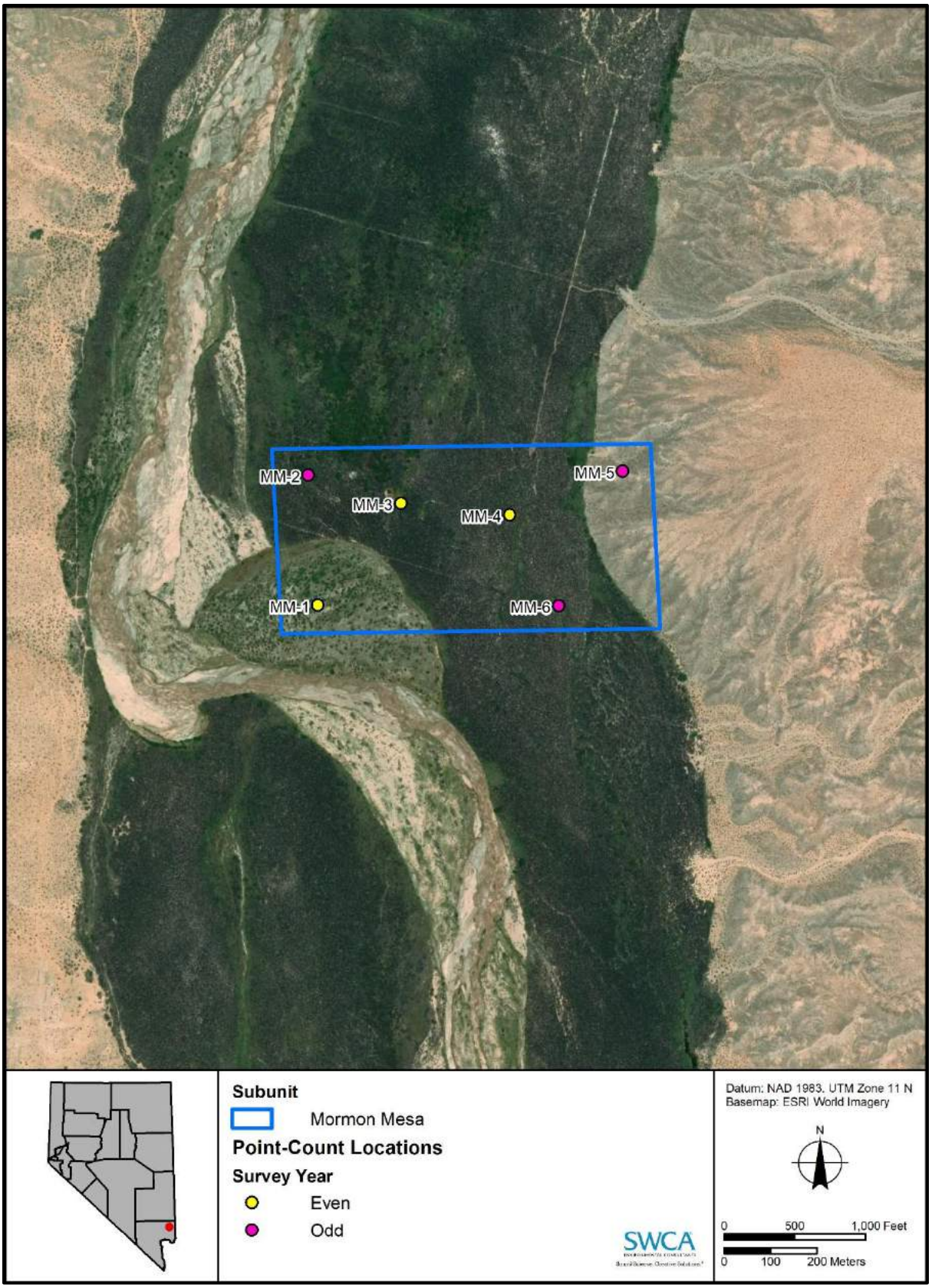

Figure 7. Point-count locations at the Mormon Mesa Riparian Reserve Subunit.

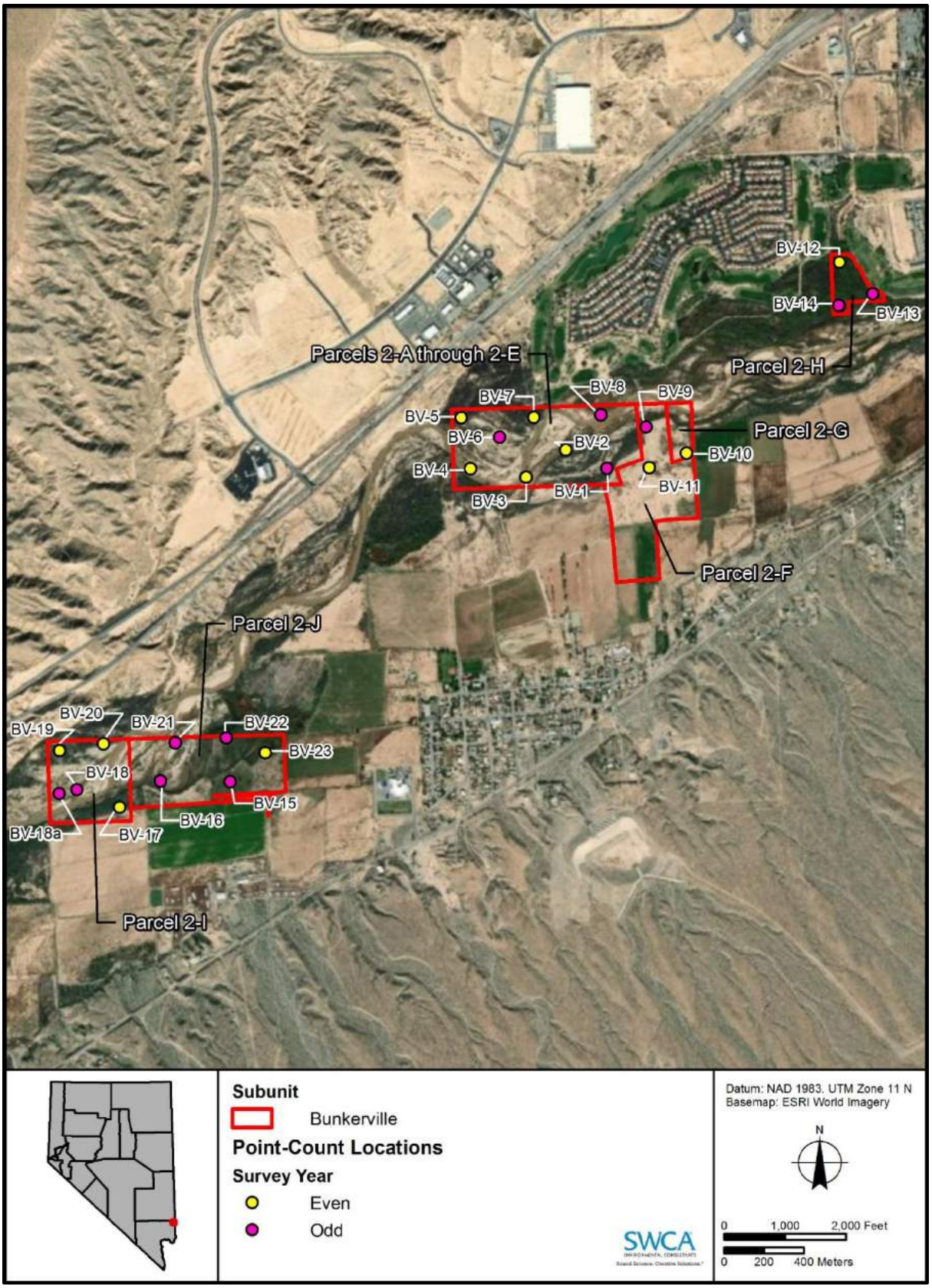

Figure 8. Point-count locations at the Bunkerville Riparian Reserve Subunit.

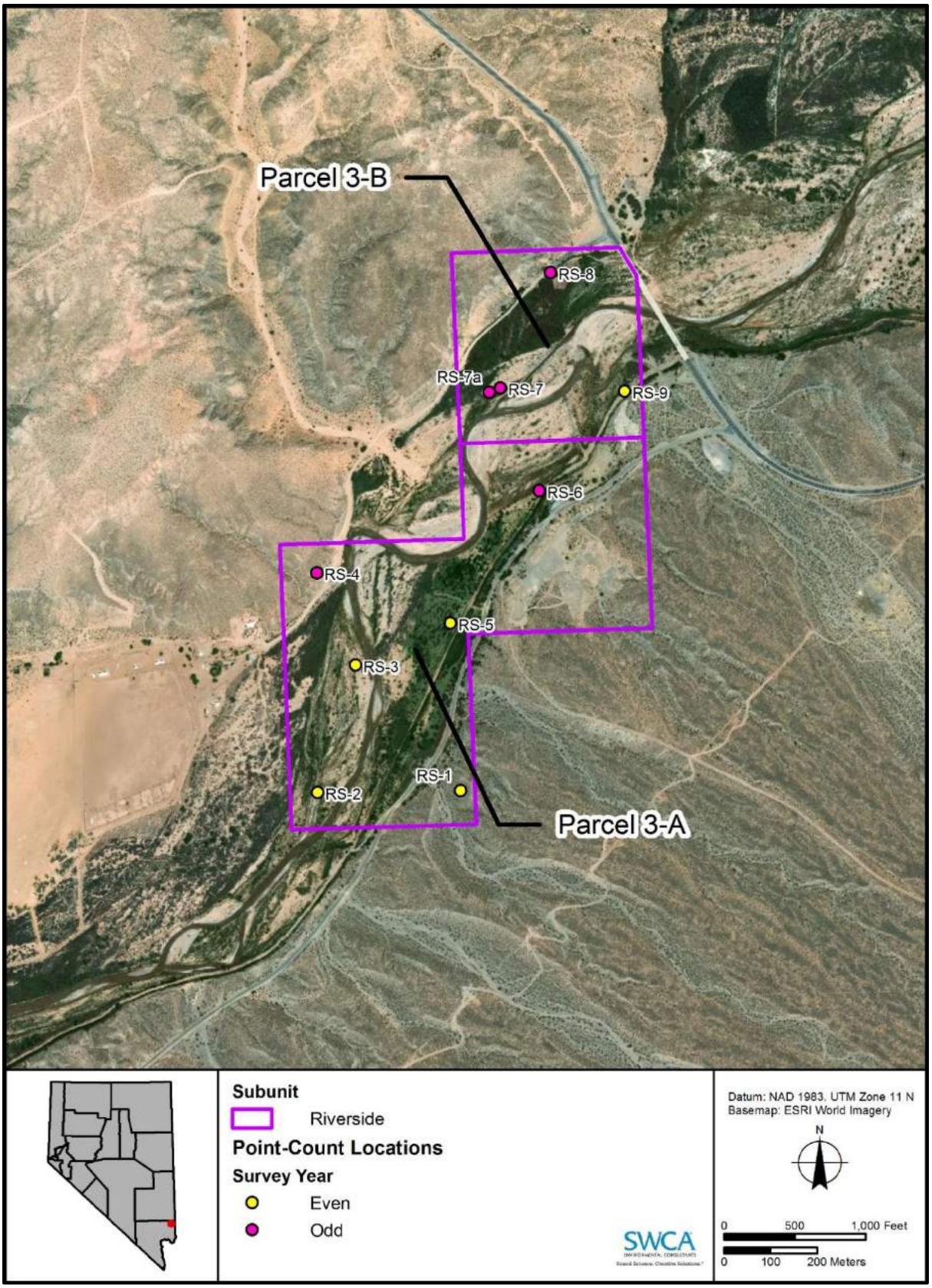

Figure 9. Point-count locations on Riverside Riparian Reserve Subunit.

