



Lower Colorado River Multi-Species Conservation Program

Balancing Resource Use and Conservation

Riparian Bird Surveys at Conservation Areas in the Lower Colorado Region, 2017



July 2018

Work conducted under LCR MSCP Work Task F2

Lower Colorado River Multi-Species Conservation Program Steering Committee Members

Federal Participant Group

Bureau of Reclamation
U.S. Fish and Wildlife Service
National Park Service
Bureau of Land Management
Bureau of Indian Affairs
Western Area Power Administration

Arizona Participant Group

Arizona Department of Water Resources
Arizona Electric Power Cooperative, Inc.
Arizona Game and Fish Department
Arizona Power Authority
Central Arizona Water Conservation District
Cibola Valley Irrigation and Drainage District
City of Bullhead City
City of Lake Havasu City
City of Mesa
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Electrical District No. 3, Pinal County, Arizona
Golden Shores Water Conservation District
Mohave County Water Authority
Mohave Valley Irrigation and Drainage District
Mohave Water Conservation District
North Gila Valley Irrigation and Drainage District
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Salt River Project Agricultural Improvement and Power District
Unit "B" Irrigation and Drainage District
Wellton-Mohawk Irrigation and Drainage District
Yuma County Water Users' Association
Yuma Irrigation District
Yuma Mesa Irrigation and Drainage District

Other Interested Parties Participant Group

QuadState Local Governments Authority
Desert Wildlife Unlimited

California Participant Group

California Department of Fish and Wildlife
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Coachella Valley Water District
Colorado River Board of California
Bard Water District
Imperial Irrigation District
Los Angeles Department of Water and Power
Palo Verde Irrigation District
San Diego County Water Authority
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The Metropolitan Water District of Southern California

Nevada Participant Group

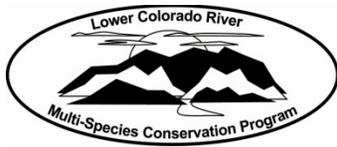
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Basic Water Company

Native American Participant Group

Hualapai Tribe
Colorado River Indian Tribes
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Conservation Participant Group

Ducks Unlimited
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The Nature Conservancy



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ACRONYMS AND ABBREVIATIONS

AMM	Avoidance and Minimization Measure
BLCA	Beal Lake Conservation Area
Cibola NWR Unit #1	Cibola National Wildlife Refuge Unit #1 Conservation Area
Collector	Collector for ArcGIS
cottonwood-willow	Fremont cottonwood-willow species (<i>Populus fremontii-Salix</i> spp.)
CVCA	Cibola Valley Conservation Area
HCP	Habitat Conservation Plan
LCR	lower Colorado River
LCR MSCP	Lower Colorado River Multi-Species Conservation Program
LDCA	Laguna Dam Conservation Area
m	meter(s)
Middle Bill Williams River NWR	acreage on the Middle Bill Williams River National Wildlife Refuge
MRM	Monitoring and Research Measure
n	sample size
PVER	Palo Verde Ecological Reserve
PWCA	Pretty Water Conservation Area
Reclamation	Bureau of Reclamation
spp.	unidentified multiple species in a genus
SWCA	SWCA Environmental Consultants
YEW	Yuma East Wetlands

Symbols

x	by
=	equal to
>	greater than
≥	greater than or equal to
<	less than
%	percent

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EXECUTIVE SUMMARY

In 2017, SWCA Environmental Consultants conducted riparian bird surveys at nine conservation areas following the double-sampling survey methodology (Bart et al. 2010). A total of 80 plots were surveyed, with 2 in the Beal Lake Conservation Area (BLCA), 15 in the Middle Bill Williams National Wildlife Refuge (Middle Bill Williams River NWR), 7 in the Cibola National Wildlife Refuge Unit #1 Conservation Area (Cibola NWR Unit #1), 12 in the Cibola Valley Conservation Area (CVCA), 13 in the Laguna Division Conservation Area (LDCA), 2 in Parker Dam Camp, 15 in the Palo Verde Ecological Reserve (PVER), 10 in the Pretty Water Conservation Area (PWCA), and 4 in Yuma East Wetlands (YEW). Surveyors detected a total of 78 breeding species across all 80 plots during rapid area search surveys. These included four of the six focal species for this project: Arizona Bell's vireo (*Vireo bellii arizonae*), Gila woodpecker (*Melanerpes uropygialis*), Sonoran yellow warbler (*Dendroica petechia sonorana* = *Setophaga petechia sonorana*), and summer tanager (*Piranga rubra*). Also included were two additional species also covered by the Lower Colorado Multi-Species Conservation Program: western least bittern (*Ixobrychus exilis hesperis*) and Yuma clapper rail (*Rallus longirostris yumanensis* [also known as Yuma Ridgway's rail = *R. obsoletus yumanensis*]).

Arizona Bell's vireo territories were recorded in the BLCA, Middle Bill Williams River NWR, CVCA, PVER, and YEW. Gila woodpecker territories were recorded at the Middle Bill Williams River NWR, Parker Dam Camp, and YEW. Summer tanager territories were recorded in the BLCA, Middle Bill Williams River NWR, Cibola NWR Unit #1, and PVER. Sonoran yellow warbler territories were recorded in the BLCA, Middle Bill Williams River NWR, and PVER. All four species were most abundant in the Middle Bill Williams River NWR.

The highest density of breeding territories for territorial species recorded during rapid area search surveys was in the Middle Bill Williams River NWR (3.3 territories per hectare). The lowest density (0.5 territory per hectare) was in the PWCA. The highest density of estimated pairs of non-territorial species was in Cibola NWR Unit #1 (7.8 estimated pairs per hectare). The lowest density was in the BLCA (1.3 pairs per hectare).

Intensive area search surveys were also conducted on a subset of eight plots, with one plot in Cibola NWR Unit #1, one plot in the CVCA, two plots in the LDCA, three plots in the PVER, and one plot in the PWCA. No probable or confirmed breeding territories were recorded for any focal species. Surveyors recorded a total of 48 breeding species across the 8 plots.

INTRODUCTION

The Lower Colorado River Multi-Species Conservation program (LCR MSCP) is a 50-year program that seeks to protect 27 species (hereafter covered species) and their habitats along the lower Colorado River (LCR) while maintaining river regulation and water management required by law. The LCR MSCP was approved in April 2005 with the signing of a Record of Decision by the Secretary of the U.S. Department of the Interior, and implementation of the program began in October 2005. Documentation for the LCR MSCP includes a Habitat Conservation Plan (HCP), biological assessment/biological opinion, and an environmental impact statement. The HCP specifies Avoidance and Minimization Measures (AMMs) as well as Monitoring and Research Measures (MRMs) (AMM1, AMM3, MRM1, MRM2, and MRM4) that call for surveys and research to better define habitat requirements for covered species and studies to determine the effects of brown-headed cowbird (*Molothrus ater*) nest parasitism on the reproduction of covered bird species (LCR MSCP 2004). The HCP also calls for the creation of a system of conservation areas, where habitat would be created for the benefit of many species.

The Bureau of Reclamation (Reclamation) implemented a monitoring program along the LCR in 2002 to document bird use of riparian habitat in restoration sites that would become conservation areas for the LCR MSCP. The monitoring program included area search surveys, which were conducted by Reclamation from 2002 to 2006. In 2007, the U.S. Geological Survey designed and executed a sampling plan to produce density and trend estimates for bird species within riparian habitat along the LCR (Bart et al. 2010). The plan uses a double sampling survey method, which requires both rapid and intensive area search surveys. From 2008 to 2016, the Great Basin Bird Observatory conducted riparian bird surveys using the developed methods, while also addressing specific questions on certain bird species covered by the LCR MSCP. Of the 12 bird species covered by the LCR MSCP, 6 are considered focal species for this project: Arizona Bell's vireo (*Vireo bellii arizonae*), Gila woodpecker (*Melanerpes uropygialis*), gilded flicker (*Colaptes chrysoides*), Sonoran yellow warbler (*Dendroica petechia sonorana* = *Setophaga petechia sonorana*), summer tanager (*Piranga rubra*), and vermilion flycatcher (*Pyrocephalus rubinus*). The remaining six covered species are not considered focal species for this project because they are monitored under other efforts. The six non-focal covered species are California black rail (*Laterallus jamaicensis coturniculus*), elf owl (*Micrathene whitneyi*), southwestern willow flycatcher (*Empidonax traillii extimus*), western least bittern (*Ixobrychus exilis hesperis*), yellow-billed cuckoo (*Coccyzus americanus occidentalis*), and Yuma clapper rail (*Rallus longirostris yumanensis* [also known as Yuma Ridgway's rail = *R. obsoletus yumanensis*]).

In 2017, SWCA Environmental Consultants (SWCA) continued the riparian bird monitoring studies along the LCR. The objective in 2017 was to inventory the number of breeding territories of the six focal species and non-covered riparian

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bird species within both existing conservation areas using the double sampling method and existing habitat in future (pre-development) conservation areas. Information presented in this report is specific to the existing conservation areas.

METHODS

Survey Area

Rapid area search surveys were conducted to determine the presence and abundance of breeding bird species on 80 plots within 9 existing conservation areas (table 1). Using the double sampling method, intensive area search surveys were conducted on a subset of eight of these plots (see “Data Collection” below). The plots were selected by Reclamation and ranged in size from 4 to 19 hectares (attachment 1). Each plot was classified by Reclamation into one of three habitat types: cottonwood-willow (Fremont cottonwood-willow species) (*Populus fremontii-Salix* spp.), mesquite (*Prosopis* spp.), and mixed (mixture of cottonwood-willow and mesquite). Each plot was assessed for access issues prior to the surveys. If vegetation density at or below chest height was found to inhibit movement through the habitat, trails were established. If the establishment of a trail was deemed necessary, vegetation was cut conservatively so as to impact the habitat as little as possible. All established trails were marked with biodegradable orange flagging. Reclamation selected additional plots that could be used as alternate options if access to or within a plot was deemed unsafe. All 80 of the originally selected plots were deemed safely accessible after assessment, and none of the alternate plots were surveyed in 2017.

Table 1.—Number of plots and area by habitat type in conservation areas, 2017

Conservation area	Number of plots	Total area (hectares)	Area (hectares)		
			Cottonwood-willow (n) ¹	Mesquite (n) ¹	Mixed (n) ¹
Beal Lake Conservation Area	2	19	13 (1)	-	6 (1)
Middle Bill Williams River National Wildlife Refuge	15	154	154 (15)	-	-
Cibola National Wildlife Refuge Unit #1 Conservation Area	7	68	49 (5)	-	19 (2)
Cibola Valley Conservation Area	12	117	49 (5)	60 (6)	8 (1)
Laguna Division Conservation Area	13	174	22 (2)	23 (2)	129 (9)
Palo Verde Ecological Reserve	15	165	104 (9)	4 (1)	57 (5)
Parker Dam Camp	2	21	-	10 (1)	11 (1)
Pretty Water Conservation Area	10	105	-	47 (5)	58 (5)
Yuma East Wetlands	4	54	28 (2)	8 (1)	18 (1)
Total	80	877	419 (39)	152 (16)	306 (25)

¹ Numbers in parentheses equal the number of plots surveyed in the habitat type within the area.

Data Collection

Rapid Area Search Surveys

Rapid area search surveys at each plot consisted of two visits, following the rapid area search survey methodology (Bart et al. 2010). The first visit was conducted between April 10 and May 5, and the second was completed between May 5 and June 5. Visits were spaced at least 20 days apart, and both visits on a given plot were conducted by the same surveyor. Visits were conducted between first light and 11:00 a.m. Surveyors remained in the plot for 2 hours or the amount of time necessary to detect > 90% of the birds using the plot, whichever was longer. Given that visits ended by 11:00 a.m., the maximum amount of time that could be spent in a plot was 6 hours. If sustained high winds or temperatures ≥ 100 degrees Fahrenheit occurred during a visit, the visit was postponed until conditions improved.