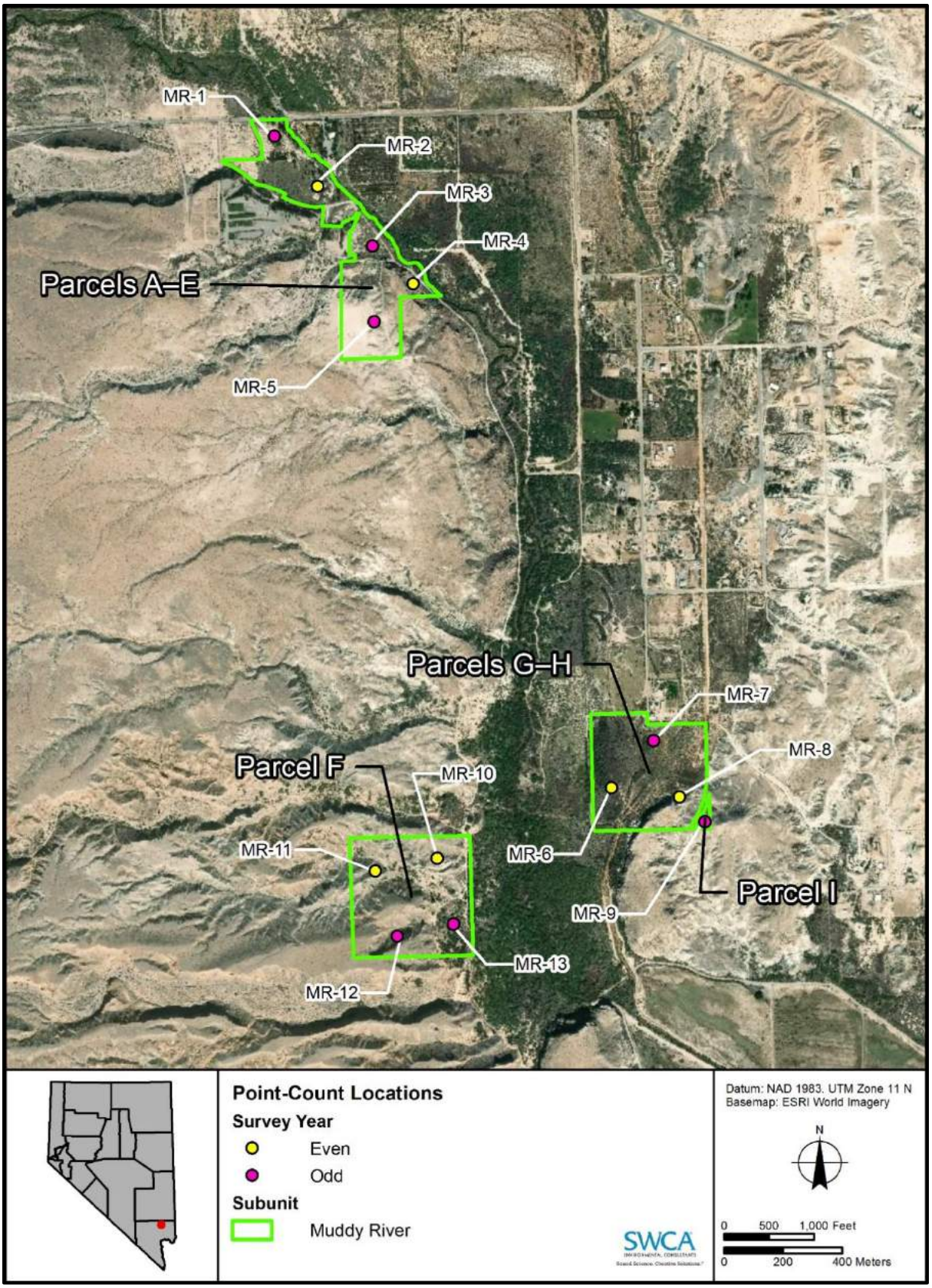

Figure 10. Point-count locations on Muddy River Riparian Reserve Unit.

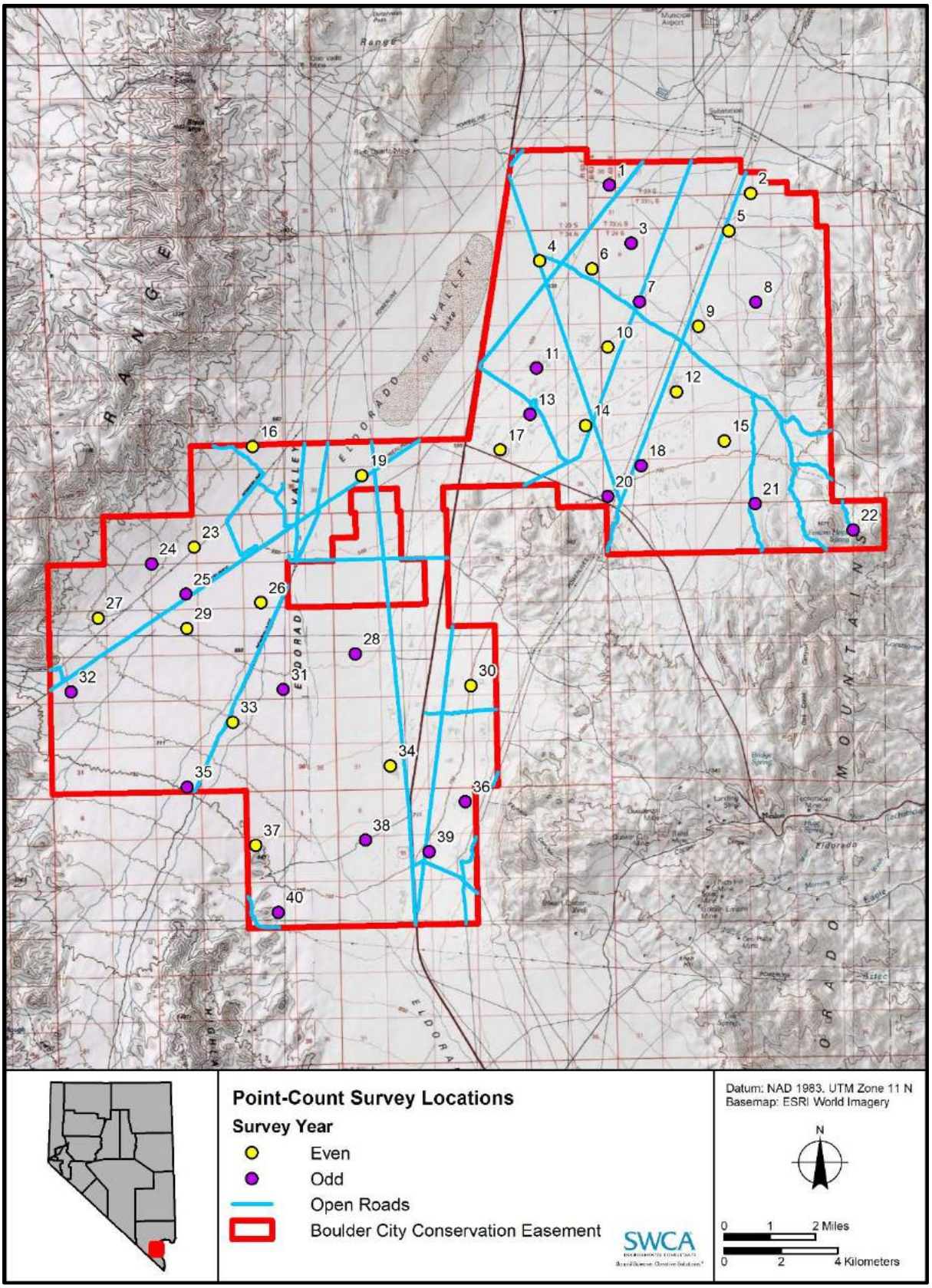

Figure 11. Point-count locations at the BCCE.

For each survey, the surveyor approached each point quietly to avoid overly disturbing any birds present. Prior to the commencement of each point-count, the surveyor recorded weather data, including 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, as both conditions could have inhibited the comprehensive inventory of a survey area (GBBO 2003).
The 10-minute observation period was broken into four intervals (0–3, 3–5, 5–8, and 8–10 minutes), and surveyors noted the time interval in which the first detection of a given bird was made.

Surveyors recorded species code, interval of detection, sex, age, estimated distance from the observer, bearing to the bird, and behavior of the bird as it pertains to its breeding status. Any bird that flushed as the surveyor approached the point-count location but that 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, and bird locations were plotted on a standard point-count map (with their associated behavior codes) to help avoid double-counting individuals within a survey location. Any bird that gave an unknown vocalization was tracked following the survey to determine its identity (Ralph et al. 1993).

3.0 RESULTS AND EVIDENCE OF THE RESULTS

3.1 Objectives Completed

The sole objective for this project was to continue building on a baseline record of federally listed and non-listed bird species present at both the Riparian Reserve Units and at the BCCE that could be used to compare with future datasets to measure the success of management and restoration efforts at those properties; those baseline data are presented here.

3.2 Survey Effort

3.2.1 Federally Listed Bird Surveys

The five rounds of southwestern willow flycatcher surveys were completed by SWCA biologists Sarah Nichols, Justin Streit, and Mike Swink between May 15 and July 16, 2019 (Table 1). Each round of southwestern willow flycatcher surveys required five survey mornings; this was either conducted across five different days or across fewer days using a combination of surveyors working at different parcels.
The four rounds of yellow-billed cuckoo surveys were completed by SWCA biologists Sarah Nichols and Mike Swink between June 17 and August 2, 2019 (Table 2). Each yellow-billed cuckoo survey round required three to five mornings. Of the 53.5 ha (132.2 acres) originally estimated for survey by the County, SWCA surveyed 47.9 ha (118.4 acres) for both species across all Subunits; this required 98.5 survey-hours for southwestern willow flycatcher and 61.2 survey-hours for yellow-billed cuckoo (Table 3). Descriptions and rationale for areas excluded from surveys in 2019 are included in Section 4.0.

3.2.2 Point-Count Surveys

The three rounds of point-count surveys were completed at the Riparian Reserve Units by SWCA biologist Justin Streit between May 21 and June 25, 2019 (Table 4). Each round of point-counts required three mornings to cover all the Riparian Reserve Units. Weather conditions were favorable during all three survey rounds, with no precipitation and wind speeds ranging from 0 to 18.7 km (0 to 11.6 miles) per hour.

Table 1. Dates for Southwestern Willow Flycatcher Surveys, 2019

Subunit	Mormon Mesa		Bunkerville		Riverside	Muddy River
Parcel(s)	**1**	**2-A through 2-G**	**2-H**	**2-I and 2-J**	**3-A and 3-B**	**A–H**
First Survey	May 16	May 20	May 17	May 17-18	May 15-17	May 18
Second Survey	June 7	June 3-4	June 4	June 2-3	June 1-2	June 1
Third Survey	June 16	June 14-15	June 15	June 15	June 14-16	June 16
Fourth Survey	June 28	July 1	July 2	June 30	June 29-30	June 29
Fifth Survey	July 16	July 14	July 13	July 15	July 15	July 15

Table 2. Dates for Yellow-Billed Cuckoo Surveys, 2019

Subunit	Mormon Mesa		Bunkerville		Riverside	Muddy River
Parcel(s)	**1**	**2-A through 2-G**	**2-H**	**2-I and 2-J**	**3-A and 3-B**	**A–H**
First Survey	June 17	June 20	June 18	June 18	June 17	June 17
Second Survey	July 2	July 4	July 3	July 3	July 1	July 1
Third Survey	July 17	July 19	July 18	July 18	July 15-16	July 16
Fourth Survey	July 31	August 2	August 1	August 1	July 30	July 30

Table 3. Area and Total Hours of Survey for Southwestern Willow Flycatcher and Yellow-Billed Cuckoo Surveys

Subunit	Mormon Mesa		Bunkerville		Riverside	Muddy River
Parcel(s)	**1**	**2-A through 2-G**	**2-H**	**2-I and 2-J**	**3-A and 3-B**	**A–H**
County Area Estimate (acres)	56.3	24.3	9.9	20.1	13.1	8.5
Area Surveyed (acres)*	52.0	20.5	9.9	17.9	9.6	8.5
Total Survey Hours – Southwestern Willow Flycatcher	22.8	23.5	9.7	18.0	18.0	6.5
Total Survey Hours – Yellow-billed Cuckoo	14.7	14.0	3.4	13.0	10.8	5.3

* Area surveyed was a result of flooding or restoration events eliminating previously surveyed habitat.

Table 4. Survey Dates for Point-Count Surveys at the Riparian Reserve Units, 2019

Subunit	Mormon Mesa		Bunkerville		Riverside	Muddy River
Parcel(s)	**1**	**2-A through 2-G**	**2-H**	**2-I and 2-J**	**3-A and 3-B**	**A–H**
First Survey	May 22	May 24-25	May 25	May 21-24	May 22	May 21
Second Survey	June 12	June 10-11	June 10	June 10-11	June 12	June 13
Third Survey	June 24	June 21	June 21	June 25	June 24	June 23

The three rounds of point-count surveys were completed at the BCCE by SWCA biologists Justin Streit and Mike Swink between May 7 and June 4, 2019 (Table 5). Each round of point-counts at the BCCE required three survey mornings. Weather conditions were favorable during all three survey rounds, with light drizzle or no precipitation and wind speeds ranging from 0 to 14.8 km (0 to 9.2 miles) per hour.

Table 5. Survey Dates for Point-Count Surveys at the BCCE, 2019

Survey Round	Dates
First	May 7–9
Second	May 22–24
Third	June 2–4

3.3 Findings

3.3.1 Federally Listed Bird Surveys

SOUTHWESTERN WILLOW FLYCATCHER

At least five individual adult southwestern willow flycatchers, comprising three breeding pairs and one unpaired male, were detected over the course of five surveys at the Riparian Reserve Units in 2019. Southwestern willow flycatchers were detected at Mormon Mesa and at Bunkerville Parcel 2-H; no willow flycatchers were detected at any of the County's other properties in 2019.

Multiple detections of what was believed to be one individual male southwestern willow flycatcher were recorded from the extreme northwestern portion of the Mormon Mesa Subunit during surveys conducted on June 7 and June 16. This bird sang spontaneously and regularly from its apparent territory (defined as an area occupied and defended by a male southwestern willow flycatcher) during these two surveys. Additionally, while this individual was not recorded during subsequent surveys for this project, it was recorded as late as July 12 as part of a southwestern willow flycatcher monitoring project conducted in this area by SWCA in 2019 (SWCA unpublished data). Despite its presence for over a month, it appears that this individual did not successfully pair with a female at any point during the 2019 breeding season.

The other four individuals recorded in 2019 were all documented at Bunkerville Parcel 2-H and comprised three breeding pairs: a territorial male, known as "OWO" for its orange-white-orange color band, and three nesting females within OWO's territory ("YK," an unbanded female, and "GG"). These three females had five nesting attempts: two by YK, one by the unbanded female, and two by GG (Figures 12 and 13). YK successfully fledged at least one fledgling (and as many as three), the unbanded female's only nesting attempt failed, and GG succeeded in two of her three nesting attempts, yielding three fledglings in 2019.

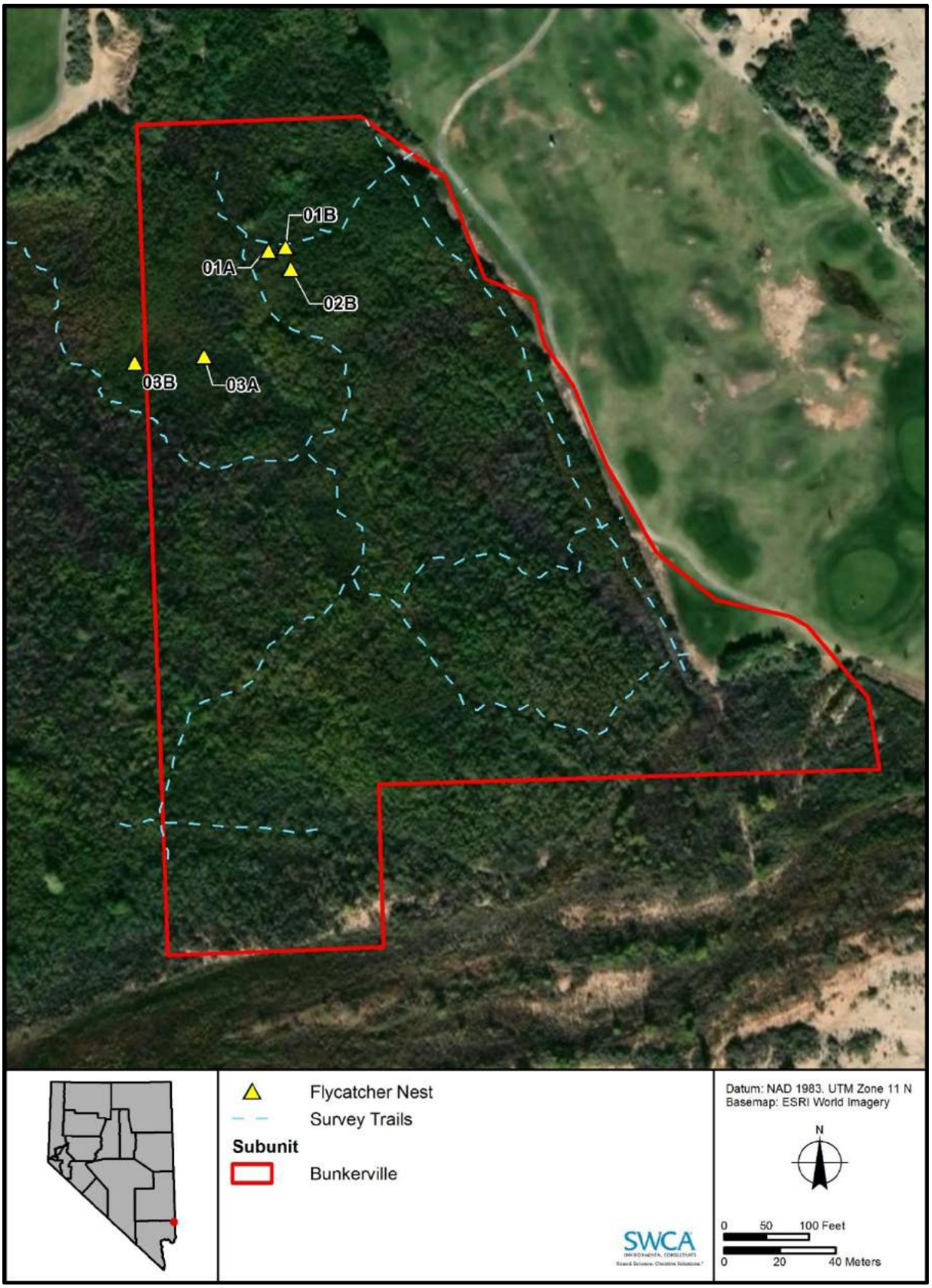

Figure 12. Southwestern willow flycatcher nesting attempts at Bunkerville Parcel 2-H, 2019.

Figure 13. Two of the southwestern willow flycatcher nests at Bunkerville Parcel 2-H.

YELLOW-BILLED CUCKOO

Yellow-billed cuckoo surveys across the Riparian Reserve Units in 2019 yielded nine different yellow-billed cuckoo detections, and an additional four detections were recorded incidentally during southwestern willow flycatcher surveys and monitoring activities; these detections represent an estimated seven different individual adult cuckoos.

At Bunkerville Parcel 2-H, a cuckoo was heard giving contact calls in response to broadcast surveys on July 18 and incidentally during flycatcher monitoring activities associated with a different project on July 24. Then on July 26, while conducting flycatcher nest monitoring at Parcel 2-H, and after incidentally hearing a cuckoo give several contact calls throughout the morning, the lead biologist stumbled upon an adult cuckoo incubating or brooding a nest in the middle of the Parcel (Figures 14 and 15). While the bird was being observed incubating, a second adult gave a contact call in the distance. One of these birds responded to broadcast surveys with a contact call again on August 1, during the final round of yellow-billed cuckoo surveys at Parcel 2-H. Then on August 3, a fledgling was confirmed at this nest (see Figure 14) during southwestern willow flycatcher monitoring. While this fledgling was being documented, an adult returned to the nest and gave a "*knock*" alarm call, prompting the biologist to vacate the area.

Figure 14. Adult yellow-billed cuckoo incubating (left) and fledgling yellow-billed cuckoo (right) at Bunkerville Parcel 2-H.

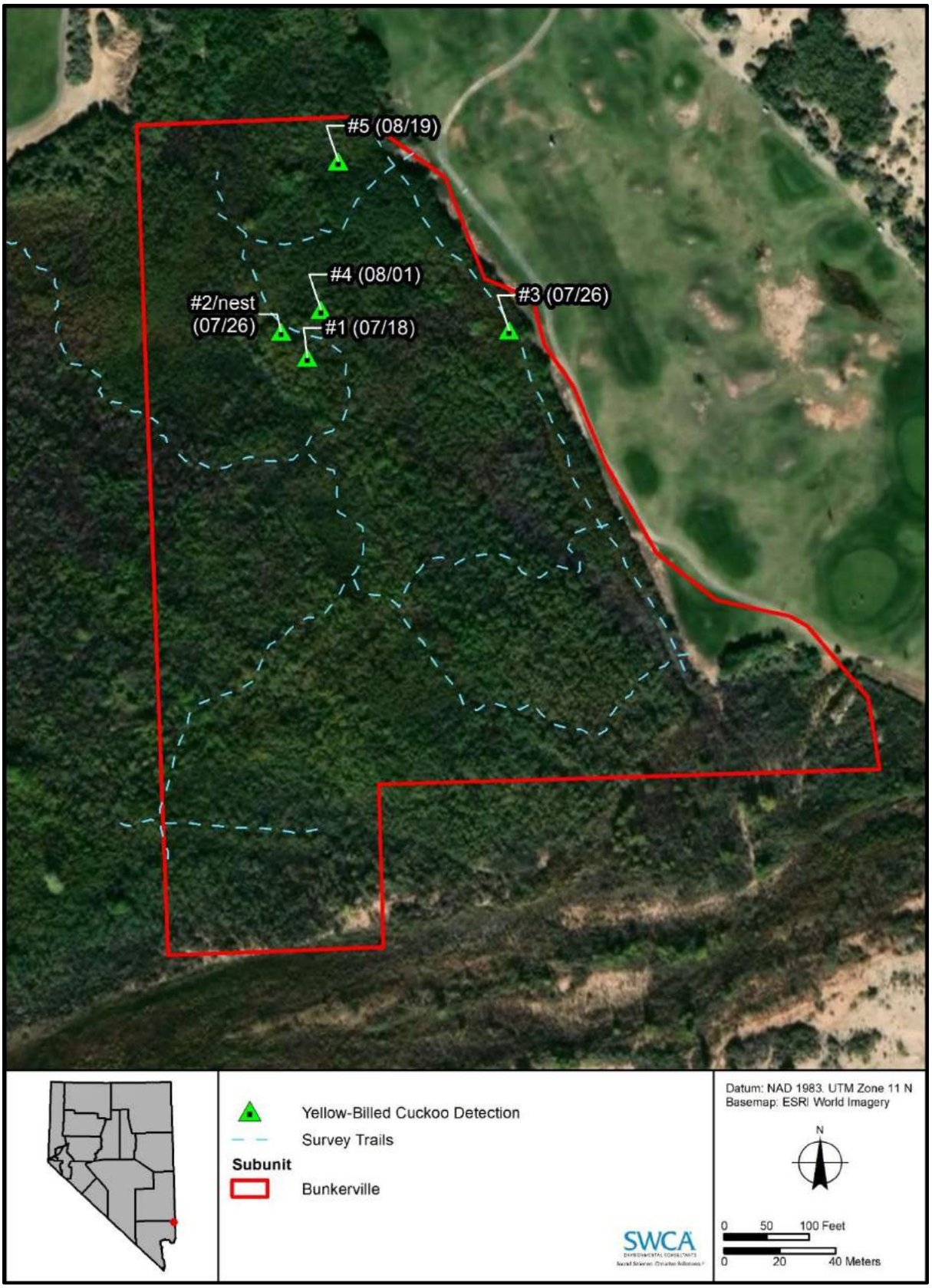

Figure 15. Yellow-billed cuckoo detections at Bunkerville Parcel 2-H, 2019.

At Bunkerville Parcel 2-I, a yellow-billed cuckoo was detected giving a contact call on June 30, while the biologist was conducting flycatcher surveys (Figure 16). Then, during the third round of yellow-billed cuckoo surveys at Bunkerville 2-I and 2-J (July 18, 2019), a bird was documented giving a "*knock*" alarm call from two different survey locations (see Figure 16); it is unclear whether there were two birds present during this round of survey or there was a single bird detected twice.

At Mormon Mesa, a cuckoo was detected giving a long, drawn-out contact call on June 28, during the fourth round of southwestern willow flycatcher surveys (Figure 17). Then, on July 2, during the second round of yellow-billed cuckoo surveys, a cuckoo was incidentally detected giving a contact call as the biologist travelled between survey points. This detection was at one of the County's Mormon Mesa restoration plots, approximately 200 m (656 feet) north of the first detection (see Figure 17). This bird was not detected during the third or fourth rounds of cuckoo surveys and, therefore, does not meet the criteria for a possible breeder (Halterman et al. 2015).