Intensive Area Search Surveys

Intensive area search surveys were conducted on a subset of eight plots (table 2), following the intensive area search survey methodology (Bart et al. 2010). Surveyors visited each plot eight times between April 10 and June 5, 2017, spacing visits apart by 5 to 9 days. All eight visits were conducted by the same surveyor, and this surveyor was a different individual from the one who completed the rapid area search survey in the same plot. No information about bird species or territory numbers was shared between surveyors doing rapid and intensive area search surveys of the same plot. The same protocol specified above for the rapid area search visits regarding the length of time spent in the plot on each visit was followed during intensive area search visits.

Table 2.—Plots where intensive area search surveys were conducted with habitat type and area in hectares, 2017

Conservation area	Plot ID	Habitat type	Area (ha)
Cibola National Wildlife Refuge Unit #1 Conservation Area	C2722	Cottonwood-willow	10
Cibola Valley Conservation Area	C2502	Cottonwood-willow	8
Laguna Division Conservation Area	C4916	Mixed	16
	C4922	Mixed	13
Palo Verde Ecological Reserve	C2315	Cottonwood-willow	12
	C2329	Cottonwood-willow	10
	C2332	Cottonwood-willow	10
Pretty Water Conservation Area	C2921	Mesquite	9

Field Methods

For both rapid and intensive area search surveys, field data were collected with Collector for ArcGIS (hereafter Collector) on a Panasonic FZ-B2 Toughpad tablet running an Android operating system. Several feature services were published to ArcGIS Online for use in Collector. These included plot boundaries, trails, a feature service to record real-time locations of the surveyor at regular intervals (i.e., surveyor “tracks”), a 50- x 50-meter (m) grid, and a “working data” service for field data. Field data included point locations of each individual or group of birds detected. The symbology in Collector is somewhat limited, and a total of five easily distinguished shapes (i.e., diamond, square, circle, triangle, and pentagon) were selected for use in the point feature. The list of species known to breed along the LCR was split into five groups, some of which are composed of similar species (e.g., flycatchers) and some of dissimilar species (e.g., buntings, grosbeaks, tanagers, and warblers), depending on the number of species in each group. Each shape was then applied to a group of species, and different colors were selected to differentiate each species in the field. Feature services were structured such that there was one independent copy per surveyor. High-resolution, gray-scale aerial imagery of the pre-development conservation areas was loaded directly onto the tablets for use in Collector. All data collected in the field were recorded into an offline copy of a surveyor’s feature services, which the surveyors downloaded onto their tablets prior to conducting a visit.

During each visit, surveyors ensured thorough coverage of their plot by walking a route that took them within 50 m of the plot boundary and each 50-m grid intersection point. Surveyors were also instructed to walk outside the plot boundary whenever possible to gather higher resolution data on territories located on the plot boundary. To maximize coverage within the plot during early morning hours when detection probability is highest, surveyors varied their start and stop locations within a plot between successive visits.

Surveyors recorded the plot ID, weather conditions, and the current time and location at the beginning and end of each visit. Weather conditions consisted of a wind code based on the Beaufort scale and a sky code (see attachment 2). Detection locations were recorded for individuals of all territorial species known to breed along the LCR. Data recorded for each point included species of the detection, behaviors observed, number of individuals by gender (i.e., male, female, or unknown), and number of dependent young. Surveyors drew lines between location points to indicate the relationship between two detections of the same species (e.g., same or different individual, possible pair, etc.), and these lines were later used in separating intraspecific territories (see “Data Processing” and attachment 2). If a detection location was offset from the surveyor’s current location, the surveyor estimated the distance to the detection location and used a compass to note the bearing. The surveyor then visually estimated the location of the detection on the map in Collector using the aerial imagery, bearing, and estimated distance to aid in location placement. Surveyors focused on recording

at least one detection location per potential territory or pair,¹ while trying to avoid double counting territories or pairs. If a focal species was detected, surveyors attempted to record multiple location points to aid with delineating the territory. Any notes on complex behavioral observations that could not be adequately recorded in Collector were recorded in Microsoft OneNote (Microsoft Office Professional Plus 2013, Version 15.0.4901.1000) on the tablets. All surveyors had their own independent Microsoft OneNote notebook files loaded on their tablets.

If non-territorial or colonial species, or species deemed difficult to map using spot-mapping techniques (hereafter “non-territorial species”), were detected, surveyors estimated the number of pairs present in the plot. Surveyors also recorded any breeding behavior and the number of individuals by gender using Collector, Microsoft OneNote, or a combination of the two. Surveyors were not required to record all detection locations for non-territorial species, though location information could be helpful in determining the overall number of pairs present during the visit. Examples of groups of species classified as non-territorial in 2017 are shorebirds, wading birds, water birds, marsh birds, waterfowl, colonial nesters, and raptors. A complete list of species considered to be non-territorial in 2017 can be found in attachment 2.

Whenever an LCR MSCP covered species was detected, surveyors recorded a detection location and associated information, even if the detection was outside of a plot. Because the non-focal covered species are monitored under other efforts, no effort was made to record multiple detection locations or to confirm breeding status.

Data Processing

Daily Process

Survey data were processed as soon as possible and no later than 2 days after a visit occurred. Upon returning to a field house, surveyors synchronized the survey data in Collector with ArcGIS Online. Surveyors then viewed the spatial data from ArcGIS Online on a laptop in an ArcMap map file. When viewing the data in ArcMap, surveyors were able to apply special symbols that were based on both the species of the detection and a recorded behavior (see attachment 2), and which approximate the spot-mapping symbology developed by Bibby et al. (2000). Surveyors then reviewed the data for completeness (i.e., no fields with null values) and accuracy (i.e., no erroneous values). As part of this process, surveyors examined the relationships between and spatial distribution of detection

¹ In this report, species that display territorial behavior are described in terms of breeding territories. Species that do not display territorial behavior, or whose breeding biology is not conducive to spot-mapping techniques, are described in terms of the estimated number of pairs.

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locations and determined which location or group of locations constituted an individual or pair based on knowledge of the species' biology. A unique territory ID number was then assigned to each location or group of locations that were determined to be an individual or unique pair. If the visit was a successive visit after the first, surveyors compared the current day's data in the "working data" feature service with previously collected data in the "master data" feature service to determine if they had detected the same individual or pair multiple times. If the surveyors determined they had detected the same individual or pair on a subsequent visit, they assigned the existing territory ID number to the new detection locations. All individuals or pairs determined to be detected for the first time on any visit were assigned unique territory IDs. Survey data from both ArcGIS Online and Microsoft OneNote were then summarized into a Microsoft Access (Microsoft Office Professional Plus 2013, Version 15.0.4893.1000) database provided by Reclamation. All surveyors had their own individual copies of the database.

Once each individual surveyor's spatial data in ArcGIS Online had been reviewed, data were removed from the "working data" feature service and moved into the surveyor's "master data" feature service. Data located in the "master data" feature service remained available for future editing and viewing by the surveyor in ArcMap but were not visible in the field on the tablets. Surveyors removed the offline copy of their feature services on a daily basis prior to downloading a new copy specific to the plot they were scheduled to visit the next day. Completing the steps listed above ensured the surveyor would have a "working data" feature service clear of any previous days' data.

Breeding Justifications

Rapid Area Search Surveys

After the second visit to a plot, surveyors reviewed the cumulative data from both visits in ArcMap, the Microsoft Access database, and Microsoft OneNote to determine the breeding status of each territory. Surveyors lumped the observed breeding behaviors into one of four breeding evidence categories (table 3). They then applied a decision matrix based on the species' natural history (table 4) to the pattern of observed breeding evidence categories to obtain the breeding status. Each territorial species was classified as either a local breeder (i.e., not known to migrate during the survey season) or a species that is known to both breed and migrate during the season (see attachment 2). A conservative approach was employed when determining whether a species was considered a local breeder. If there was any chance that late migrants (including lingering winter residents) could occur during any part of the survey season, the species was classified as both a migrant and breeder. The category of "No Standard Scenarios" was selected if the breeding evidence observed during both visits did not fit into any of the other standard categories, but the surveyor was certain that the detections

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Table 3.—Behavioral information collected during area search surveys and associated breeding evidence categories

Breeding evidence category	Behavior/breeding evidence
Observed	Seen or heard only
Possible	Singing
	Pair seen or heard together
	Copulation
Probable	Territorial display
	Pair in suitable nesting habitat
	Courtship and/or mate guarding
	Agitated behavior
	Nest guarding
Confirmed	Nest building
	Carrying nest material
	Prolonged distraction behavior
	Occupied nest
	Food carrying
	Dependent young present
	Fecal sac carrying
	Nest with eggs
	Nest with young
	Nest colony
	Female observed on nest

represented a breeding territory. The surveyor provided an explanation to justify using this category. If no breeding evidence was observed or all detections were outside the plot, the surveyor selected “No Justification Required.”

Intensive Area Search Surveys

After the eighth visit to a plot, surveyors reviewed the cumulative data from all visits in ArcMap, the Microsoft Access database, and Microsoft OneNote to determine the breeding status of each territory. Surveyors lumped the observed breeding behaviors into one of four breeding evidence categories (see table 3). To obtain breeding status, they then applied a decision matrix based on the pattern of detections across the season where possible, probable, or confirmed breeding evidence was observed (table 4). The category of “No Standard Scenarios” was selected if the breeding evidence observed during all visits did not fit into any of the other standard categories, but the surveyor was certain that the detections

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Table 4.—Description of justification categories for breeding territories on rapid and intensive area search surveys

Category	Survey type	Description
No Justification Required	Rapid and intensive	No Justification Required (no breeding evidence observed or all detection locations outside the plot).
Observed Confirmed	Rapid and intensive	Observed confirmed breeding evidence (see table 3) on at least one visit.
Observed Probable Evidence Consecutive	Intensive	Observed bird/pair probable or possible breeding evidence (see table 3) on three consecutive visits.
Observed Probable Evidence Season	Intensive	Observed bird/pair probable or possible breeding evidence (see table 3) on at least five non-consecutive visits.
Observed Probable Evidence Local	Rapid	Observed probable or possible breeding evidence (see table 3) on at least one visit for known local breeders (i.e., species that do not occur as migrants).
Observed Probable Evidence Both	Rapid	Observed probable or possible breeding evidence (see table 3) on both visits for species that are both migrants and breeders.
No Standard Scenarios	Rapid and intensive	Called it breeding but does not fit any of the standard scenarios. A detailed explanation was provided in the notes for this territory. This category might be selected for a species that breeds along the LCR but migrates partway through the survey season.

represented a breeding territory. The surveyor provided an explanation to justify using this category. If no breeding evidence was observed or all detections were outside the plot, the surveyor selected “No Justification Required.”

Territory Delineation

Once the breeding justification category was determined for a territory, surveyors determined the percentage of the territory that was in the plot. If a territory was not confirmed as breeding, the territory was considered 0% in the plot, and the territory boundary was not delineated. For rapid area search surveys, territories of all focal species, as well as territories of any other species that were on or near the plot boundary, were delineated by drawing polygons in ArcMap using the detection locations as vertices. For intensive area search surveys, all species’ territories (focal and non-focal) were delineated following the same methodology as for rapid area search surveys. For both types of area search surveys, if territorial behavior was primarily observed in a cluster of detection locations near a nest site or area of activity and was not observed sufficiently (i.e., very few detection locations spaced widely apart) to delineate a clear territory boundary beyond the cluster of detections, then surveyors used 90% of the detection locations to approximate the area of the territory. This method was used regardless of whether a territory was on or near the plot boundary, or clearly

within the plot. Surveyors then visually assessed the percentage of the polygon in the plot. Percentages were recorded in the Microsoft Access database to the nearest 25% (i.e., 0%, 25%, 50%, 75%, and 100%). Any territory < 10% in the plot was considered to be 0% in the plot. If < 10% of the territory was in the plot, but the nest was located in the plot, the territory was considered to be 25% in the plot.

Territories with the entirety of their detections within the plot were considered to have a 100% territory regardless of how close to the plot boundary the detections were located. Several surveyors were each assigned a few sets of adjacent plots, and in these cases, they often had detailed information on the location of a territory that was present in both plots. If surveyors knew that the detections recorded in both plots were from the same territory, and if the data from at least one plot were sufficient to meet the criteria for one of the breeding justifications in table 4 (i.e., data from at least one plot had to have a breeding justification other than “No Justification Required”), they drew one additional polygon, delineating the boundary of the combined data from both plots. Only data collected by the same surveyor in adjacent plots were used in generating the combined plot polygons. As these combined plot polygons utilized data from territories located on the boundary of two adjacent plots, they were drawn for all territorial species (i.e., focal and non-covered territorial). These combined plot polygons were stored in a separate layer and were not used in determining the percentage of the territory in either plot, and are not presented in this report. Their function is informational only, to improve on the knowledge of the areal extent of boundary territories where possible.

Data Summarization

Data were summarized from the Microsoft Access database using queries provided by Reclamation. The number of territories in a plot was calculated as the sum of the percentages of each territory in the plot, with 100% equal to one territory, 75% equal to 0.75 territory, etc. The number of territories per species were summarized for both rapid and intensive area search surveys by plot, conservation area, and habitat type within the conservation area. There was not an equal number of plots surveyed in each habitat type in 2017, so territory totals in each habitat type are not directly comparable without taking into account the number of plots surveyed. Total density of territories and non-territorial pairs (counts per hectare) of all species combined were calculated by summing all territories or pairs recorded during rapid area search surveys within each conservation area and dividing by the total hectares surveyed within each conservation area.

Data Quality Assurance and Control

Each surveyor's identification skills and knowledge of protocol were assessed during training and at the start of surveys. Identification skills were assessed through audio and visual quizzes. If there were species that surveyors were unable to identify, they studied and took the quiz again. Surveyors used personal copies of audio and visual identification materials (i.e., field guides and smartphone apps) to improve their identification skills. Knowledge of the protocol was assessed through one-on-one shadowing in the field with an experienced surveyor. To ensure data were being processed correctly, experienced personnel periodically proofed the data and reviewed any errors with the surveyor. Surveyors were provided with protocols detailing step-by-step instructions on how to use the tablets and associated software, how to process data in ArcGIS, how to enter data into the Microsoft Access database, and how to conduct a survey. Surveyors were also provided with information on breeding biology of common species along the LCR to help with interpretation of field observations. Access to a Birds of North America account was provided so that surveyors could fill in knowledge gaps for a particular species as necessary.

To prevent surveyors from being biased by other surveyors' observations, each surveyor's data were kept completely separate from all other data in individual databases and feature services. Surveyors were instructed to not discuss their observations in great detail with other surveyors. For surveyors conducting the rapid and intensive area search surveys in the same plot, the importance of following the instructions and not discussing their results was emphasized strongly.

As part of final territory delineation after surveys were completed, surveyors reviewed their data in ArcGIS to ensure that the correct territory IDs had been assigned to each detection location. They also made sure that all data had been entered into Microsoft Access as they were completing the breeding justification and percentage of a territory in the plot for each potential territory. After surveyors had finished processing their data, all data were reviewed one final time by project personnel. Project personnel checked that data entered into the Microsoft Access database matched the data recorded in ArcGIS and Microsoft OneNote. They checked that the cluster of detection locations assigned to the same territory ID and the polygons drawn to delineate a territory made sense given the species' biology and the lines recorded between detection locations. Project personnel also checked that the appropriate breeding justification code was selected for the information recorded for each pair and that the appropriate percentage was selected based on how much of the territory was in the plot.

RESULTS

Trail access was developed or refreshed prior to the start of surveys on 13 plots in the Middle Bill Williams River National Wildlife Refuge (Middle Bill Williams River NWR) (C1904, C1907, C1908, C1910, C1913, C1918, C1924, C1925, and C1928–C1932) and 1 plot (C2722) in the Cibola National Wildlife Refuge Unit #1 Conservation Area (Cibola NWR Unit #1). Trail access was needed in two plots (C1934 and C1911) in the Middle Bill Williams River NWR and one plot (C4932) in the Laguna Division Conservation Area (LDCA) but was not developed due to insufficient time prior to the start of surveys. Surveyors were able to access the interior of C1911 and C1934 with reasonable coverage but not C4932. Visits were postponed on 1 day during the first round of visits due to high winds. Postponed visits were completed within the following week.

A total of 32 territorial species and 49 non-territorial species were detected breeding across all conservation areas in either rapid or intensive area search surveys (attachment 3). Four focal species (Arizona Bell's vireo, Gila woodpecker, Sonoran yellow warbler, and summer tanager) were detected breeding in at least one conservation area (attachments 3 and 4). Of the other two focal species, surveyors detected vermilion flycatchers, but did not observe any probable or confirmed breeding behaviors, and no gilded flickers were detected during the 2017 field season.

Rapid Area Search Surveys

The highest density of breeding territories was in the Middle Bill Williams River NWR (3.3 territories per hectare) (table 5). All other conservation areas had lower densities of breeding territories (0.5–2.4 territories per hectare) (table 5). The highest density of estimated pairs was in Cibola NWR Unit #1 (7.8 estimated pairs per hectare), which had almost 60% more estimated pairs of non-territorial species than the next highest conservation area (4.6 estimated pairs per hectare in Yuma East Wetlands) (table 5). All other conservation areas had 3.4 or fewer estimated pairs per hectare (table 5).

All Conservation Areas

Focal Species

Probable or confirmed breeding territories of four focal species (Arizona Bell's vireo, Gila woodpecker, Sonoran yellow warbler, and summer tanager) were recorded during rapid area search surveys (table 6). Arizona Bell's vireo territories (23) were recorded in 5 of the 9 conservation areas where rapid area search surveys were conducted (table 6). Gila woodpecker (13.75 territories) and Sonoran yellow warbler territories (39) were recorded in 3 conservation areas, while summer tanager territories (11.25) were recorded in 4 conservation areas

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Table 5.—Number of breeding territories for territorial species and estimated number of pairs for non-territorial species per hectare during rapid area search surveys by conservation area, 2017

Conservation area	Breeding territories per hectare	Estimated number of pairs per hectare
Beal Lake Conservation Area	2.4	1.3
Middle Bill Williams River National Wildlife Refuge	3.3	1.5
Cibola National Wildlife Refuge Unit #1 Conservation Area	1.1	7.8
Cibola Valley Conservation Area	1.0	3.0
Laguna Division Conservation Area	1.1	1.6
Palo Verde Ecological Reserve	0.7	1.8
Parker Dam Camp	2.1	3.4
Pretty Water Conservation Area	0.5	1.4
Yuma East Wetlands	2.0	4.6

(table 6). When Gila woodpecker nests were located, the recorded substrates included a saguaro cactus (*Carnegiea gigantea*), an old cottonwood snag, and a mature mulberry (*Morus* sp.) tree. The highest abundance of each focal species was noted in the Middle Bill Williams River NWR (table 6). Surveyors only observed vermilion flycatchers at plot C1924 in the Middle Bill Williams River NWR, but no possible, probable, or confirmed breeding behavior was observed, and no territory was designated.

Arizona Bell’s vireo and Gila woodpecker territories were recorded in all three habitat types (table 7). Four times more Arizona Bell’s vireo territories were recorded in cottonwood-willow plots (16 territories) compared with the other habitat types (3 territories in mesquite and 4 territories in mixed) (table 7). A total of 11.75 Gila woodpecker territories were recorded in cottonwood-willow habitat, while only 1 territory was recorded in both mesquite and mixed habitats. Sonoran yellow warbler territories (39) were only recorded in cottonwood-willow habitat. Summer tanager territories were recorded in cottonwood-willow (9.5 territories) and mixed habitat (1.75 territories) (table 7). No summer tanager territories were recorded in mesquite habitat (table 7).

Non-Covered, Territorial Species

Surveyors recorded breeding territories for 28 non-covered, territorial species (table 6). The 3 most abundant non-covered, territorial species were Lucy’s warbler (*Oreothlypis luciae*) (140 territories recorded in 6 conservation areas), Abert’s towhee (*Melospiza aberti*) (130.5 territories recorded in all 9 conservation areas), and song sparrow (*Melospiza melodia*) (129.25 territories recorded in

Table 6.—Number of probable or confirmed breeding territories for 32 territorial species detected during rapid area search surveys by conservation area, phase, and plot in 2017

(Number of territories is the sum of the percentages of all territories in the plot. The numbers in parentheses represent the total number of whole [100%] and partial [< 100%] territories in the plot. Dashes indicate no detections, while a 0 means the species was detected but insufficient breeding evidence was observed. The number in parentheses next to "Area total" is the total number of species detected in that area.)