During the first round of surveys at the Muddy River Subunit (June 17), one yellow-billed cuckoo responded to broadcast surveys by giving multiple "*coo*" calls before flying off to the southwest (Figure 18). Then on July 1, this Subunit produced two cuckoos on the second round of surveys, with one bird giving "*coo*" calls in response to broadcast surveys and a second bird giving a contact call shortly thereafter to the east-southeast (see Figure 18). While no cuckoos were detected during the third or fourth rounds of surveys, multiple detections at the Muddy River Subunit over the course of two cuckoo surveys at least 10 days apart mean these detections constitute a possible breeding territory per Halterman et al. (2015).

No yellow-billed cuckoos were detected at the Riverside Subunit or at Bunkerville Parcels 2-A through 2-G.

RIPARIAN RESERVE UNITS

MSHCP Species

Of the eight MSHCP-covered bird species, five were recorded during the 2019 point-count surveys: Arizona Bell's vireo, blue grosbeak, phainopepla, southwestern willow flycatcher, and vermilion flycatcher. In addition, one other MSHCP-covered species, the yellow-billed cuckoo, was recorded while conducting other surveys at the Riparian Reserve Units. Neither the summer tanager nor the American peregrine falcon was recorded within the Riparian Reserve Units in 2019.

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 phases or amendments to the MSHCP. Of the seven evaluation bird species, the crissal thrasher was recorded at all the Riparian Reserve Subunits, and the loggerhead shrike was recorded once at the Mormon Mesa Subunit.

Seven MSHCP-covered and evaluation species were recorded during point-count surveys at the Riparian Reserve Units in 2019 (Table 6). For each species, the number of recorded individuals is listed for each set of connected parcels. In an effort to standardize the data and account for species that may be detected at greater distances than others (e.g., crissal thrasher, yellow-breasted chat [*Icteria virens*]), numbers recorded in Table 6 only refer to birds detected within 100 m (328.1 feet) of a point-count location.

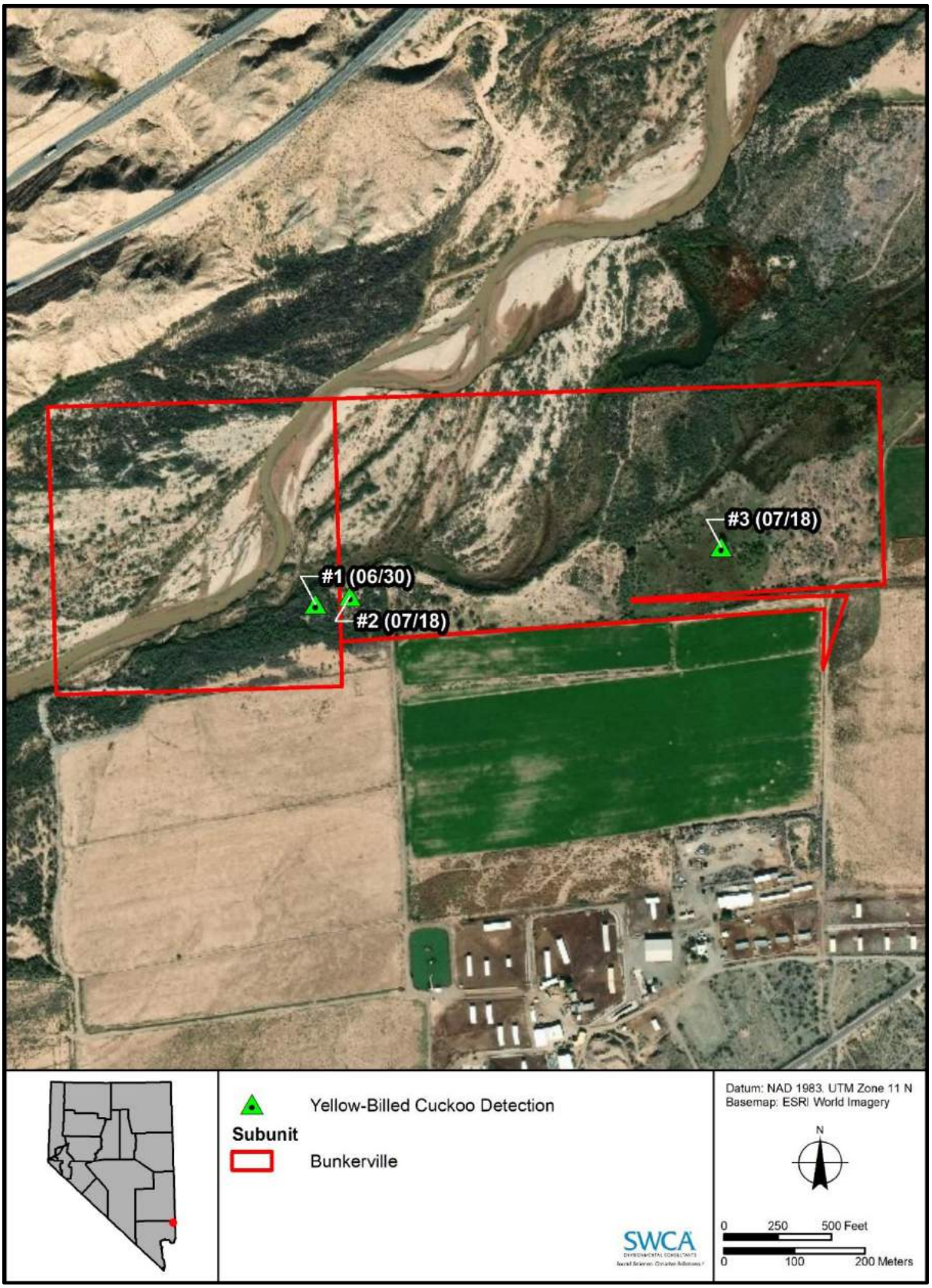

Figure 16. Yellow-billed cuckoo detections at Bunkerville Parcels 2-I and 2-J, 2019.

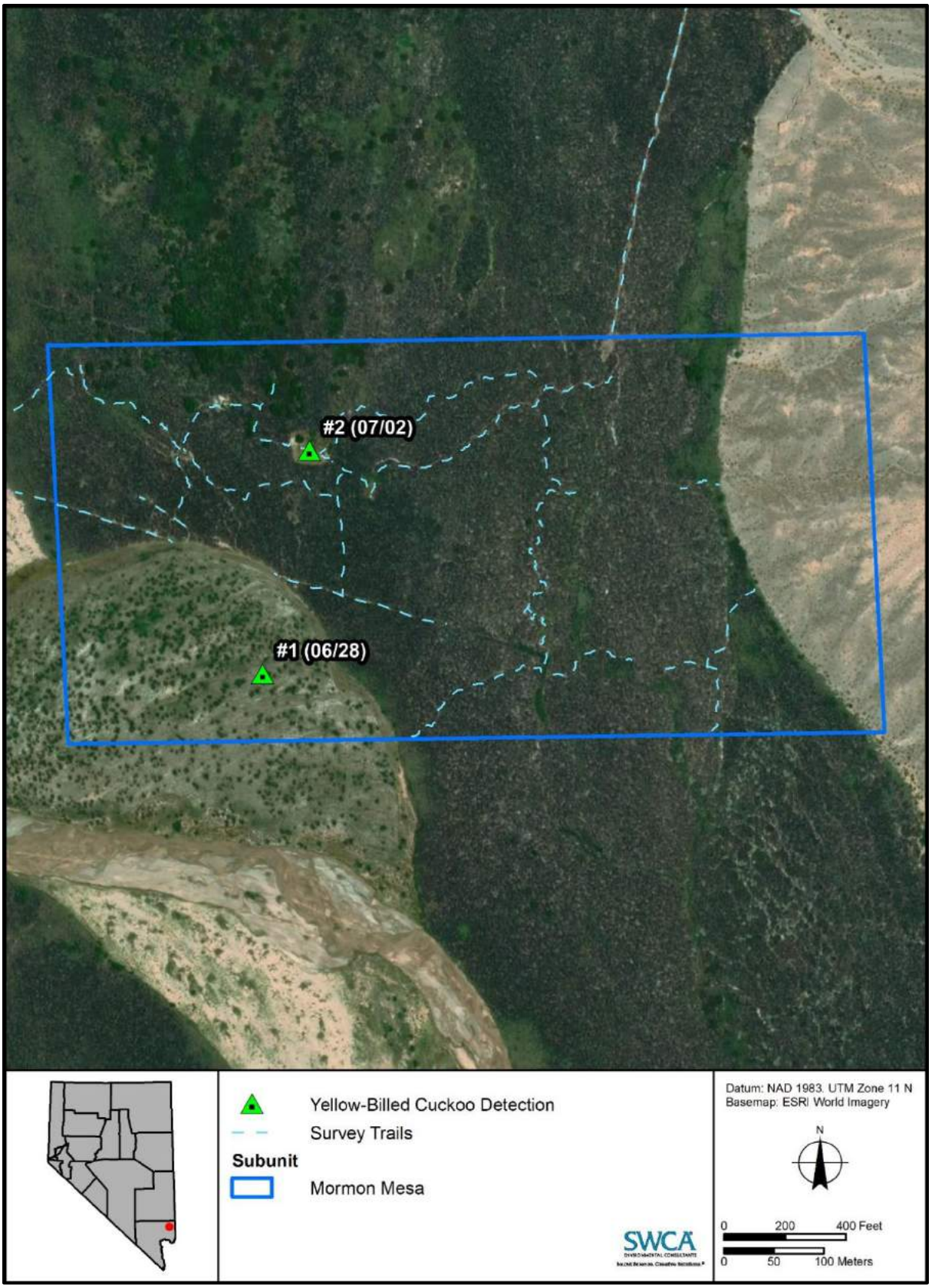

Figure 17. Yellow-billed cuckoo detections at Mormon Mesa, 2019.

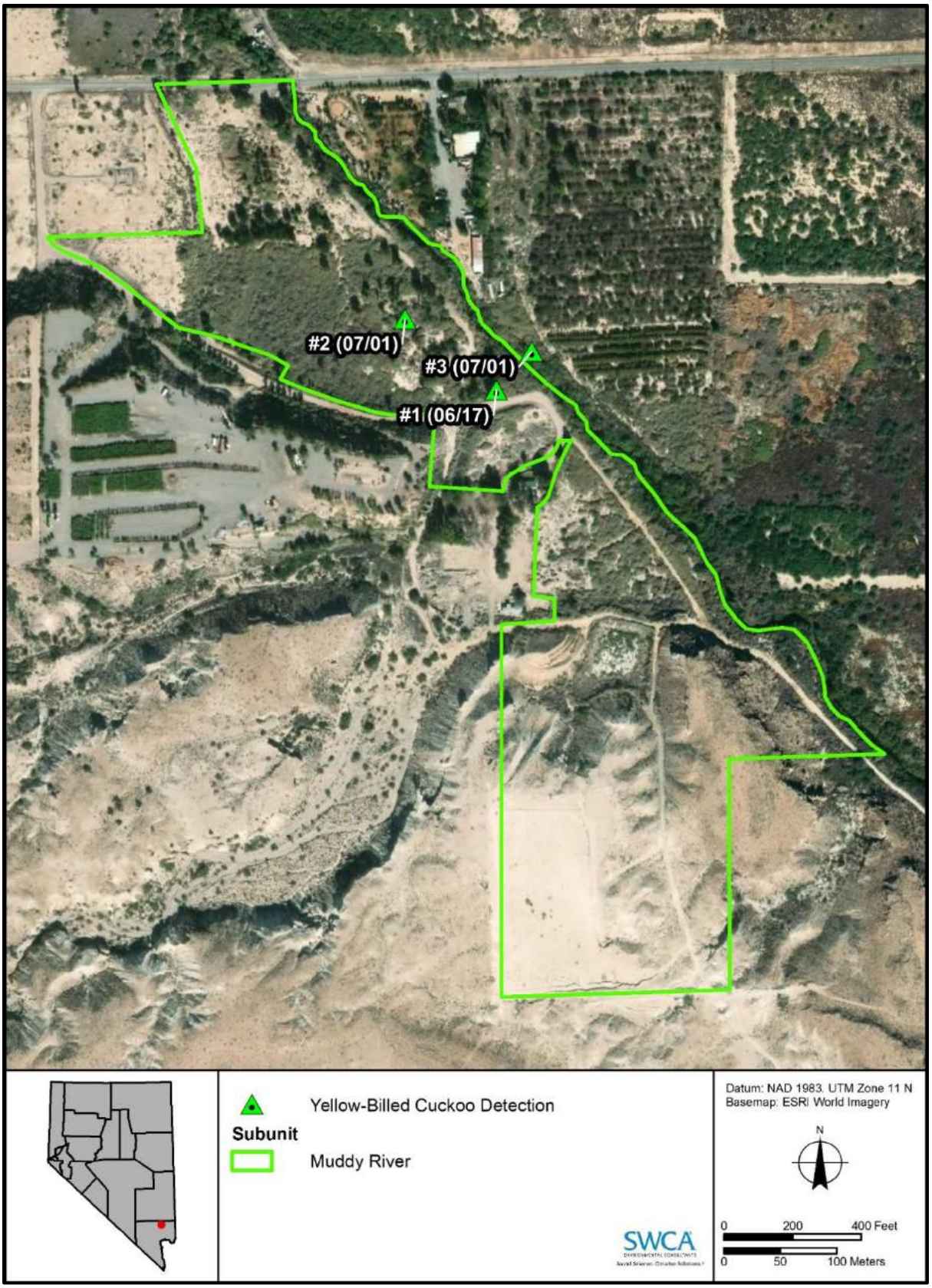

Figure 18. Yellow-billed cuckoo detections at Muddy River, 2019.