Area ¹	Site	Plot ID (habitat type) ²	Focal species (n = 4)				Non-covered species (n = 28) ³																												Total			
			Arizona Bell's vireo	Gila woodpecker	Sonoran yellow warbler	Summer tanager	Abert's towhee	Anna's hummingbird	Ash-throated flycatcher	Bewick's wren	Black-chinned hummingbird	Black-tailed gnatcatcher	Blue-gray gnatcatcher	Blue grosbeak	Brown-crested flycatcher	Bullock's oriole	Canyon wren	Common yellowthroat	Crissal thrasher	Hooded oriole	Horned lark	Indigo bunting	Ladder-backed woodpecker	Lazuli bunting	Lesser goldfinch	Lucy's warbler	Marsh wren	Northern cardinal	Northern mockingbird	Phainopepla	Song sparrow	Unidentified thrasher	Verdin	Western kingbird		Yellow-breasted chat		
BLCA	CPhase 01	C1501 (MX)	3 (3)	-	0	-	2 (2)	-	-	-	0	0	-	-	-	0	-	3.75 (4)	-	-	-	-	0	-	-	0	-	-	0	-	-	-	6 (6)	-	-	-	5.75 (6)	20.5 (21)
	CPhase 02	C1502 (CW)	2.25 (3)	-	3.5 (4)	1 (1)	2.25 (3)	0	0	1 (1)	-	1 (1)	-	-	-	2.5 (3)	-	5.5 (6)	1 (1)	-	-	-	0	-	-	0	-	-	-	-	-	0	-	1.5 (2)	-	4.5 (5)	26 (30)	
	Area total (n = 12)		5.25 (6)	-	3.5 (4)	1 (1)	4.25 (5)	0	0	1 (1)	0	1 (1)	-	-	-	2.5 (3)	0	9.25 (10)	1 (1)	-	-	-	0	-	-	0	-	-	0	-	-	6 (6)	-	1.5 (2)	-	10.25 (11)	46.5 (51)	
Middle Bill Williams River NWR	Esquerra Ranch	C1904 (CW)	2 (2)	0.5 (1)	0	1 (1)	2.5 (3)	-	0	2 (2)	-	0	-	1 (1)	0.75 (1)	0	0	0	1 (1)	-	-	-	0.75 (1)	-	-	10.75 (11)	-	1 (1)	0	-	-	-	-	1 (1)	-	4 (4)	28.25 (30)	
	Gibraltar Rock	C1910 (CW)	-	0	0	0	1.75 (2)	-	0.75 (1)	1.75 (2)	1 (1)	1.5 (2)	-	2 (2)	1 (1)	-	1 (1)	-	0.5 (1)	-	-	-	1 (1)	-	-	9.25 (10)	-	0.5 (1)	0	0.25 (1)	-	-	0.75 (1)	-	-	23 (27)		
	Kohen Ranch	C1907 (CW)	-	1 (1)	0	-	2 (2)	1 (1)	1.5 (2)	2.75 (3)	2 (2)	-	-	0	0.75 (1)	0	-	-	1 (1)	-	-	-	1 (1)	-	-	7.5 (8)	-	1 (1)	-	-	-	5.5 (6)	-	-	-	0	27 (29)	
		C1908 (CW)	-	0	0	0	0	-	1.25 (2)	-	-	0	-	0	0.75 (1)	-	-	-	-	-	-	-	0.75 (1)	-	-	6 (6)	-	-	-	-	-	1 (1)	-	0	-	1.75 (2)	11.5 (13)	
		Site total	-	1 (1)	0	0	2 (2)	1 (1)	2.75 (4)	2.75 (3)	2 (2)	0	-	0	1.5 (2)	0	-	-	-	1 (1)	-	-	-	1.75 (2)	-	-	13.5 (14)	-	1 (1)	-	-	6.5 (7)	-	0	-	1.75 (2)	38.5 (42)	
	Borrow Pit	C1918 (CW)	-	0.5 (1)	3.25 (4)	1 (1)	2.75 (3)	0	0	2.25 (3)	0	-	-	0	0.25 (1)	0	-	1 (1)	-	-	-	-	0.75 (1)	-	0	9.25 (10)	-	-	-	-	-	3.75 (4)	-	-	-	4 (4)	28.75 (33)	
	Cross River	C1928 (CW)	0	1 (1)	1 (1)	-	1 (1)	-	-	2 (2)	-	-	-	-	1 (1)	-	2 (2)	2 (2)	-	-	-	-	2 (2)	-	-	4 (4)	-	-	-	-	-	8 (8)	-	-	-	7.5 (8)	31.5 (32)	
		C1929 (CW)	-	1 (1)	-	-	1 (1)	-	0	0	-	-	-	-	-	-	-	1 (1)	0.75 (1)	-	-	-	-	-	1 (1)	-	-	-	-	-	8 (8)	-	-	-	9 (10)	21.75 (23)		
		Site total	0	2 (2)	1 (1)	-	2 (2)	-	0	2 (2)	-	-	-	-	1 (1)	-	2 (2)	3 (3)	0.75 (1)	-	-	-	2 (2)	-	-	5 (5)	-	-	-	-	16 (16)	-	-	-	16.5 (18)	53.25 (55)		
	Fox Wash	C1924 (CW)	-	0.75 (1)	-	-	2.5 (3)	-	0.75 (1)	2.5 (3)	-	1 (1)	-	1 (1)	0	-	-	1 (1)	1 (1)	-	-	-	1 (1)	-	1 (1)	5.5 (8)	-	-	-	-	3 (3)	-	1 (1)	0	0	22 (26)		
		C1925 (CW)	1 (1)	0	-	-	4 (4)	-	1.5 (2)	3 (3)	0	0.5 (1)	-	0	0	-	0.75 (1)	1 (1)	0.75 (1)	-	-	-	1 (1)	-	0	5 (6)	-	-	-	0	5.5 (6)	-	0.75 (1)	-	6 (7)	30.75 (35)		
		Site total	1 (1)	0.75 (1)	-	-	6.5 (7)	-	2.25 (3)	5.5 (6)	0	1.5 (2)	-	1 (1)	0	-	0.75 (1)	2 (2)	1.75 (2)	-	-	-	2 (2)	-	1 (1)	10.5 (14)	-	-	-	0	8.5 (9)	-	1.75 (2)	0	6 (7)	52.75 (61)		
	Mosquito Flats	C1930 (CW)	4 (4)	1.5 (2)	3.5 (4)	1 (1)	1.5 (2)	0	0	3.5 (4)	1 (1)	1 (1)	-	0	1 (1)	1 (1)	2 (2)	1 (1)	1 (1)	-	-	-	2 (2)	-	0	4.5 (5)	-	-	-	0	6.5 (7)	-	1 (1)	-	10.75 (11)	47.75 (51)		
		C1931 (CW)	3 (3)	0.75 (1)	7 (7)	1 (1)	1 (1)	0	0	9 (9)	-	0	-	-	2 (2)	0	3 (3)	6.75 (7)	-	-	-	-	1 (1)	-	0	3 (3)	-	-	-	-	15 (15)	-	-	-	13.75 (14)	66.25 (67)		
C1932 (CW)		1 (1)	1.75 (2)	8.5 (9)	0	3.75 (4)	1 (1)	-	6.5 (7)	0	-	-	-	1 (1)	1 (1)	3 (3)	4 (4)	-	-	-	-	1 (1)	-	-	4 (5)	-	-	-	-	7 (7)	-	-	-	13.25 (16)	56.75 (62)			
C1934 (CW)		-	1 (1)	9.5 (10)	1 (1)	4 (4)	-	0	3.5 (4)	1 (1)	-	-	-	1 (1)	2 (2)	2 (2)	5 (5)	-	-	-	-	2 (2)	-	-	8.75 (9)	-	-	-	-	7 (7)	-	-	0	10 (10)	57.75 (59)			
Site total		8 (8)	5 (6)	28.5 (30)	3 (3)	10.25 (11)	1 (1)	0	22.5 (24)	2 (2)	1 (1)	-	0	5 (5)	4 (4)	10 (10)	16.75 (17)	1 (1)	-	-	-	6 (6)	-	0	20.25 (22)	-	-	-	0	35.5 (36)	-	1 (1)	0	47.75 (51)	228.5 (239)			

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Table 6.—Number of probable or confirmed breeding territories for 32 territorial species detected during rapid area search surveys by conservation area, phase, and plot in 2017

(Number of territories is the sum of the percentages of all territories in the plot. The numbers in parentheses represent the total number of whole [100%] and partial [< 100%] territories in the plot. Dashes indicate no detections, while a 0 means the species was detected but insufficient breeding evidence was observed. The number in parentheses next to "Area total" is the total number of species detected in that area.)

Area ¹	Site	Plot ID (habitat type) ²	Focal species (n = 4)				Non-covered species (n = 28) ³																												Total	
			Arizona Bell's vireo	Gila woodpecker	Sonoran yellow warbler	Summer tanager	Abert's towhee	Anna's hummingbird	Ash-throated flycatcher	Bewick's wren	Black-chinned hummingbird	Black-tailed gnatcatcher	Blue-gray gnatcatcher	Blue grosbeak	Brown-crested flycatcher	Bullock's oriole	Canyon wren	Common yellowthroat	Crissal thrasher	Hooded oriole	Horned lark	Indigo bunting	Ladder-backed woodpecker	Lazuli bunting	Lesser goldfinch	Lucy's warbler	Marsh wren	Northern cardinal	Northern mockingbird	Phainopepla	Song sparrow	Unidentified thrasher	Verdin	Western kingbird		Yellow-breasted chat
Middle Bill Williams River NWR (cont.)	Sandy Wash	C1911 (CW)	-	0.5 (1)	1 (1)	1 (1)	2 (3)	-	0.75 (1)	4 (4)	0	0	-	1 (1)	1 (1)	-	1.75 (2)	-	0	-	-	0	1 (1)	-	1 (1)	8 (8)	-	-	-	0	0	-	-	-	3 (3)	26 (28)
		C1913 (CW)	-	1 (1)	0	-	3 (3)	-	-	4 (4)	0	0	-	-	0.75 (1)	-	0	2 (2)	0	-	-	-	1 (1)	-	0	10 (10)	-	-	-	-	8 (8)	-	-	-	4.75 (5)	34.5 (35)
		Site total	-	1.5 (2)	1 (1)	1 (1)	5 (6)	-	0.75 (1)	8 (8)	0	0	-	1 (1)	1.75 (2)	-	1.75 (2)	2 (2)	0	-	-	0	2 (2)	-	1 (1)	18 (18)	-	-	-	0	8 (8)	-	-	-	7.75 (8)	60.5 (63)
	Area total (n = 24)	11 (11)	11.25 (14)	33.75 (36)	6 (6)	32.75 (36)	2 (2)	6.5 (9)	46.75 (50)	5 (5)	4 (5)	-	5 (5)	11.25 (13)	4 (4)	15.5 (16)	24.75 (25)	6 (7)	-	-	0	16.25 (17)	-	2 (2)	96.5 (104)	-	2.5 (3)	0	0.25 (1)	78.25 (80)	-	4.5 (5)	0	87.75 (94)	513.5 (550)	
Cibola NWR Unit #1	Cottonwood Genetic	C2704 (CW)	-	-	-	-	0	0	2 (2)	-	0	0	-	1 (1)	-	0	-	-	-	-	-	0	-	-	-	-	-	-	-	-	-	-	1.75 (2)	-	4.75 (5)	
		Crane Roost	C2721 (CW)	-	-	-	-	0	-	2 (2)	-	0	0	-	2 (2)	-	1 (1)	-	-	-	-	-	0.75 (1)	0	-	-	-	-	-	-	-	1 (1)	-	-	6.75 (7)	
		C2722 (CW)	-	-	-	-	2.75 (3)	-	1 (1)	-	3 (3)	1 (1)	-	3.25 (4)	-	-	-	-	-	-	-	1 (1)	-	-	3 (3)	-	-	-	0	2 (2)	-	2.75 (3)	0	-	19.75 (21)	
		C2723 (MX)	-	-	-	0	1 (1)	-	-	0	-	2 (2)	-	2 (2)	-	1 (1)	-	0	-	-	-	1 (1)	0	-	-	-	-	-	-	-	-	0.75 (1)	-	-	7.75 (8)	
		C2725 (MX)	-	-	-	1 (1)	3 (3)	-	1 (1)	-	-	5 (5)	-	1 (1)	-	1 (1)	-	1 (1)	0	-	-	-	1 (1)	-	0	13 (13)	-	-	0	-	-	4 (4)	-	0	31 (31)	
		Site total	-	-	-	1 (1)	6.75 (7)	-	4 (4)	0	3 (3)	8 (8)	-	8.25 (9)	-	3 (3)	-	1 (1)	0	-	-	-	3.75 (4)	0	0	16 (16)	-	-	0	0	2 (2)	-	7.75 (8)	0.75 (1)	0	65.25 (67)
	Upper Hippy Fire	C2726 (CW)	-	-	-	-	1 (1)	0	-	-	-	-	-	0	-	-	-	-	0	-	-	-	1 (1)	-	-	-	-	-	-	-	-	-	1 (1)	-	3 (3)	
		C2727 (CW)	-	-	0	-	1 (1)	-	1 (1)	-	-	-	-	1 (1)	-	0	-	-	-	-	-	-	1 (1)	0	-	-	-	-	-	-	-	-	0	-	4 (4)	
		Site total	-	-	0	-	2 (2)	0	1 (1)	-	-	-	-	1 (1)	-	0	-	-	0	-	-	-	2 (2)	0	-	-	-	-	-	-	-	-	1 (1)	-	7 (7)	
Area total (n = 13)	-	-	0	1 (1)	8.75 (9)	0	7 (7)	0	3 (3)	8 (8)	-	10.25 (11)	-	3 (3)	-	1 (1)	0	-	-	-	5.75 (6)	0	0	16 (16)	-	-	0	0	2 (2)	-	7.75 (8)	3.5 (4)	0	77 (79)		
CVCA	Phase 01	C2502 (CW)	-	-	-	-	2 (2)	0	1 (1)	-	-	-	-	1 (1)	-	0	-	0	-	-	-	1 (1)	-	0	-	-	-	-	-	-	-	-	-	5 (5)		
		C2503 (CW)	-	-	-	-	2.5 (3)	0	0.5 (1)	-	-	-	-	0	-	0	-	-	-	-	-	-	0.5 (1)	-	-	-	-	-	-	-	-	-	-	-	3.5 (5)	
		Site total	-	-	-	-	4.5 (5)	0	1.5 (2)	-	-	-	-	0	-	1 (1)	-	0	-	0	-	-	1.5 (2)	-	0	-	-	-	-	-	-	-	-	-	8.5 (10)	
	Phase 02	C2506 (MX)	-	-	-	-	0	-	0	-	-	-	-	0.5 (1)	0	1 (1)	-	-	0	-	0	-	1 (1)	-	-	-	-	-	-	-	-	-	0.5 (1)	-	3 (4)	
		C2508 (CW)	-	-	0	-	1 (1)	0	0	-	-	-	-	2 (2)	0	1 (1)	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-	-	0.25 (1)	-	4.25 (5)	
		Site total	-	-	0	-	1 (1)	0	0	-	-	-	-	2.5 (3)	0	2 (2)	-	-	0	-	0	-	1 (1)	-	-	-	-	-	-	-	-	-	0.75 (2)	-	7.25 (9)	

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CVCA (cont.)	Phase 03	C2511 (CW)	-	-	-	0	2.5 (4)	-	0	-	-	-	0	-	1.5 (2)	-	-	-	-	-	-	1 (1)	-	0	-	-	-	-	-	-	-	-	2.25 (3)	-	7.25 (10)		
		C2512 (CW)	-	-	-	-	1.25 (2)	-	-	-	-	0	-	-	-	0.75 (1)	-	-	-	-	-	-	1 (1)	-	-	-	-	-	-	0.25 (1)	-	-	-	0	1.75 (2)	-	5 (7)
		Site total	-	-	-	0	3.75 (6)	-	0	-	-	0	-	0	-	2.25 (3)	-	-	-	-	-	-	2 (2)	-	0	-	-	-	0.25 (1)	-	-	-	0	4 (5)	-	12.25 (17)	
	Phase 04	C2513 (MQ)	2 (2)	-	-	-	7 (7)	-	0.75 (1)	-	-	8.5 (9)	-	1.5 (3)	-	1 (1)	-	-	3.5 (4)	-	-	-	0.5 (1)	-	-	5.5 (6)	-	-	0	-	-	-	4.75 (5)	-	0.25 (1)	35.25 (40)	
		C2514 (MQ)	-	-	-	-	2 (2)	-	1 (1)	-	-	2 (2)	-	0	-	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1 (1)	1 (1)	0	-	7 (7)		
		C2516 (MQ)	-	-	-	-	3.5 (4)	-	0	-	1 (1)	0	-	1 (1)	-	0	-	-	1 (1)	-	-	-	1 (1)	-	-	1 (1)	-	-	-	-	-	1 (1)	0	-	9.5 (10)		
		C2517 (MQ)	1 (1)	-	-	-	5 (5)	-	0	-	-	3 (3)	-	1 (1)	-	0	-	-	1 (1)	-	0	-	-	-	0.5 (1)	0	-	-	-	-	-	1 (1)	0	0	12.5 (13)		
		C2518 (MQ)	0	-	-	-	1.25 (2)	-	0.75 (1)	-	0	6 (6)	-	0.75 (1)	-	0.25 (1)	-	-	1.75 (2)	-	-	0.5 (1)	0.75 (1)	-	0	1 (1)	-	-	-	-	0	-	0	-	13 (16)		
		Site total	3 (3)	-	-	-	18.75 (20)	-	2.5 (3)	-	1 (1)	19.5 (20)	-	4.25 (6)	-	1.25 (2)	-	-	7.25 (8)	-	0	0.5 (1)	2.25 (3)	-	0.5 (1)	7.5 (8)	-	-	0	-	0	1 (1)	7.75 (8)	0	0.25 (1)	77.25 (86)	
	Phase 07	C2540 (MQ)	-	-	-	0	2.75 (3)	-	0	-	-	-	3 (3)	-	1 (1)	-	-	-	1 (1)	0	-	-	0	0	0	-	-	-	-	-	-	-	0	-	7.75 (8)		
Area total (n = 17)			3 (3)	-	0	0	30.75 (35)	0	4 (5)	-	1 (1)	19.5 (20)	-	9.75 (12)	0	7.5 (9)	-	0	7.25 (8)	1 (1)	0	0.5 (1)	6.75 (8)	0	0.5 (1)	7.5 (8)	-	-	0.25 (1)	-	0	1 (1)	7.75 (8)	4.75 (7)	0.25 (1)	113 (130)	
LDCA	Historic Channel	C4932 (MX)	-	-	-	-	0	-	-	-	-	-	-	-	-	5 (5)	-	-	-	-	-	-	-	-	7 (7)	-	-	-	1 (1)	-	-	-	1 (1)	14 (14)			
	Reach 01	C4901 (MX)	-	-	0	-	1 (1)	-	0	-	-	0	-	-	0	-	5 (5)	-	-	-	-	-	-	-	-	2 (2)	-	-	-	0	-	1 (1)	-	-	9 (9)		
		C4905 (MX)	-	-	-	-	1 (1)	-	1 (1)	-	-	0	-	1 (1)	-	-	0	-	-	-	-	-	-	-	-	3 (3)	-	-	-	1 (1)	-	-	-	-	7 (7)		
		C4907 (CW)	-	-	-	-	2 (2)	-	-	-	0	0	-	1 (1)	-	-	-	3.5 (4)	-	-	-	-	1 (1)	-	-	-	2.25 (3)	-	-	-	4 (4)	-	-	-	1 (1)	14.75 (16)	
		C4908 (MX)	0	-	0	-	1 (1)	-	0	-	-	-	-	-	-	-	4 (4)	-	-	-	-	1 (1)	-	-	-	4 (4)	-	-	-	4 (4)	-	-	-	0	14 (14)		
		C4911 (CW)	-	-	0	-	4 (4)	0	0	-	1 (1)	0	-	2.75 (3)	-	-	-	11 (11)	-	-	-	-	0	-	-	1 (1)	-	-	-	14.75 (15)	-	1.75 (2)	-	6 (6)	42.25 (43)		
		C4913 (MX)	-	-	-	-	1 (1)	-	-	-	-	0	-	-	-	-	8 (8)	-	-	-	-	0	-	-	-	6 (6)	-	-	-	4 (4)	-	-	-	2 (2)	21 (21)		
		Site total	0	-	0	-	10 (10)	0	1 (1)	-	1 (1)	0	-	4.75 (5)	-	0	-	31.5 (32)	-	-	-	-	2 (2)	-	-	-	18.25 (19)	-	-	-	27.75 (28)	-	2.75 (3)	-	9 (9)	108 (110)	

Table 6.—Number of probable or confirmed breeding territories for 32 territorial species detected during rapid area search surveys by conservation area, phase, and plot in 2017

(Number of territories is the sum of the percentages of all territories in the plot. The numbers in parentheses represent the total number of whole [100%] and partial [< 100%] territories in the plot. Dashes indicate no detections, while a 0 means the species was detected but insufficient breeding evidence was observed. The number in parentheses next to "Area total" is the total number of species detected in that area.)

Area ¹	Site	Plot ID (habitat type) ²	Focal species (n = 4)				Non-covered species (n = 28) ³																												Total		
			Arizona Bell's vireo	Gila woodpecker	Sonoran yellow warbler	Summer tanager	Abert's towhee	Anna's hummingbird	Ash-throated flycatcher	Bewick's wren	Black-chinned hummingbird	Black-tailed gnatcatcher	Blue-gray gnatcatcher	Blue grosbeak	Brown-crested flycatcher	Bullock's oriole	Canyon wren	Common yellowthroat	Crissal thrasher	Hooded oriole	Horned lark	Indigo bunting	Ladder-backed woodpecker	Lazuli bunting	Lesser goldfinch	Lucy's warbler	Marsh wren	Northern cardinal	Northern mockingbird	Phainopepla	Song sparrow	Unidentified thrasher	Verdin	Western kingbird		Yellow-breasted chat	
PVER (cont.)	Phase 06	C2322 (MX)	-	-	0	-	0	-	-	-	-	-	2.25 (3)	-	1 (1)	-	0	-	-	-	-	1 (1)	-	0	0	-	-	-	-	0	-	-	-	0	4.25 (5)		
		C2324 (CW)	-	-	0	-	0	-	0.75 (1)	-	-	-	-	0	-	0	-	-	-	-	-	-	2.75 (4)	-	-	-	-	-	-	-	0	-	-	-	-	3.5 (5)	
		Site total	-	-	0	-	0	-	0.75 (1)	-	-	-	-	2.25 (3)	-	1 (1)	-	0	-	-	-	-	3.75 (5)	-	0	0	-	-	-	-	0	-	-	-	0	7.75 (10)	
	Phase 07	C2328 (CW)	-	-	0.5 (1)	1 (1)	-	-	0	-	-	-	-	2.75 (4)	-	0	-	-	-	-	-	-	1.25 (2)	-	-	-	-	-	-	-	-	-	-	-	-	5.5 (8)	
		C2329 (CW)	-	-	0.25 (1)	0.5 (1)	0	-	-	-	-	-	-	1.5 (2)	-	1.25 (2)	-	-	-	-	-	-	0.75 (1)	-	0.75 (1)	0	-	-	-	-	0	-	-	-	-	5 (8)	
		C2332 (CW)	-	-	-	-	0	-	0	-	-	-	-	2.25 (3)	-	0	-	-	-	-	-	-	0.75 (1)	-	-	-	-	-	-	-	-	-	0.25 (1)	-	-	3.25 (5)	
		C2334 (MX)	-	-	-	-	0.25 (1)	-	0	-	0	1 (1)	-	4 (4)	-	2 (2)	-	0	0	-	-	-	2.75 (3)	-	-	-	-	-	-	-	-	-	3 (3)	0	-	13 (14)	
		Site total	-	-	0.75 (2)	1.5 (2)	0.25 (1)	-	0	-	0	1 (1)	-	10.5 (13)	-	3.25 (4)	-	0	0	-	-	-	5.5 (7)	-	0.75 (1)	0	-	-	-	-	0	-	-	3.25 (4)	0	-	26.75 (35)
	Area total (n = 19)			1.75 (2)	-	1.75 (3)	3.25 (4)	18.5 (21)	0	1.5 (2)	-	1 (1)	6 (7)	-	25.75 (32)	0	12 (14)	-	3 (3)	0	-	-	1.75 (2)	17.5 (22)	0.75 (1)	3.75 (4)	3.25 (4)	-	-	0	-	5.25 (7)	-	1 (1)	6.25 (9)	7.5 (8)	121.5 (147)
	Parker Dam Camp	Parker Dam Camp	C2002 (MQ)	0	1 (1)	0	-	2.25 (3)	1 (1)	1.25 (2)	-	0	0	-	-	-	-	0	2 (2)	1 (1)	-	-	0.75 (1)	-	3.25 (4)	3.25 (4)	-	-	-	4 (4)	0	-	2.5 (3)	-	-	22.25 (26)	
C2003 (MX)			0	1 (1)	0	-	4.5 (5)	-	0.5 (1)	-	1.75 (2)	1.25 (2)	-	-	-	-	0	1 (1)	1.75 (2)	0	-	-	1 (1)	-	0	2 (2)	-	-	-	0.75 (1)	4 (4)	-	2.25 (3)	-	-	21.75 (25)	
Area total (n = 15)			0	2 (2)	0	-	6.75 (8)	1 (1)	1.75 (3)	-	1.75 (2)	1.25 (2)	-	-	-	0	1 (1)	3.75 (4)	1 (1)	-	-	1.75 (2)	-	3.25 (4)	5.25 (6)	-	-	-	4.75 (5)	4 (4)	-	4.75 (6)	-	-	44 (51)		
PWCA	PWCA	C2906 (MX)	-	-	-	-	-	-	0	-	-	0	-	-	-	-	0	1 (1)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	1 (1)		
		C2909 (MQ)	-	-	-	-	0	-	0	-	-	0.5 (1)	-	-	-	-	-	0.75 (1)	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-	1.25 (2)	
		C2910 (MQ)	-	-	-	-	-	-	0.75 (1)	-	-	1.5 (2)	-	1 (1)	-	-	-	-	-	-	-	-	1 (1)	0	-	0	-	-	-	-	-	-	-	-	-	4.25 (5)	
		C2911 (MQ)	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	1 (1)	-	-	-	-	-	-	-	-	-	-	-	-	-	0	1 (1)	
		C2912 (MX)	-	0	-	-	1.5 (2)	-	0	-	-	0	-	1 (1)	-	-	-	0	-	-	-	-	-	-	-	-	0.5 (1)	-	-	-	-	-	0	0	-	3 (4)	
		C2913 (MX)	-	-	-	-	1 (1)	-	0.5 (1)	-	-	2 (2)	-	1 (1)	-	-	-	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.5 (5)	
		C2914 (MX)	-	-	-	-	1 (1)	-	0	-	-	4 (4)	-	1 (1)	-	-	-	-	-	-	-	-	-	0.5 (1)	0	-	-	-	-	-	-	-	-	-	-	-	6.5 (7)
		C2919 (MX)	-	-	-	-	2.25 (3)	-	0.5 (1)	-	-	2.5 (3)	-	0	-	-	-	-	-	1 (1)	-	-	-	1 (1)	-	-	2 (2)	-	-	-	-	-	0	1 (1)	-	-	10.25 (12)
		C2920 (MQ)	-	0	-	-	-	-	1 (1)	-	1 (1)	1.5 (2)	-	-	-	0	-	-	-	1 (1)	-	-	-	1 (1)	-	-	7 (7)	-	-	-	-	-	0	-	-	-	12.5 (13)

**Riparian Bird Surveys at Conservation Areas
in the Lower Colorado River Region, 2017**

Table 6.—Number of probable or confirmed breeding territories for 32 territorial species detected during rapid area search surveys by conservation area, phase, and plot in 2017

(Number of territories is the sum of the percentages of all territories in the plot. The numbers in parentheses represent the total number of whole [100%] and partial [< 100%] territories in the plot. Dashes indicate no detections, while a 0 means the species was detected but insufficient breeding evidence was observed. The number in parentheses next to "Area total" is the total number of species detected in that area.)