Table 6. Number of Detections of MSHCP Species Recorded at the Riparian Reserve Units during Point-count Surveys, 2019

	Mormon Mesa	Bunkerville			Riverside	Muddy River
Parcel(s)	**1**	**2-A through 2-G**	**2-H**	**2-I and 2-J**	**3-A and 3-B**	**A–H**
Southwestern willow flycatcher	2 (PO)	-	-	-	-	-
Loggerhead shrike	1	-	-	-	-	-
Blue grosbeak	X (PO)	3 (PO)	1 (PO)	5 (PO)	4 (PO)	1 (PO)
Phainopepla	-	-	-	-	1	2
Vermilion flycatcher	-	-	-	1 (PO)	-	-
Crissal thrasher	X (PO)	X	X	X	2	3
Arizona Bell's vireo	2 (PO)	1 (PO)	7 (PO)	7 (PO)	5 (PO)	1 (PO)

* X = species recorded at that unit but never within 100 m (328.1 feet) of a point-count location; CO = Breeding confirmed—recently fledged birds observed; PO = breeding possible—individual(s) singing in appropriate habitat at that unit during the breeding season.

3.3.2 Point-Count Surveys

While southwestern willow flycatchers and yellow-billed cuckoos were recorded at multiple parcels during species-specific surveys and were confirmed breeding at Bunkerville Parcel 2-H, these species were generally not detected during point-count surveys and are accordingly not included in Table 6. Breeding could not be confirmed for any of the other MSHCP species in 2019. However, blue grosbeak, Arizona Bell's vireo, and vermilion flycatcher were all suspected of breeding at the Riparian Reserve Units, because individuals were heard singing in appropriate habitat during the breeding season (refer to breeding codes in Table 6). 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 that no evidence of such was recorded.

Non-MSHCP-listed Species

During the three rounds of point-count surveys in 2019, the biologists recorded 58 non-MSHCP avian species across all the subunits (Table 7). Of these 58 species, 11 were recorded at each of the four subunits. While several of these species (e.g., warbling vireo [*Vireo galvus*] and western tanager [*Piranga ludoviciana*]) were likely just 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 the majority 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 2019.

Confirmation of breeding was recorded for Bewick's wren (*Thryomanes bewickii*), common raven (*Corvus corax*), and red-winged blackbird (*Agelaius phoeniceus*), all of which were observed carrying food, which indicates the presence of nestlings or fledglings. Additionally, 29 other species were recorded singing or performing territorial displays, indicating that breeding for that species was possible within the Riparian Reserve Units, even though some species may exhibit either of these behaviors during migration.

Species richness varied between the four Riparian Reserve Subunits. The Bunkerville Subunit showed the highest avian species richness, with 49 species recorded, while the Mormon Mesa Subunit yielded the lowest species richness with 27 species. The three most commonly detected species across all the Riparian Reserve Units were mourning dove (*Zenaida macroura*), Abert's towhee (*Pipilo aberti*), and northern rough-winged swallow (*Stelgidopteryx serripennis*).

Table 7. All Other Bird Species Present at the Riparian Reserve Subunits during Point-Count Surveys, 2019

Common Name	Scientific Name	Clark County Riparian Reserve Subunits – Presence and Breeding Codes*			
		Mormon Mesa	Bunkerville	Riverside	Muddy River
Red-winged blackbird	*Agelaius phoeniceus*	X (PO)	36 (CO)	-	-
Black-throated sparrow	*Amphispiza bilineata*	-	-	2	-
Mallard	*Anas platyrhynchos*	-	X	-	-
Black-chinned Hummingbird	*Archilochus alexandri*	-	4	-	1 (PO)
Great blue heron	*Ardea herodias*	-	1	-	-
Verdin	*Auriparus flaviceps*	2	27	13	13 (PO)
Canada goose	*Branta canadensis*	-	X	2	-
Common goldeneye	*Bucephala clangula*	-	X	-	-
Red-tailed hawk	*Buteo jamaicensis*	X	-	-	2
Swainson's hawk	*Buteo swainsoni*	-	X	-	X
Gambel's quail	*Callipepla gambelii*	4	20 (PO)	8	28 (PO)
Anna's hummingbird	*Calypte anna*	-	1 (PO)	-	-
Wilson's warbler	*Cardellina pusilla*	1 (PO)	-	-	1
Turkey vulture	*Cathartes aura*	11	1	1	X
Killdeer	*Charadrius vociferus*	-	3	X	-
Northern harrier	*Circus cyaneus*	X (PO)	-	-	-
Western wood-pewee	*Contopus sordidulus*	X	1	-	-
Common raven	*Corvus corax*	X	X	2 (CO)	X
Ladder-backed woodpecker	*Dryobates scalaris*	3	1	1	2
Pacific-slope flycatcher	*Empidonax difficilis*	1	-	-	-
American kestrel	*Falco sparverius*	-	1	-	-
Greater roadrunner	*Geococcyx californianus*	-	1	-	X
Common yellowthroat	*Geothlypis trichas*	X (PO)	15 (PO)	1	-
House finch	*Haemorhous mexicanus*	-	1 (PO)	4 (PO)	14 (PO)
Barn Swallow	*Hirundo rustica*	2	1	1	-
Yellow-breasted chat	*Icteria virens*	7 (PO)	10 (PO)	1 (PO)	1 (PO)
Bullock's oriole	*Icterus bullockii*	-	-	-	2 (PO)
Hooded oriole	*Icterus cucullatus*	-	1	1	-
Song sparrow	*Melospiza melodia*	4 (PO)	10 (PO)	-	3 (PO)
Northern mockingbird	*Mimus polyglottos*	-	1	-	-
Brown-headed cowbird	*Molothrus ater*	X	28	2	-
Ash-throated flycatcher	*Myiarchus cinerascens*	-	1	2	1 (PO)
Lucy's warbler	*Oreothlypis luciae*	5 (PO)	22 (PO)	8 (PO)	19 (PO)
House sparrow	*Passer domesticus*	-	-	-	11 (PO)
Lazuli bunting	*Passerina amoena*	-	3 (PO)	1	-
Indigo bunting	*Passerina cyanea*	-	-	-	2 (PO)

Common Name	Scientific Name	Clark County Riparian Reserve Subunits – Presence and Breeding Codes*			
		Mormon Mesa	Bunkerville	Riverside	Muddy River
Cliff swallow	*Petrochelidon pyrrhonota*	-	14	7	-
Double-crested cormorant	*Phalacrocorax auratus*	-	X	-	-
Ring-necked pheasant	*Phasianus colchicus*	-	-	-	1 (PO)
Abert's towhee	*Pipilo aberti*	2 (PO)	30 (PO)	6 (PO)	25 (PO)
Western tanager	*Piranga ludoviciana*	-	7 (PO)	-	-
Black-tailed gnatcatcher	*Polioptila melanura*	1	15	3	6
Great-tailed grackle	*Quiscalus mexicanus*	-	3 (PO)	X	-
Virginia rail	*Rallus limicola*	-	1	-	-
Rock wren	*Salpinctes obsoletus*	-	-	-	6 (PO)
Black phoebe	*Sayornis nigricans*	-	-	-	1
Say's phoebe	*Sayornis saya*	-	3	1	4 (PO)
Yellow warbler	*Setophaga petechia*	2	11 (PO)	6 (PO)	-
Lesser goldfinch	*Spinus psaltria*	-	6	2 (PO)	-
Northern rough-winged swallow	*Stelgidopteryx serripennis*	5	55	2	1
Eurasian collared-dove	*Streptopelia decaocto*	-	1	X	7 (PO)
Western meadowlark	*Sturnella neglecta*	-	X (PO)	-	-
Violet-green swallow	*Tachycineta thalassina*	-	8	2	-
Bewick’s wren	*Thryomanes bewickii*	-	5 (PO)	-	12 (CO)
Western kingbird	*Tyrannus verticalis*	-	4	-	2 (PO)
Warbling vireo	*Vireo gilvus*	-	-	2	-
White-winged dove	*Zenaida asiatica*	-	-	-	3 (PO)
Mourning dove	*Zenaida macroura*	13 (PO)	31 (PO)	7 (PO)	16 (PO)

***** X = species recorded at that unit but never within 100 m (328.1 feet) of a point-count location; CO = Breeding confirmed—adult(s) observed carrying food; PO = breeding possible—individual(s) singing or performing a territorial display in appropriate habitat at that unit during the breeding season.

BCCE

MSHCP-listed Species

Of the eight MSHCP-covered bird species, only one, a single phainopepla, was recorded during the 2019 point-count surveys. However, biologists also recorded three evaluation bird species: loggerhead shrike was recorded at two point-count locations; a single crissal thrasher was recorded at one location; and LeConte’s thrasher (*Toxostoma lecontei*) was recorded at seven point-count locations. Four MSHCP-covered and evaluation species were recorded during point-count surveys in the BCCE in 2019 (Table 8). These data are presented as total detections and detections within 100 m (328.1 feet) of the observer in order to compare species with different detection probabilities and reduce bias towards species that are more conspicuous at greater distances (e.g., LeConte’s thrasher; GBBO 2003; Ralph et al. 1995). Breeding of LeConte’s thrasher was incidentally confirmed at the BCCE in 2019, as three active nests were observed either during field reconnaissance or while hiking to a point-count location (Figure 19).

Table 8. Number of Detections and Breeding Codes for MSHCP Species Recorded at the BCCE during 2018 Point-Count Surveys

Common Name	Scientific Name	Total Detections	Detections within 100 m	Breeding Codes*
Loggerhead shrike	*Lanius ludovicianus*	2	0	-
Phainopepla	*Phainopepla nitens*	1	1	-
Crissal thrasher	*Toxostoma crissale*	1	1	-
LeConte's thrasher	*Toxostoma lecontei*	7	1	CO

* CO = Breeding confirmed—active nests.

Non-MSHCP-listed Species

SWCA biologists recorded 19 avian species not listed under the MSHCP across the BCCE point-count locations over all three rounds of 2019 point-count surveys (Table 9). As in Table 8, data presented in Table 9 include all detections, as well as birds detected within 100 m (328.1 feet) of a point-count location, to standardize the data and account for bias towards birds that can be detected at greater distances than others (e.g., common raven and turkey vulture [*Cathartes aura*]). Of these 19 species recorded during point-count surveys, 16 were recorded within 100 m (328.1 feet) of a point-count location. The three most commonly detected species at the BCCE, independent of distance from surveyor, were black-throated sparrow (*Amphispiza bilineata*), common raven, and horned lark (*Eremophila alpestris*) (see Table 9). The three most common species recorded within 100 m (328.1 feet) of a point-count location were black-throated sparrow, horned lark, and house finch (*Haemorhous mexicanus*).

While several of the species detected at the BCCE in 2019 were likely migrating through the area on their way to breeding grounds farther north or at higher elevations (e.g., green-tailed towhee [*Pipilo chlorurus*] and Wilson's warbler [*Cardellina pusilla*]), 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 2019. For example, black-throated sparrows, the most abundant species at the BCCE in 2019, were never confirmed to be breeding within the BCCE during the 2019 point-count surveys; however, this species is one of the most common breeders in the Mojave Desert, and it undoubtedly breeds within the BCCE boundary.

Confirmation of breeding was recorded for four species not covered under the MSHCP: cactus wren (*Campylorhynchus brunneicapillus*) (at a nest), common raven (at a nest), red-tailed hawk (*Buteo jamaicensis*) (at a nest), and rock wren (*Salpinctes obsoletus*) (adult carrying food). Additionally, six other species were recorded singing or performing territorial displays, which indicates that breeding for those species was possible (though some species may do either during migration). Species lacking a breeding code in Table 9 may have bred within the BCCE; however, no evidence of such was recorded.

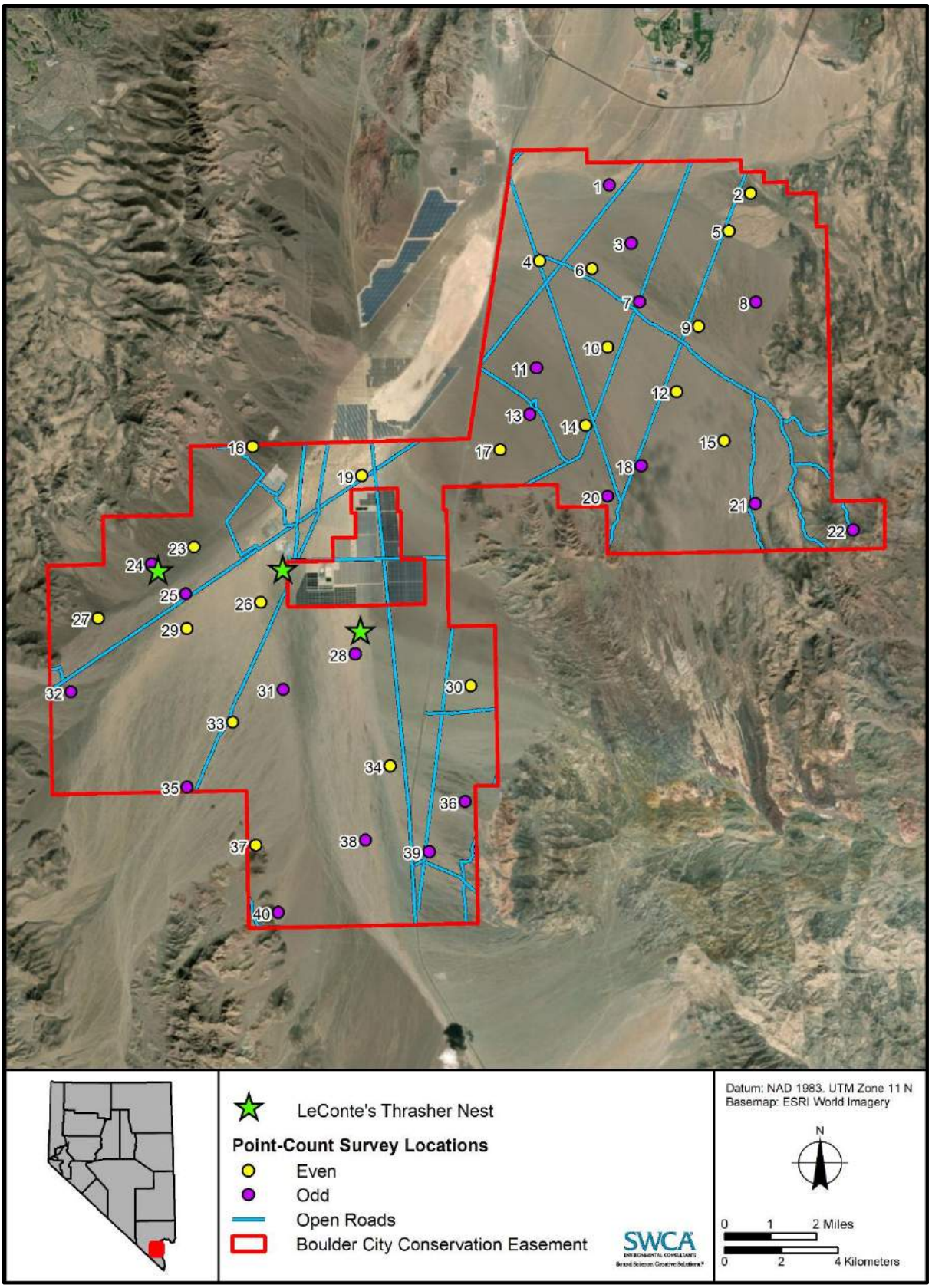

Figure 19. LeConte's thrasher nests at the BCCE, 2019.

Table 9. Number of Detections and Breeding Codes for Non-MSHCP-listed Species Recorded at the BCCE during Point-Count Surveys, 2019

Common Name	Scientific Name	Total Detections	Detections within 100 m	Breeding Codes*
White-throated swift	*Aeronautes saxatalis*	1	1	-
Black-throated sparrow	*Amphispiza bilineata*	81	49	PO
Verdin	*Auriparus flaviceps*	5	5	-
Red-tailed hawk	*Buteo jamaicensis*	7	0	CO
Costa's hummingbird	*Calypte costae*	1	1	-
Cactus wren	*Campylorhynchus brunneicapillus*	4	1	CO
Wilson's warbler	*Cardellina pusilla*	1	1	-
Lesser nighthawk	*Chordeiles acutipennis*	1	0	PO
Common raven	*Corvus corax*	40	2	CO
Horned lark	*Eremophila alpestris*	37	20	PO
House finch	*Haemorhous mexicanus*	16	9	-
Scott's oriole	*Icterus parisorum*	1	0	PO
Northern mockingbird	*Mimus polyglottos*	8	3	PO
Ash-throated flycatcher	*Myiarchus cinerascens*	13	7	PO
Green-tailed towhee	*Pipilo chlorurus*	1	1	-
Black-tailed gnatcatcher	*Polioptila melanura*	9	8	-
Rock Wren	*Salpinctes obsoletus*	7	4	CO
Say's phoebe	*Sayornis saya*	2	2	-
Mourning dove	*Zenaida macroura*	4	4	-

***** CO = Breeding confirmed – adult(s) observed carrying food or at an active nest; PO = breeding possible – individual(s) singing or performing a territorial display in appropriate habitat during the breeding season.

4.0 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 65 avian species detected, including 7 MSHCP-covered and evaluation species. Point-counts across the BCCE yielded 23 total avian species, including 4 MSHCP-covered and evaluation species. Goals identified in both the Riparian Reserve Unit Management Plan (Clark County 2015) and the BCCE Management Plan (Clark County 2019) 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 to successfully manage 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 Mormon Mesa

The Mormon Mesa Subunit is dominated largely by a monotypic stand of tamarisk. However, much of this vegetation is dead or dying as the result of defoliation by the tamarisk leaf beetle (*Diorhabda* spp.) (Figure 20), and 1.7 ha (4.3 acres) of dead tamarisk was cleared via mastication by the County in late

2018 (Figure 21 and see Figure 20). This area of masticated tamarisk was subsequently not surveyed for southwestern willow flycatcher or yellow-billed cuckoo in 2019 (see Figure 3).

Figure 20. Dead and dying tamarisk at the Mormon Mesa Subunit.

Figure 21. Masticated tamarisk at the Mormon Mesa Subunit.

An approximately 5-ha (13-acre) patch of screwbean mesquite (*Prosopis pubescens*) and arrowweed (*Pluchea sericea*) shrubland is present in the southwestern corner of this Subunit, and some large native Goodding's willow (*Salix gooddingii*) are present in the northwestern corner. Eight restoration plots are also scattered throughout the northwestern corner of the Mormon Mesa Subunit; in 2014, the County cleared non-native tamarisk and planted native vegetation within these plots. Examples of these plots are shown in Figure 22.

Three MSHCP-covered bird species were recorded at the Mormon Mesa Riparian Reserve Unit, including two detections of an Arizona Bell's vireo and two detections of, presumably, the same southwestern willow flycatcher recorded during southwestern willow flycatcher surveys. In addition, at least one yellow-billed cuckoo was detected while conducting other activities at this Subunit. Crissal thrasher was recorded multiple times from MM-5 (see Figure 7), though this individual(s) seemed to be calling from scrubby habitat outside the County Mormon Mesa Subunit boundary.

Figure 22. Sample habitat within restoration plots at the Mormon Mesa Subunit.

All three of the MSHCP-covered bird species that were recorded at Mormon Mesa (Arizona Bell's vireo, southwestern willow flycatcher, and yellow-billed cuckoo) were recorded from the western end of the Subunit, which is the area where the restoration plots are situated and also where most of the native vegetation and surface water within this Subunit occurs. MM-2 was the only point-count location surveyed near this area in 2019, and both the Arizona bell's vireo and southwestern willow flycatcher were detected at this point. MM-2 is dominated by tamarisk but has several large Goodding's willows nearby. A willow flycatcher was recorded from MM-2 during the second and third rounds of point-count surveys, but it is believed that this individual was unsuccessful in attracting a mate in 2019 (see Section 3.3.1). One yellow-billed cuckoo was detected from the large patch of screwbean mesquite in the southwestern corner of the Mormon Mesa Subunit, and a second yellow-billed cuckoo was detected from a large Goodding's willow in one of the County's restoration plots (see Section 3.3.1). These two detections were recorded just four days apart, so it is, therefore, believed that this individual(s) did not breed at Mormon Mesa but was more likely moving through the area.

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. This is corroborated by the fact that Mormon Mesa yielded the lowest species richness of any of the subunits during both the 2017 and 2019 point-count surveys (surveys were not conducted at Mormon Mesa in 2018). These dying monotypic tamarisk stands provide less concealment from predators and are relatively hot and dry compared to living vegetation, thereby causing a reduction in canopy cover and decreased thermal protection for eggs and nestlings (McLeod 2019). McLeod and Pellegrini (2013) showed that occupied breeding habitat for southwestern willow 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.

4.2 Bunkerville

The habitat at the Bunkerville Subunit is extremely varied, ranging from highly disturbed areas to mostly intact, native habitat. In vegetated areas, dominant species range from young, sparsely distributed arrowweed in open, sandy soil, to mature monotypic tamarisk, to dense stands of narrowleaf willow (*Salix exigua*). Therefore, for the purposes of this report, we will evaluate and discuss the avian dataset as it pertains to habitat within in each unique set of connected parcels: 1) Parcels 2-A through 2-G, 2) Parcel 2-H, and 3) Parcels 2-I and 2-J.

4.2.1 Parcels 2-A through 2-G

Bunkerville Parcels 2-A through 2-G contain mostly shrubby habitat with frequent openings that have been scoured by flooding or cleared by anthropogenic activities. Parcels 2-A through 2-E are situated mostly within the active floodplain of the Virgin River, which experiences frequent high-flow events. These Parcels therefore consist largely of sandy bare ground dotted with sapling arrowweed and tamarisk (Figure 23). In 2019, higher than normal winter precipitation yielded significant spring run-off that scoured portions of these Parcels, creating more open, unvegetated habitat than was present in 2017, the last time this area was surveyed (Figure 24). Of the 9.8 ha (24.3 acres) originally delineated for surveys by the County, 1.3 ha (3.2 acres) were scoured by the 2019 flooding (see Figures 4 and 24), and 0.3 ha (0.7 acre) was burned in a wildfire late in 2017 (Figure 25) (SWCA 2017a). These 1.6 ha (3.9 acres) of previously tamarisk-dominated woodland were excluded from surveys in 2019 (see Figure 4).

Figure 23. Examples of flood-disturbed habitat at Bunkerville Parcels 2-A through 2-E.

Figure 24. Evidence of the 2019 flooding at Bunkerville Parcels 2-A through 2-E.

Figure 25. Evidence of wildfire at Bunkerville Parcels 2-A through 2-E.

Parcels 2-A through 2-G do not currently contain vegetation that resembles typical southwestern willow flycatcher or yellow-billed cuckoo breeding habitat, and the lack of detections for both species is not surprising. The site completely lacks the multistoried canopy that is generally used by cuckoos, and although the minimum canopy height for breeding flycatchers is considered to be 3 m, occupied flycatcher sites along the Virgin River in 2003–2011 had median canopy heights of 5–6 m (16.4–19.7 feet) (McLeod and Pellegrini 2013). There is 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 had canopy closure that reached 80%, but the majority of the site was much more open.