Area ¹	Site	Plot ID (habitat type) ²	Focal species (n = 4)				Non-covered species (n = 28) ³																												Total	
			Arizona Bell's vireo	Gila woodpecker	Sonoran yellow warbler	Summer tanager	Abert's towhee	Anna's hummingbird	Ash-throated flycatcher	Bewick's wren	Black-chinned hummingbird	Black-tailed gnatcatcher	Blue-gray gnatcatcher	Blue grosbeak	Brown-crested flycatcher	Bullock's oriole	Canyon wren	Common yellowthroat	Crissal thrasher	Hooded oriole	Horned lark	Indigo bunting	Ladder-backed woodpecker	Lazuli bunting	Lesser goldfinch	Lucy's warbler	Marsh wren	Northern cardinal	Northern mockingbird	Phainopepla	Song sparrow	Unidentified thrasher	Verdin	Western kingbird		Yellow-breasted chat
PWCA (cont.)	PWCA (cont.)	C2921 (MQ)	-	-	-	0	0	-	1 (1)	-	-	3 (3)	-	-	-	1 (1)	-	-	1 (1)	-	-	-	1 (1)	-	-	2 (2)	-	-	0	0.75 (1)	-	-	1 (1)	-	-	10.75 (11)
	Area total (n = 14)		-	0	-	0	5.75 (7)	-	3.75 (5)	-	1 (1)	15 (17)	-	4 (4)	-	1 (1)	-	0.75 (1)	4 (4)	-	1 (1)	-	4.5 (5)	0	-	11.5 (12)	0	-	0	0.75 (1)	-	-	1 (1)	0	1 (1)	55 (61)
YEW	G	C4709 (MQ)	-	-	0	-	1 (1)	3 (3)	0	-	-	2 (2)	-	-	-	-	-	0.25 (1)	-	-	-	-	1 (1)	-	-	-	-	-	0	-	0	-	5 (5)	0	-	12.25 (13)
	I	C4702 (MX)	1 (1)	-	-	-	2.5 (3)	4 (4)	0	-	0	0	1 (1)	1 (1)	-	-	-	0.5 (1)	-	-	-	-	1.75 (2)	-	1.75 (2)	-	-	-	-	-	0	-	7 (7)	-	-	20.5 (22)
	J	C4703 (CW)	0	0	0	-	3.75 (4)	7 (7)	2 (2)	-	1 (1)	1.25 (2)	-	0	-	0	-	2 (2)	0	-	-	-	2.75 (3)	-	1 (1)	-	-	-	-	0	-	10.75 (11)	-	-	31.5 (33)	
	South AC	C4711 (CW)	1 (1)	0.5 (1)	-	-	5 (5)	9.5 (10)	2 (3)	-	1 (1)	2 (2)	-	-	-	0	-	4 (4)	1 (1)	-	-	-	1.75 (3)	-	2 (2)	-	6.5 (7)	-	-	-	1 (1)	-	7.75 (9)	0	0	45 (50)
	Area total (n = 16)		2 (2)	0.5 (1)	0	-	12.25 (13)	23.5 (24)	4 (5)	-	2 (2)	5.25 (6)	1 (1)	1 (1)	-	0	-	6.75 (8)	1 (1)	-	-	-	7.25 (9)	-	4.75 (5)	-	6.5 (7)	-	0	-	1 (1)	-	30.5 (32)	0	0	109.25 (118)
Overall total		23 (24)	13.75 (17)	39 (43)	11.25 (12)	130.5 (145)	26.5 (27)	29.5 (37)	47.75 (51)	15.75 (16)	60.75 (67)	1 (1)	61 (71)	11.25 (13)	30 (34)	15.5 (16)	104.25 (108)	23 (25)	2 (2)	1 (1)	2.25 (3)	63 (73)	0.75 (1)	14.25 (16)	140 (150)	74.25 (77)	2.5 (3)	1.25 (2)	5.75 (7)	129.25 (133)	1 (1)	61.5 (66)	14.5 (20)	116.75 (125)	1,273.75 (1,387)	

¹ BLCA = Beal Lake Conservation Area, CVCA = Cibola Valley Conservation Area, LDCA = Laguna Division Conservation Area, PVER = Palo Verde Ecological Reserve, PWCA = Pretty Water Conservation Area, and YEW = Yuma East Wetlands.

² CW = cottonwood-willow, MQ = mesquite, and MX = mixed.

³ The detection of an unknown thrasher species is recorded as a separate column, but it is not counted as a separate species based on the probability that it is the same as a crissal thrasher.

Note: The scientific names of the species can be found in attachment 3, table 3-1.

Table 7.—Number of probable or confirmed breeding territories for 32 territorial species detected during rapid area search surveys by habitat type and conservation area in 2017 (Number of territories is the sum of the percentages of all territories in the plot. The numbers in parentheses represent the total number of whole [100%] and partial [< 100%] territories in the plot. Dashes indicate no observations, while a 0 means the species was detected but insufficient breeding evidence was observed. The number in parentheses next to "Habitat total" is the total number of species detected in that habitat type.)

Habitat type	Conservation area ¹	Focal species (n = 4)				Non-covered species (n = 28) ²																								Area total					
		Arizona Bell's vireo	Gila woodpecker	Sonoran yellow warbler	Summer tanager	Abert's towhee	Anna's hummingbird	Ash-throated flycatcher	Bewick's wren	Black-chinned hummingbird	Black-tailed gnatcatcher	Blue-gray gnatcatcher	Blue grosbeak	Brown-crested flycatcher	Bullock's oriole	Canyon wren	Common yellowthroat	Crissal thrasher	Hooded oriole	Horned lark	Indigo bunting	Ladder-backed woodpecker	Lazuli bunting	Lesser goldfinch	Lucy's warbler	Marsh wren	Northern Cardinal	Northern mockingbird	Phainopepla		Song sparrow	Unidentified thrasher	Verdin	Western kingbird	Yellow-breasted chat
Cottonwood-willow	BLCA	2.25 (3)	-	3.5 (4)	1 (1)	2.25 (3)	0	0	1 (1)	-	1 (1)	-	-	2.5 (3)	-	5.5 (6)	1 (1)	-	-	-	0	-	-	0	-	-	-	-	0	-	1.5 (2)	-	4.5 (5)	26 (30)	
	Middle Bill Williams River NWR	11 (11)	11.25 (14)	33.75 (36)	6 (6)	32.75 (36)	2 (2)	6.5 (9)	46.75 (50)	5 (5)	4 (5)	-	5 (5)	11.25 (13)	4 (4)	15.5 (16)	24.75 (25)	6 (7)	-	-	0	16.25 (17)	-	2 (2)	96.5 (104)	-	2.5 (3)	0	0.25 (1)	78.25 (80)	-	4.5 (5)	0	87.75 (94)	513.5 (550)
	Cibola NWR Unit #1	-	-	0	-	4.75 (5)	0	6 (6)	-	3 (3)	1 (1)	-	7.25 (8)	-	1 (1)	-	-	0	-	-	-	3.75 (4)	0	-	3 (3)	-	-	-	0	2 (2)	-	3.75 (4)	2.75 (3)	-	38.25 (40)
	CVCA	-	-	0	0	9.25 (12)	0	1.5 (2)	-	-	0	-	2 (2)	0	4.25 (5)	-	0	-	0	-	-	3.5 (4)	-	0	-	-	-	0.25 (1)	-	-	-	0	4.25 (6)	-	25 (32)
	LDCA	-	-	0	-	6 (6)	0	0	-	1 (1)	0	-	3.75 (4)	-	-	-	14.5 (15)	-	-	-	-	1 (1)	-	-	-	3.25 (4)	-	-	-	18.75 (19)	-	1.75 (2)	-	7 (7)	57 (59)
	PVER	1.75 (2)	-	1.75 (3)	2.5 (3)	14 (15)	0	1.5 (2)	-	1 (1)	2 (3)	-	14.5 (19)	-	8 (10)	-	2 (2)	0	-	-	-	11 (15)	0.75 (1)	2.75 (3)	1 (1)	-	-	0	-	2.75 (4)	-	1 (1)	3.25 (6)	4 (4)	75.5 (95)
	YEW	1 (1)	0.5 (1)	0	-	8.75 (9)	16.5 (17)	4 (5)	-	2 (2)	3.25 (4)	-	0	-	0	-	6 (6)	1 (1)	-	-	-	4.5 (6)	-	3 (3)	-	6.5 (7)	-	-	-	1 (1)	-	18.5 (20)	0	0	76.5 (83)
	Habitat total (n = 28)	16 (17)	11.75 (15)	39 (43)	9.5 (10)	77.75 (86)	18.5 (19)	19.5 (24)	47.75 (51)	12 (12)	11.25 (14)	-	32.5 (38)	11.25 (13)	19.75 (23)	15.5 (16)	52.75 (54)	8 (9)	0	-	0	40 (47)	0.75 (1)	7.75 (8)	100.5 (108)	9.75 (11)	2.5 (3)	0.25 (1)	0.25 (1)	102.75 (106)	-	31 (34)	10.25 (15)	103.25 (110)	811.75 (889)
Mesquite	CVCA	3 (3)	-	-	0	21.5 (23)	-	2.5 (3)	-	1 (1)	19.5 (20)	-	7.25 (9)	-	2.25 (3)	-	7.25 (8)	1 (1)	0	0.5 (1)	2.25 (3)	0	0.5 (1)	7.5 (8)	-	-	0	-	0	1 (1)	7.75 (8)	0	0.25 (1)	85 (94)	
	LDCA	-	-	0	-	0.75 (1)	-	0	-	0	0.75 (1)	-	0.5 (1)	-	-	0	0	-	0	-	0	-	-	0	0	-	1 (1)	-	0	-	-	-	0	3 (4)	
	Parker Dam Camp	0	1 (1)	0	-	2.25 (3)	1 (1)	1.25 (2)	-	0	0	-	-	-	-	0	2 (2)	1 (1)	-	-	0.75 (1)	-	3.25 (4)	3.25 (4)	-	-	-	4 (4)	0	-	2.5 (3)	-	-	22.25 (26)	
	PVER	-	-	-	-	1 (1)	-	-	-	-	2 (2)	-	1 (1)	-	1 (1)	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	1.5 (2)	6.5 (7)	
	PWCA	-	0	-	0	0	-	2.75 (3)	-	1 (1)	6.5 (8)	-	1 (1)	-	1 (1)	-	0.75 (1)	2 (2)	-	1 (1)	-	3 (3)	0	-	9 (9)	0	-	0	0.75 (1)	-	-	1 (1)	-	0	29.75 (32)
	YEW	-	-	0	-	1 (1)	3 (3)	0	-	-	2 (2)	-	-	-	-	-	0.25 (1)	-	-	-	-	1 (1)	-	-	-	-	-	0	-	5 (5)	0	-	-	12.25 (13)	
	Habitat total (n = 21)²	3 (3)	1 (1)	0	0	26.5 (29)	4 (4)	6.5 (8)	-	2 (2)	30.75 (33)	-	9.75 (12)	-	4.25 (5)	-	1 (2)	11.25 (12)	2 (2)	1 (1)	0.5 (1)	7 (8)	0	3.75 (5)	19.75 (21)	0	-	1 (1)	4.75 (5)	0	1 (1)	16.25 (17)	0	1.75 (3)	158.75 (176)

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in the Lower Colorado River Region, 2017**

Table 7.—Number of probable or confirmed breeding territories for 32 territorial species detected during rapid area search surveys by habitat type and conservation area in 2017 (Number of territories is the sum of the percentages of all territories in the plot. The numbers in parentheses represent the total number of whole [100%] and partial [< 100%] territories in the plot. Dashes indicate no observations, while a 0 means the species was detected but insufficient breeding evidence was observed. The number in parentheses next to "Habitat total" is the total number of species detected in that habitat type.)

Habitat type	Conservation area ¹	Focal species (n = 4)				Non-covered species (n = 28) ²																								Area total					
		Arizona Bell's vireo	Gila woodpecker	Sonoran yellow warbler	Summer tanager	Abert's towhee	Anna's hummingbird	Ash-throated flycatcher	Bewick's wren	Black-chinned hummingbird	Black-tailed gnatcatcher	Blue-gray gnatcatcher	Blue grosbeak	Brown-crested flycatcher	Bullock's oriole	Canyon wren	Common yellowthroat	Crissal thrasher	Hooded oriole	Horned lark	Indigo bunting	Ladder-backed woodpecker	Lazuli bunting	Lesser goldfinch	Lucy's warbler	Marsh wren	Northern Cardinal	Northern mockingbird	Phainopepla		Song sparrow	Unidentified thrasher	Verdin	Western kingbird	Yellow-breasted chat
Mixed	BLCA	3 (3)	-	0	-	2 (2)	-	-	-	0	0	-	-	0	-	3.75 (4)	-	-	-	-	0	-	-	0	-	-	0	-	-	6 (6)	-	-	-	5.75 (6)	20.5 (21)
	Cibola NWR Unit #1	-	-	-	1 (1)	4 (4)	-	1 (1)	0	-	7 (7)	-	3 (3)	-	2 (2)	-	1 (1)	0	-	-	-	2 (2)	0	0	13 (13)	-	-	0	-	-	4 (4)	0.75 (1)	0	38.75 (39)	
	CVCA	-	-	-	-	0	-	0	-	-	-	-	0.5 (1)	0	1 (1)	-	-	0	-	0	-	1 (1)	-	-	-	-	-	-	-	-	-	0.5 (1)	-	3 (4)	
	LDCA	0	-	0	-	4 (4)	-	1 (1)	-	0	0	-	1 (1)	-	0	-	43.25 (44)	0	-	-	-	2.25 (3)	0	-	-	64.5 (66)	-	-	-	14 (14)	-	1 (1)	-	3 (3)	134 (137)
	Parker Dam Camp	0	1 (1)	0	-	4.5 (5)	-	0.5 (1)	-	1.75 (2)	1.25 (2)	-	-	-	0	1 (1)	1.75 (2)	0	-	-	-	1 (1)	-	0	2 (2)	-	-	-	0.75 (1)	4 (4)	-	2.25 (3)	-	-	21.75 (25)
	PVER	-	-	0	0.75 (1)	3.5 (5)	0	0	-	0	2 (2)	-	10.25 (12)	0	3 (3)	-	1 (1)	0	-	-	1.75 (2)	6.5 (7)	0	1 (1)	2.25 (3)	-	-	0	-	2.5 (3)	-	-	3 (3)	2 (2)	39.5 (45)
	PWCA	-	0	-	-	5.75 (7)	-	1 (2)	-	-	8.5 (9)	-	3 (3)	-	-	-	0	2 (2)	-	-	-	1.5 (2)	0	-	2.5 (3)	-	-	-	-	-	-	0	1 (1)	25.25 (29)	
	YEW	1 (1)	-	-	-	2.5 (3)	4 (4)	0	-	0	0	1 (1)	1 (1)	-	-	-	0.5 (1)	-	-	-	-	1.75 (2)	-	1.75 (2)	-	-	-	-	0	-	7 (7)	-	-	20.5 (22)	
	Habitat total (n = 23)	4 (4)	1 (1)	0	1.75 (2)	26.25 (30)	4 (4)	3.5 (5)	0	1.75 (2)	18.75 (20)	1 (1)	18.75 (21)	0	6 (6)	0	50.5 (52)	3.75 (4)	0	0	1.75 (2)	16 (18)	0	2.75 (3)	19.75 (21)	64.5 (66)	-	0	0.75 (1)	26.5 (27)	-	14.25 (15)	4.25 (5)	11.75 (12)	303.25 (322)

¹ BLCA = Beal Lake Conservation Area, CVCA = Cibola Valley Conservation Area, LDCA = Laguna Division Conservation Area, PVER = Palo Verde Ecological Reserve, PWCA = Pretty Water Conservation Area, and YEW = Yuma East Wetlands.

² The detection of an unknown thrasher species is recorded as a separate column, but it is not counted as a separate species based on the probability that it is the same as a crissal thrasher.

Note: The scientific names of the species can be found in attachment 3, table 3-1.

7 conservation areas) (see table 6). Nest sites for three cavity nesting species (brown-crested flycatcher [*Myiarchus tyrannulus*], ladder-backed woodpecker [*Picoides scalaris*], and Lucy's warbler) were observed and included cavities in old (presumably cottonwood) snags and an old mulberry snag.

Surveyors recorded breeding territories of 24 non-covered, territorial species within the cottonwood-willow habitat type, while recording only 19 species in mesquite and 20 species in mixed habitat (see table 7). Including all territorial species (focal and non-covered), the highest number of territories (811.75) was recorded in cottonwood-willow habitat and mesquite habitat had the fewest (158.75 territories) (see table 7). The difference is largely due to the Middle Bill Williams River NWR, which had the highest number of territories (513.5) of any conservation area by habitat type (see table 7). Species richness for both focal and non-covered species was highest in cottonwood-willow habitat (28 species) and lower in both mesquite habitat (21 species) and mixed habitat (23 species) (see table 7).

Non-Territorial Species

Surveyors also recorded 46 non-territorial species as having at least 1 estimated pair (table 8). Two of the non-territorial species (Yuma clapper rail and western least bittern) are LCR MSCP covered species (table 8). The 4 most abundant non-territorial species were white-winged dove (*Zenaida asiatica*) (596 estimated pairs), brown-headed cowbird (340 estimated pairs), red-winged blackbird (*Agelaius phoeniceus*) (337 estimated pairs), and mourning dove (*Zenaida macroura*) (268 estimated pairs) (table 8).

Surveyors estimated more breeding pairs of non-territorial species in cottonwood-willow habitat (1,248 estimated pairs) than in either mesquite or mixed habitat (336 and 591 estimated pairs, respectively) (table 9). Species richness was similar between cottonwood-willow habitat (36 species) and mixed habitat (35 species), and lower in mesquite habitat (22 species) (table 9).

Individual Conservation Areas

Beal Lake Conservation Area

Three focal species were recorded breeding in the Beal Lake Conservation Area (BLCA), with the Arizona Bell's vireo being the most numerous (5.25 territories) (see table 6). Surveyors also recorded 3.5 Sonoran yellow warbler territories and 1 summer tanager territory (see table 6). Surveyors detected an additional nine non-covered, territorial species. The most numerous non-covered, territorial species were yellow-breasted chat (*Icteria virens*) (10.25 territories) and common yellowthroat (*Geothlypis trichas*) (9.25 territories) (see table 6). Surveyors detected 10 non-territorial species (table 8). The most numerous non-territorial breeding species were brown-headed cowbird and great-tailed grackle (*Quiscalus mexicanus*) (5 estimated pairs each) (table 8).

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In the BLCA, more breeding territories were found in the cottonwood-willow plot (26 territories) than in the mixed plot (20.5 territories) (see table 7). All Sonoran yellow warbler and summer tanager territories were found in the cottonwood-willow plot (see table 7). Arizona Bell's vireo territories were found in both plots, with slightly more territories recorded in mixed habitat (3 territories) than in cottonwood-willow (2.25 territories) (see table 7). The most numerous non-covered, territorial species in the cottonwood-willow plot was common yellowthroat (5.5 territories), while the most numerous species in the mixed plot was song sparrow (6 territories) (see table 7). The same number of estimated non-territorial species pairs were found between the cottonwood-willow and mixed plots (12 estimated pairs) (table 9). The most numerous non-territorial species in the cottonwood-willow plot was great-tailed grackle (three estimated pairs), and the most numerous in the mixed plot was brown-headed cowbird (three estimated pairs) (table 9).

Middle Bill Williams River National Wildlife Refuge

Four focal species were recorded breeding in the Middle Bill Williams River NWR, with the most numerous being Sonoran yellow warbler (33.75 territories) (see table 6). Surveyors recorded 11 Arizona Bell's vireo territories, 11.25 Gila woodpecker territories, and 6 summer tanager territories (see table 6). Surveyors detected an additional 20 non-covered, territorial species (see table 6). The 3 most numerous non-covered, territorial species were Lucy's warbler (96.5 territories), yellow-breasted chat (87.75 territories), and song sparrow (78.25 territories) (see table 6). Surveyors also recorded 17 non-territorial species (table 8). The 2 most numerous non-territorial species were white-winged dove (66 estimated pairs) and mourning dove (51 estimated pairs) (table 8). All surveyed plots within the Middle Bill Williams River NWR were cottonwood-willow.

Cibola National Wildlife Refuge Unit #1 Conservation Area

One breeding territory for one focal species (summer tanager) was recorded in Cibola NWR Unit #1 (see table 6). Surveyors recorded an additional 12 non-covered, territorial species. The 3 most numerous non-covered, territorial species were Lucy's warbler (16 territories), blue grosbeak (*Passerina caerulea*) (10.25 territories), and Abert's towhee (8.75 territories) (see table 6). Surveyors also recorded 13 non-territorial species (table 8). The 3 most numerous non-territorial species were red-winged blackbird (269 estimated pairs), white-winged dove (100 estimated pairs), and brown-headed cowbird (95 estimated pairs) (table 8).

Surveyed plots within Cibola NWR Unit #1 consisted of cottonwood-willow and mixed habitat. Surveyors recorded about the same number of breeding territories in mixed habitat (38.75 territories) as in cottonwood-willow (38.25 territories) (see table 7). The one summer tanager territory in this conservation area was in a

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Table 8.—Estimated number of pairs of 46 non-territorial species detected during rapid area search surveys by conservation area, site, and plot in 2017
(Dashes indicate no detections, while a 0 means the species was detected but insufficient breeding evidence was observed. The number in parentheses next to "Area total" is the total number of species detected in that area.)