Bunkerville Parcels 2-F and 2-G are dominated by anthropogenically disturbed lands and include large areas that have been completely bladed and cleared of native vegetation (Figure 26). Any regrowth in this area is generally patchy tamarisk and arrowweed, 2- to 4-m- (6.6- to 13.1-foot-) high, with little continuous canopy. Much of the southern portion of Bunkerville Parcel 2-F is currently being used for growing alfalfa (*Medicago sativa*) and grazing cattle (see Figure 4). The areas of Parcels 2-F and 2-G that have not been disturbed by anthropogenic activities are dominated by 1- to 3-m- (3.3- to 9.8-foot-) tall seep willow (*Baccharis salicifolia*), tamarisk, and intermittent arrowweed (Figure 27). There is a small patch of monotypic tamarisk in Parcel 2-F and a small patch of narrowleaf willow in Parcel 2-G (Figure 28). The tamarisk occurs largely on a dry terrace, raised above the river, and consists of 3- to 4-m- (9.8- to 13.1-foot-) tall trees with < 50% canopy closure. The patch of willow consists largely of narrowleaf willow, with intermittent tamarisk and seep willow, all of which ranges mostly between 3 and 4 m (9.8 and 13.1 feet) in height. This area of willow has intermittent surface water and relatively dense canopy cover (~75%) but is less than 0.4 ha (1 acre) in size, which is likely too small to support most of the MSHCP-covered bird species, including southwestern willow flycatcher (Sogge et al. 2010). A few mature Goodding's willow and screwbean mesquite also occur within the Virgin River floodplain throughout Parcels 2-A through 2-G.

Figure 26. Anthropogenically disturbed habitat at Bunkerville Parcels 2-F and 2-G.

Figure 27. Examples of young seep willow and arrowweed at Bunkerville Parcels 2-F and 2-G.

Figure 28. Monotypic tamarisk at Bunkerville Parcel 2-F (left) and the narrowleaf willow patch at Bunkerville Parcel 2-G (right).

Just two MSHCP-covered avian species were recorded at Bunkerville Parcels 2-F and 2-G: Arizona Bell's vireo and blue grosbeak. Arizona Bell's vireo is typically found in desert riparian habitat (Clark County 2000), and this species was recorded from all four points surveyed within this set of Parcels in 2019. Blue grosbeaks were detected from three of the four point-count locations surveyed within this set of Parcels in 2019. While both species are considered to be desert riparian obligates, it appears that they both can tolerate more open, scrubby habitat than some of the other MSHCP riparian species. In addition to the covered species, a single crissal thrasher was recorded from a point-location within these Parcels. This species prefers dense, scrubby vegetation often near water, but is not a riparian obligate species.

4.2.2 Parcel 2-H

More than 90% of the vegetation at Bunkerville Parcel 2-H consists of narrowleaf willow, the majority of which is 4–6 m (13.1–19.7 feet) in height (Figure 29); the remainder of the vegetation consists of 4- to 6-m- (13.1- to 19.7-feet-) tall tamarisk and some patches of narrowleaf willow approximately 3–4 m (9.8–13.1 feet) in height. Parcel 2-H generally exhibits canopy closure > 90%. Intermittently throughout the breeding season, irrigation return water runs north to south throughout all but the southeast corner of Parcel 2-H. On days when there are no return flows, the site still contains saturated soils. This Parcel contains the best habitat for southwestern willow flycatchers within the County's Riparian Reserve Units. All 4.0 ha (9.9 acres) originally delineated for surveys by the County were considered habitat suitable for federally listed bird surveys in 2019 (see Figure 4).

Habitat quality in Parcel 2-H is evidenced by the presence of three known southwestern willow flycatcher territories and five known nesting attempts (see Section 3.3.1, and Figures 12 and 13). Bunkerville Parcel 2-H occupies the majority of the eastern portion of a larger study site known as Mesquite West, which has been monitored annually by SWCA (under contract with the Bureau of Reclamation) and NDOW biologists since 2003 (McLeod and Pellegrini 2013, 2014; NDOW, unpublished data). From 2003 to 2012, Mesquite West had anywhere from 6 to 30 resident adult southwestern willow flycatchers in a given year (McLeod and Pellegrini 2013). However, similar to 2019 surveys, surveys at Bunkerville Parcel 2-H in 2018 detected three southwestern willow flycatcher territories, which were composed of OWO and three different nesting females (SWCA 2018a).

Figure 29. Typical narrowleaf willow habitat at Bunkerville Parcel 2-H.

The western and central portions of Parcel 2-H contain taller narrowleaf willows that approach 8 m (26.2 feet) in height, and it was at the eastern edge of one of these patches that yellow-billed cuckoos nested in 2019 (see Section 3.3.2). Yellow-billed cuckoos appear to have had a banner year throughout southern Nevada in 2019 (personal communication, D. Van Dooremolen, Southern Nevada Water

Authority, with Justin Streit, Project Manager, SWCA, August 8, 2019), and multiple detections were made at three of the four subunits surveyed in 2019. However, the nesting attempt at Parcel 2-H is the only one documented within the Riparian Reserve Units in 2019. In fact, this is only the third confirmed breeding location for yellow-billed cuckoo in southern Nevada, the others being multiple nesting attempts at Warm Springs Ranch along the upper Muddy River (approximately 2 km [1.2 miles] upstream from the County's Muddy River Riparian Reserve Unit) in 2001 (Floyd et al. 2007) and a lone nesting attempt at Mormon Mesa, also in 2001 (McKernan and Carter 2002). Bunkerville Parcel 2-H is the largest contiguous patch of native riparian vegetation within the County's Riparian Reserve Units. While it was originally thought that Parcel 2-H did not contain enough of the multi-storied canopy or continuous overstory preferred by yellow-billed cuckoo, this Parcel could be one of the better options for nesting along the Nevada reach of the lower Virgin River. Yellow-billed cuckoos were detected in this Parcel in 2010 and 2011 (McLeod and Pellegrini 2013).

In addition to the southwestern willow flycatcher and yellow-billed cuckoo, two other MSHCP-covered avian species (Arizona Bell's vireo and blue grosbeak) as well as one evaluation species (crissal thrasher) were recorded at Bunkerville Parcel 2-H. While the blue grosbeak and crissal thrasher were each recorded once from one point-count location at Parcel 2-H, Arizona Bell's vireos were recorded on five of six point-count surveys conducted within Parcel 2-H in 2019. This habitat is ideal for Arizona Bell's vireo, as this species is known to nest in thickets of dense willow (Clark County 2000, Floyd et al. 2007), and it is presumed that Arizona Bell's vireos likely breed within this Parcel.

Though not an MSHCP-covered species, the yellow warbler (*Setophaga petechia*), a Mojave riparian indicator species (GBBO 2010), was recorded at both of the point-count locations surveyed at Bunkerville Parcel 2-H in 2019, further indicating that Parcel 2-H has some of the best quality habitat of any of the parcels within the Riparian Reserve Units.

4.2.3 Parcels 2-I and 2-J

Much of Bunkerville Parcels 2-I and 2-J appear to be subject to regular flooding, and some of the most abundant plants within these two Parcels are sapling arrowweed and tamarisk < 3 m (9.8 feet) tall (Figure 30). Much of the area is relatively unvegetated when compared to other riparian habitat in the desert Southwest, and this is likely due, at least in part, to relatively recent flood events, including flooding in the spring of 2019. Of the 8.1 ha (20.1 acres) delineated for surveys by the County prior to 2019 surveys, 0.9 ha (2.2 acres) were scoured by spring flooding, leaving unvegetated bare ground (Figure 31 and see Figure 4). These areas were excluded from southwestern willow flycatcher and yellow-billed cuckoo surveys. Additionally, flooding resulted in scouring, which affected the habitat at point-count location BV-18 (Figure 32).

Figure 30. Typical open, scrubby habitat at Bunkerville Parcels 2-I and 2-J.

Figure 31. Evidence of the 2019 flooding at Bunkerville Parcel 2-I.

Figure 32. BV-18, facing north, in 2018 (left) and in 2019 (right).

Bunkerville Parcels 2-I and 2-J host very few large native riparian tree species, such as the Goodding's and narrowleaf willow, which are preferred by southwestern willow flycatcher and yellow-billed cuckoo. Most of the mature riparian vegetation within these Parcels consists of tamarisk and screwbean mesquite 2–5 m (6.6–16.4 feet) tall (Figure 33), and these stands have virtually no continuous canopy cover or nearby surface water. Additionally, much of the tamarisk is dead or dying, due to defoliation by the tamarisk leaf beetle or herbicidal treatment by the National Park Service (personal communication, C. Deuser, National Park Service, with Justin Streit, Project Manager, SWCA, August 28, 2019) (Figure 34). 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.

Figure 33. Open tamarisk (left) and screwbean mesquite (right) habitat at Bunkerville Parcels 2-I and 2-J.

Figure 34. Tamarisk stand treated with herbicide at Bunkerville Parcel 2-J, before (left) and after (right) treatment.

Bunkerville Parcels 2-I and 2-J do not currently contain any typical breeding habitat for southwestern willow flycatcher or yellow-billed cuckoo, and the site completely lacks the multistoried canopy that is generally used by cuckoos; unsurprisingly, no southwestern willow flycatchers were detected during surveys. However, much to the surprise of the biologists working at these two Parcels, three detections of yellow-billed cuckoos were recorded across Parcels 2-I and 2-J in 2019 (see Section 3.3.1). Two of these detections came from a dense, monotypic stand of 3- to 4-m- (9.8- to 13.1-feet-) tall tamarisk at the southern end of Parcel 2-I, while the third detection came from a lone large Goodding's willow surrounded by a sporadic 3- to 4-m- (9.8- to 13.1-feet-) tall tamarisk in Parcel 2-J. It is unclear if these three detections constitute one, two, or three different individuals. And while it is possible, though unlikely, that a cuckoo would fly more than 300 m (984.3 feet) in response to a subsequent call broadcast following an initial detection (Halterman et al. 2015), it seems more likely that two different individuals were detected on July 18. Both areas at which cuckoos were detected contain habitat that is atypical breeding habitat for yellow-billed cuckoo, and it is possible that this bird(s) was not breeding within Parcel 2-I or 2-J but was moving through the area. However, the three detections made at this set of Parcels spanned 18 days, thereby resulting in this area being considered a possible breeding territory for yellow-billed cuckoo in 2019 (Halterman et al. 2015).

Despite a lack of many native trees, Parcels 2-I and 2-J do have flowing channels, a pond, and a wet meadow (Figure 35), all of which could support native riparian vegetation in the future. The wet meadow is located in the eastern half of Parcel 2-J and is composed largely of sedges (*Carex spp.*) and other wetland grasses, with relic Goodding's willow and scattered tamarisk. The wet meadow is unique to Parcel 2-J within the County's reserve system and could be an area to target for riparian restoration. Cattle, which were seen on almost every visit to this Parcel and which have been documented browsing on the narrowleaf willows at these Parcels (Figure 36), should be excluded prior to any restoration efforts. A fence currently exists around much of Parcel 2-J, and excluding cattle from this Parcel could be as simple as installing or fixing a gate at the point of ingress.

Figure 35. Open water (left) and wet meadow (right) habitats at Bunkerville Parcel 2-J.

Figure 36. Evidence of cattle browse on narrowleaf willow at Bunkerville Parcel 2-I (left) and the meadow habitat at Bunkerville Parcel 2-J where the cattle were regularly seen (right).

In total, four MSHCP-covered bird species (Arizona Bell's vireo, blue grosbeak, yellow-billed cuckoo, and vermilion flycatcher) and one MSHCP evaluation bird species (crissal thrasher) were recorded within Bunkerville Parcels 2-I and 2-J in 2019. While this habitat is atypical for yellow-billed cuckoo, the other four species are known to thrive in open, scrubby habitats bordering desert riparian habitat.

The wet meadow in Parcel 2-J seems to be the best habitat for vermilion flycatcher across the Riparian Reserve Units. The only vermilion flycatcher detections recorded in both 2018 and 2019 came from Bunkerville Parcel 2-J, either in or adjacent to this meadow. The MSHCP identifies that this species can be found in desert riparian habitat, but it is also known to use mesquite habitat adjacent to irrigated fields and pastures (Clark County 2000).

The blue grosbeak can be found in a variety of habitats, including desert riparian (Clark County 2000). However, more than any of the five other MSHCP-covered bird species found in desert riparian habitats, the blue grosbeak can be found foraging in open areas adjacent to desert riparian habitat, such as that found in the Bunkerville Subunit. The blue grosbeak was recorded more often at Bunkerville Parcels 2-I and 2-J than at any other set of parcels, and this seems congruent with this species' affinity for open riparian habitat.

4.3 Riverside

Much like Bunkerville Parcels 2-I and 2-J, Riverside Parcels 3-A and 3-B are composed mostly of the open, scrubby habitat typically found in riparian areas that experience frequent flooding (Figure 37). Like Parcels 2-I and 2-J, the Riverside Subunit was subjected to substantial seasonal run-off associated with above average winter precipitation in the Virgin River watershed in 2019. This resulted in the inundation of point-count location RS-7, which necessitated that that point be moved 25 m (82.0 feet) to the southwest (Figure 38). The 2019 flooding also removed portions of a large, contiguous patch of tamarisk at the northern end of the Riverside Subunit (see Figure 5). Subsequently, of the 5.3 ha (13.1 acres) that the County identified for federally listed bird surveys, 3.9 ha (9.6 acres) were deemed suitable for surveys by SWCA. Areas that were included in the 2019 surveys consisted of two general types: 1) relatively contiguous tamarisk 3–4 m (9.8–13.1 feet) in height, with canopy closure < 50%, and 2) a generally < 5-m- (16.4-foot-) wide strip of 3- to 4-m- (9.8- to 13.1-feet-) tall narrowleaf willow along an irrigation ditch (Figure 39).

Figure 37. Scrubby, open habitat within the floodplain at Riverside Parcels 3-A and 3-B.

Figure 38. RS-7 facing north in 2018 (left) and RS-7a facing north in 2019 (right).

Figure 39. Narrowleaf willow along the irrigation ditch at Riverside Parcels 3-A and 3-B.

As of 2018, there were also large areas of dense 2-m- (6.6-foot-) tall arrowweed and fairly dense 2- to 4-m- (6.6- to 13.1-foot-) tall screwbean mesquite (Figure 40). However, between the 2018 and 2019 surveys, the majority of this largest patch of mesquite was cut down by an unknown party (see Figure 40). Though the perspective is different in each of the photos in Figure 40, the concrete slab and north-south road are visible on the right edge of each photo for reference (with an arrow pointing to the slab in the left photo).

Figure 40. Screwbean mesquite patch at Riverside Parcels 3-A and 3-B before (left) and after (right) cutting.

Four MSHCP avian species were recorded at the Riverside Subunit: Arizona Bell's vireo, blue grosbeak, crissal thrasher, and phainopepla. With the exception of Arizona Bell's vireo, the MSHCP identifies all of these species as capable of occupying habitat other than desert riparian, and blue grosbeak can occupy open riparian habitat (Clark County 2000). Crissal thrasher and phainopepla prefer shrub- or mesquite-dominated habitats and are not desert riparian obligates, so their presence at the Riverside Subunit is not surprising.

The Arizona Bell's vireo is a desert riparian obligate, but it can occupy dense mesquite habitat (SWCA 2017b) and is not restricted to nesting in willow, as suggested in the MSHCP (Clark County 2000). While dense willow is present along the irrigation ditch that runs along the eastern side of Parcels 3-A and 3-B, Arizona Bell's vireos were regularly heard singing and seen foraging in screwbean mesquite and tamarisk. In fact, the Arizona Bell's vireo was the third-most detected species (behind cliff swallow [*Petrochelidon pyrrhonota*] and mourning dove) at the Riverside Subunit, which contains very few native riparian trees, further exhibiting that this species can occupy habitat other than desert riparian habitat.

The Riverside Subunit does not currently contain vegetation that resembles typical southwestern willow flycatcher or yellow-billed cuckoo breeding habitat; the narrowleaf willow 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 southwestern willow flycatcher breeding habitat. Surface water at the Riverside Subunit is restricted to the active river channel and the irrigation ditch running down the east side of the Subunit. Furthermore, the Riverside Subunit completely lacks the mature vegetation and multistoried canopy that is generally required by yellow-billed cuckoo. Riverside was the only Subunit from which no yellow-billed cuckoo detections were recorded in 2019, and the two other true desert riparian obligates (e.g., southwestern willow flycatcher and summer tanager) were, likewise, absent from the Riverside Subunit in 2019.

4.4 Muddy River

Vegetation at the Muddy River Riparian Reserve Unit is highly diverse. Parcels A–E are dominated by horticultural plantings (e.g., pine [*Pinus* spp.] and California fan palm [*Washingtonia filifera*]) (Figure 41), creosote bush (*Larrea tridentata*) scrubland, or big saltbush (*Atriplex lentiformis*). Parcel F is dominated almost completely by creosote bush scrub, with smaller patches of honey mesquite (*Prosopis glandulosa*), particularly in the central and southeast portions of the Parcel (Figure 42). 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 (Figure 43). While 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 also deeply incised, and true desert riparian vegetation, consisting of widely scattered tamarisk and velvet ash (*Fraxinus velutina*), is generally limited to within a couple of meters of the riverbank.

Figure 41. Horticultural trees planted at Muddy River Parcels A-E.

Figure 42. Creosote bush habitat with scattered honey mesquite at Muddy River Parcel F.

Figure 43. Varied scrub habitat at Muddy River Parcels G-I.

In total, four MSHCP-covered bird species (Arizona Bell's vireo, blue grosbeak, phainopepla, and yellow-billed cuckoo) and one MSHCP evaluation bird species (crissal thrasher) were recorded on the Muddy River Riparian Reserve Unit. However, many of the records for these species are of single birds or birds that were recorded outside the Muddy River Riparian Reserve Unit's boundaries. Blue grosbeaks use the Muddy River Riparian Reserve Unit sparingly, as this species was recorded just twice from point Muddy River (MR)-3 (see Figure 10). Arizona Bell's vireos likely use the scattered honey mesquite in Muddy River Parcel F (see Figure 42), but all other records from 2019 were of birds singing from outside of the County's property boundaries. Similarly, at least two of the three yellow-billed cuckoo detections at the Muddy River Riparian Reserve Unit were of individuals that were either detected from or flew to private property outside of the Muddy River Riparian Reserve Unit boundary.

The remaining two species were recorded within the boundaries of the Muddy River Riparian Reserve Unit and were recorded multiple times and from multiple locations. The crissal thrasher was recorded from five of the seven point-count locations at Muddy River. Crissal thrasher, a low priority evaluation species, is found mainly in dense cover within mesquite and riparian woodlands (Floyd et al. 2007). The phainopepla was recorded from two of the seven Muddy River point-count locations. This species depends heavily on mistletoe (*Phoradendron* spp.) berries that grow on mesquite. More than any other Riparian Reserve Unit, Muddy River has a relatively abundant population of honey mesquite with dense patches of understory vegetation; therefore, it is suspected that both of these species are breeding in their preferred habitats within the Muddy River Riparian Reserve Unit.

The Muddy River Riparian Reserve Unit is composed of creosote bush upland and mesic forest, and the unit lacks the desert riparian habitat that occurs at the Virgin River Subunits. This habitat composition is reflected by crissal thrasher and phainopepla being the two most abundant MSHCP bird species at this Unit. Both species prefer mesquite-dominated habitats and are not desert riparian obligates. Most of the desert riparian obligates (e.g., southwestern willow flycatcher and summer tanager) were absent from the Muddy River Riparian Reserve Unit in 2019. The yellow warbler, a Mojave riparian indicator species (GBBO 2010), was not recorded at the Muddy River Riparian Reserve Unit in 2019, further hinting at the lack of riparian habitat at this Unit.

4.5 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 2019). The majority of point-count survey locations are situated within this habitat type (Figure 44). The remainder of the BCCE is composed of salt desert scrub (1.5%), mesquite/acacia habitat (less than 1%), and previously disturbed habitat (Clark County 2019). A few survey points were located to sample areas of dense cholla (*Cylindropuntia* spp.) or desert wash habitat (Figure 45).

Figure 44. Mojave Desert scrub habitat at point-count locations 17 (left) and 39 (right).

Figure 45. Dense cholla at point-count location 32 (left) and desert wash habitat at point-count location 37 (right).

The BCCE Management Plan identified that no MSHCP-covered avian species are known to occur within the BCCE (Clark County 2019). During the 2019 point-count surveys, biologists did not observe any habitat that could be considered suitable breeding habitat for the MSHCP-covered avian species, in particular desert riparian habitat. A small spring, Forlorn Hope Spring, is located near point-count location 22 (see Figure 11), but the habitat at the spring consists mostly of catclaw acacia and lacks species typical of desert riparian habitat, such as willow (*Salix* spp.) and cottonwood (*Populus* spp.) (Figure 46).

Figure 46. Catclaw acacia habitat at Forlorn Hope Spring, point-count location 22.

Point-count surveys yielded just one of the eight MSHCP-covered species, a single record of a phainopepla at point-count location 22 (see Figures 11 and 46). Mesquite/acacia habitat is present along ephemeral washes within the BCCE, but that habitat does not appear to provide much, if any, of the mistletoe that is generally required within phainopepla breeding habitat.

Both LeConte's thrasher and loggerhead shrike are known to occur within the BCCE (Clark County 2019), and the point-count surveys in 2018 and 2019 confirmed their presence. Because these species both generally occur in Mojave Desert scrub (Floyd et al. 2007), their presence at the BCCE is relatively unsurprising. Both species were recorded multiple times and from multiple locations (see Table 8).

Biologists found several active LeConte's thrasher nests at the BCCE in 2019, which confirmed breeding for that species (Figure 47 and see Figure 15). The closest point-count locations to two of these three nests were located in very sandy soils (Figure 48), which is thought to be a key habitat parameter for the species (Floyd et al. 2007).

Figure 47. LeConte's thrasher nest near point-count location 24.

Figure 48. Sandy soils observed at survey locations 26 (left) and 28 (right).

5.0 CONCLUSION

Six MSHCP-covered and three MSHCP evaluation bird species were recorded at the County's reserve system properties in 2019. Some notable conclusions about MSHCP avian species and their habitats at the County's properties include:

- Yellow-billed cuckoos were detected from three of the four Riparian Reserve Subunits in 2019. A successful nesting attempt at Bunkerville Parcel 2-H confirms this Parcel as the third known breeding site for this species in the state of Nevada and is the first nesting attempt documented in the state since 2001.
- Surveys for southwestern willow flycatcher yielded four breeding individuals in Bunkerville Parcel 2-H over the course of the breeding season. Surveyors recorded five nesting attempts in the territory occupied by OWO and his three nesting females in the north-central portion of Parcel 2-H.
- Arizona Bell's vireo was fairly abundant, particularly at the Riverside Subunit, where it was the third most commonly detected species on point-count surveys. This species is likely breeding throughout the Riparian Reserve Units, particularly anywhere where willows or mesquite are present.
- Mature native desert riparian habitat within the County's Riparian Reserve Units is limited to small patches throughout the parcels and one large patch of narrowleaf willow that constitutes almost all of Bunkerville Parcel 2-H. Due to a number of factors, native riparian habitats have largely died off or been replaced by non-native species such as tamarisk. While tamarisk can provide valuable habitat for some species, such as the southwestern willow flycatcher, habitat quality diminishes after infestation and defoliation by the tamarisk leaf beetle.
- Breeding habitat for the MSHCP-covered bird species is currently limited to 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. A single phainopepla was recorded at the BCCE during the 2019 point-counts.
- LeConte's thrashers were confirmed breeding at the BCCE in 2019, and three different nesting attempts were documented in the southwestern portion of the property. This species appears to be fairly common across the BCCE, with detections from several survey points.

Aggressive efforts are likely required in order to restore, create, and enhance habitat for most of the MSHCP avian species. 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.

6.0 RECOMMENDATIONS

Based on observations from the 2019 avian surveys and factors discussed in this report, there are several recommendations that 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 suffered substantial dieback as the result of defoliation by 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, assuming that any tamarisk removal be immediately followed by planting of native vegetation, such as willow and cottonwood.
- The County could plant honey and screwbean mesquite in areas of enhanced runoff that do not have the hydrological potential to support wetland facultative species like willow or Fremont cottonwood (*Populus fremontii*). Portions of the Riparian Reserve Units are susceptible to scouring floods, as evidenced by conditions recorded in 2019. 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.
- Cattle exclusion fencing should be erected in any area where native trees are newly planted. At parcels where fencing already exists, such as portions of Mormon Mesa and Bunkerville Parcel 2-J, the County should remove cattle from within the fenced area and make sure that all fences (including gates) are in working order. Cattle have been observed at all the Riparian Reserve Subunits, except for Muddy River, and they should be inhibited from foraging on native plantings wherever practicable.
- Areas of native vegetation that currently provide nesting habitat for MSHCP-covered and evaluation bird species should not be disturbed during restoration and should be allowed an appropriate buffer, in particular the existing willow stands in the Bunkerville and Mormon Mesa Subunits and the patches of honey and screwbean mesquite scattered throughout the County's properties.
- Because the Virgin River Riparian Reserve Unit lies within designated critical habitat for the southwestern willow flycatcher and proposed critical habitat for the yellow-billed cuckoo, restoration plans should be designed in coordination with the USFWS.
- Avian point-counts and species-specific surveys should be continued for subsequent years to help build on baseline data and to track changes in avian populations throughout the land management and restoration intervention and post-implementation process. These surveys should use the protocols established for this project to ensure datasets are standardized and comparable.

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