Conservation area ²	Site	Plot ID (habitat type)	Non-territorial species (n = 46) ¹																																		Total													
			American coot	American kestrel	Barn swallow	Black-crowned night-heron	Black-necked stilt	Brown-headed cowbird	Cattle egret	Cliff swallow	Common gallinule	Common ground-dove	Common raven	Cooper's hawk	Double-crested cormorant	Eurasian collared-dove	European starling	Gambel's quail	Great blue heron	Great egret	Great horned owl	Greater roadrunner	Great-tailed grackle	Green heron	House finch	Inca dove	Killdeer	Western least bittern	Lesser nighthawk	Mallard	Mourning dove	Northern harrier	Northern rough-winged swallow	Osprey	Pied-billed grebe	Red-tailed hawk		Red-winged blackbird	Ruddy duck	Sharp-shinned hawk	Snowy egret	Sora	Spotted sandpiper	Turkey vulture	Unidentified dove	Virginia rail	White-throated swift	White-winged dove	Yellow-headed blackbird	Yuma clapper rail
BLCA	CPhase 01	C1501 (MX)	-	-	-	1	-	3	-	-	0	-	-	-	-	-	-	-	-	0	2	-	-	-	1	-	-	-	-	1	-	-	-	-	-	2	-	-	-	-	-	0	-	2	-	0	12			
	CPhase 02	C1502 (CW)	-	-	-	-	-	2	-	-	-	1	-	-	-	-	1	-	-	-	1	3	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	2	-	-	12
	Area total (n = 10)			-	-	-	1	-	5	-	-	0	1	-	-	-	-	1	-	-	-	1	5	-	-	-	1	-	-	-	3	-	-	-	-	-	2	-	-	-	-	-	-	0	-	4	-	0	24	
Middle Bill Williams River NWR	Esquerra Ranch	C1904 (CW)	-	-	-	-	-	3	-	25	-	-	1	-	-	-	-	2	-	-	1	1	-	-	-	1	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	3	4	-	-	44		
	Gibraltar Rock	C1910 (CW)	-	-	-	-	-	1	-	-	-	-	-	-	-	3	-	-	-	1	-	-	1	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	2	2	-	-	14		
	Kohen Ranch	C1907 (CW)	-	-	-	-	-	4	-	-	-	-	-	-	-	3	-	-	-	-	-	-	1	-	-	-	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	-	-	19		
		C1908 (CW)	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-	-	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	17		
	<i>Site total</i>			-	-	-	-	7	-	-	-	-	-	-	-	3	-	-	-	1	-	-	2	-	-	-	-	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10	-	-	36		
	Borrow Pit	C1918 (CW)	-	-	-	-	-	-	-	-	-	1	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	7	
	Cross River	C1928 (CW)	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	3	-	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	9
		C1929 (CW)	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	6
		<i>Site total</i>			-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	5	-	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7	-	-
	Fox Wash	C1924 (CW)	-	-	-	-	-	1	-	-	-	-	1	0	-	-	-	2	-	-	-	1	-	-	-	-	-	6	-	2	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	10	6	-	-	29
		C1925 (CW)	-	-	-	-	-	2	-	-	-	-	-	-	-	1	-	1	-	-	-	1	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	12
		<i>Site total</i>			-	-	-	-	3	-	-	-	-	1	0	-	1	-	3	-	-	-	2	-	-	-	-	9	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	10	10	-	-
	Mosquito Flats	C1930 (CW)	-	-	-	-	-	2	-	-	-	-	-	-	-	5	-	-	-	1	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	-	-	14	
C1931 (CW)		-	-	-	-	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7	-	-	15		
C1932 (CW)		-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	-	-	12		

**Riparian Bird Surveys at Conservation Areas
in the Lower Colorado River Region, 2017**

Table 8.—Estimated number of pairs of 46 non-territorial species detected during rapid area search surveys by conservation area, site, and plot in 2017
(Dashes indicate no detections, while a 0 means the species was detected but insufficient breeding evidence was observed. The number in parentheses next to "Area total" is the total number of species detected in that area.)

Conservation area ²	Site	Plot ID (habitat type)	Non-territorial species (n = 46) ¹																																	Total																
			American coot	American kestrel	Barn swallow	Black-crowned night-heron	Black-necked stilt	Brown-headed cowbird	Cattle egret	Cliff swallow	Common gallinule	Common ground-dove	Common raven	Cooper's hawk	Double-crested cormorant	Eurasian collared-dove	European starling	Gambel's quail	Great blue heron	Great egret	Great horned owl	Greater roadrunner	Great-tailed grackle	Green heron	House finch	Inca dove	Killdeer	Western least bittern	Lesser nighthawk	Mallard	Mourning dove	Northern harrier	Northern rough-winged swallow	Osprey	Pied-billed grebe		Red-tailed hawk	Red-winged blackbird	Ruddy duck	Sharp-shinned hawk	Snowy egret	Sora	Spotted sandpiper	Turkey vulture	Unidentified dove	Virginia rail	White-throated swift	White-winged dove	Yellow-headed blackbird	Yuma clapper rail		
Middle Bill Williams River NWR (cont.)	Mosquito Flats (cont.)	C1934 (CW)	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	9		
		<i>Site total</i>	-	-	-	-	-	13	-	-	-	-	-	-	-	-	5	-	-	-	1	-	-	-	-	1	-	-	-	-	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	21	-	-
	Sandy Wash	C1911 (CW)	-	-	-	-	-	1	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	-	-	11
		C1913 (CW)	-	-	-	-	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	-	-	15
	<i>Site total</i>	-	-	-	-	-	6	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11	-	-	26	
Area total (n = 17)	-	-	-	-	-	35	-	25	-	-	3	1	-	1	-	18	-	-	1	6	-	-	3	2	-	-	1	-	51	-	2	-	-	-	1	-	-	-	-	-	-	2	-	-	15	66	-	-	233			
Cibola NWR Unit #1	Cottonwood Genetic	C2704 (CW)	-	-	-	-	1	-	-	-	-	0	-	0	1	1	-	-	0	-	-	-	1	-	1	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	0	-	11			
		C2721 (CW)	-	-	-	-	3	-	-	-	-	-	-	-	-	1	-	-	0	-	-	-	-	1	-	-	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7	-	-	17		
	Crane Roost	C2722 (CW)	-	-	-	-	8	-	2	-	-	-	-	-	1	0	-	-	-	-	-	-	-	-	-	-	-	16	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	10	-	-	39		
		C2723 (MX)	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	1	-	-	13		
		C2725 (MX)	-	-	-	-	20	-	-	-	-	-	-	-	-	3	-	-	1	1	-	1	1	-	-	-	-	3	-	-	-	-	-	-	-	10	-	-	-	-	-	-	-	-	-	-	61	-	-	101		
		<i>Site total</i>	-	-	-	-	34	-	2	-	-	-	-	-	-	1	4	-	-	2	2	-	1	2	-	-	-	27	-	-	-	-	1	15	-	-	-	-	-	-	-	-	-	-	-	-	-	79	-	-	170	
	Upper Hippy Fire	C2726 (CW)	-	-	-	-	50	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	5	-	-	-	-	-	250	-	-	-	-	-	-	-	-	-	-	-	-	7	-	-	313		
		C2727 (CW)	-	-	-	-	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	10	-	-	37		
	<i>Site total</i>	-	-	-	-	60	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	18	-	-	-	-	-	254	-	-	-	-	-	-	-	-	-	-	-	-	-	17	-	-	350		
Area total (n = 13)	-	-	-	-	95	-	2	-	-	-	0	-	0	2	6	-	-	2	2	-	1	3	-	1	-	-	47	-	-	-	-	1	269	-	-	-	-	-	-	-	-	-	-	-	100	0	-	531				
CVCA	Phase 01	C2502 (CW)	-	-	-	-	4	-	-	-	-	-	-	2	-	1	-	-	1	-	-	-	-	-	-	-	3	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	5	-	-	17				
		C2503 (CW)	-	-	-	-	7	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	24	-	-	37			
	<i>Site total</i>	-	-	-	-	11	-	-	-	-	-	-	-	2	-	5	-	-	1	-	-	-	2	-	-	-	3	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	0	-	-	29	-	-	54			

Riparian Bird Surveys at Conservation Areas
in the Lower Colorado River Region, 2017

Table 8.—Estimated number of pairs of 46 non-territorial species detected during rapid area search surveys by conservation area, site, and plot in 2017
(Dashes indicate no detections, while a 0 means the species was detected but insufficient breeding evidence was observed. The number in parentheses next to "Area total" is the total number of species detected in that area.)

Conservation area ²	Site	Plot ID (habitat type)	Non-territorial species (n = 46) ¹																																	Total																	
			American coot	American kestrel	Barn swallow	Black-crowned night-heron	Black-necked stilt	Brown-headed cowbird	Cattle egret	Cliff swallow	Common gallinule	Common ground-dove	Common raven	Cooper's hawk	Double-crested cormorant	Eurasian collared-dove	European starling	Gambel's quail	Great blue heron	Great egret	Great horned owl	Greater roadrunner	Great-tailed grackle	Green heron	House finch	Inca dove	Killdeer	Western least bittern	Lesser nighthawk	Mallard	Mourning dove	Northern harrier	Northern rough-winged swallow	Osprey	Pied-billed grebe		Red-tailed hawk	Red-winged blackbird	Ruddy duck	Sharp-shinned hawk	Snowy egret	Sora	Spotted sandpiper	Turkey vulture	Unidentified dove	Virginia rail	White-throated swift	White-winged dove	Yellow-headed blackbird	Yuma clapper rail			
CVCA (cont.)	Phase 02	C2506 (MX)	-	-	-	-	-	6	-	-	-	-	-	-	-	1	-	-	1	-	-	-	-	-	-	-	1	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18	-	-	31				
		C2508 (CW)	-	-	-	-	-	2	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	23	-	-	39
		Site total	-	-	-	-	-	8	-	-	-	-	-	-	-	1	-	1	-	-	1	-	-	-	-	-	-	1	-	-	-	17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	41	-	-	70	
	Phase 03	C2511 (CW)	-	-	-	-	-	3	-	-	-	-	-	-	-	-	3	-	-	1	-	-	-	-	-	-	-	-	-	-	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11	-	-	26	
		C2512 (CW)	-	-	-	-	-	3	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12	-	-	27	
		Site total	-	-	-	-	-	6	-	-	-	-	-	-	-	-	5	-	-	1	-	-	-	-	-	-	-	-	-	-	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	23	-	-	53	
	Phase 04	C2513 (MQ)	-	-	-	-	-	20	-	-	-	1	-	0	-	-	7	-	-	-	1	-	-	-	-	-	-	-	1	-	6	-	25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20	-	-	81	
		C2514 (MQ)	-	-	-	-	-	6	-	-	-	-	-	-	-	-	3	-	-	-	1	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	13	
		C2516 (MQ)	-	-	-	-	-	2	-	-	-	-	-	-	-	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	11	
		C2517 (MQ)	-	-	-	-	-	4	-	-	-	-	-	-	-	-	8	-	-	0	1	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-	1	-	-	17		
		C2518 (MQ)	-	-	-	-	-	9	-	-	-	2	-	-	-	-	8	-	-	-	1	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	-	-	28		
		Site total	-	-	-	-	-	41	-	-	-	3	-	0	-	-	31	-	-	0	4	-	-	-	-	-	-	-	2	-	14	-	25	-	-	-	-	0	-	-	-	-	-	-	-	-	-	-	30	-	-	150	
	Phase 07	C2540 (MQ)	-	-	-	-	-	3	-	-	-	1	-	-	-	-	3	-	-	-	1	-	-	-	-	-	-	-	-	13	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	2	-	-	24		
Area total (n = 13)			-	-	-	-	69	-	-	-	4	-	0	-	3	-	45	-	-	3	5	-	-	2	-	1	-	2	-	65	-	25	-	-	-	2	-	0	-	-	-	0	-	-	-	125	-	-	351				
LDCA	Historic Channel	C4932 (MX)	1	-	-	1	-	2	-	-	5	-	-	-	-	-	-	-	-	-	1	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	17			
	Reach 01	C4901 (MX)	5	-	-	-	-	0	-	-	-	-	-	0	-	-	1	0	-	-	-	1	-	-	-	2	1	-	-	1	-	-	0	1	-	1	-	-	-	-	-	-	-	-	-	1	-	-	-	14			
		C4905 (MX)	2	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	3	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	-	-	10			
		C4907 (CW)	2	-	-	1	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	0	2	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	1	1	-	-	1	13			
		C4908 (MX)	-	-	-	-	-	3	-	-	6	-	-	-	-	-	-	-	1	-	-	-	2	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	1	16			

**Riparian Bird Surveys at Conservation Areas
in the Lower Colorado River Region, 2017**

Table 8.—Estimated number of pairs of 46 non-territorial species detected during rapid area search surveys by conservation area, site, and plot in 2017
(Dashes indicate no detections, while a 0 means the species was detected but insufficient breeding evidence was observed. The number in parentheses next to "Area total" is the total number of species detected in that area.)

Conservation area ²	Site	Plot ID (habitat type)	Non-territorial species (n = 46) ¹																																		Total													
			American coot	American kestrel	Barn swallow	Black-crowned night-heron	Black-necked stilt	Brown-headed cowbird	Cattle egret	Cliff swallow	Common gallinule	Common ground-dove	Common raven	Cooper's hawk	Double-crested cormorant	Eurasian collared-dove	European starling	Gambel's quail	Great blue heron	Great egret	Great horned owl	Greater roadrunner	Great-tailed grackle	Green heron	House finch	Inca dove	Killdeer	Western least bittern	Lesser nighthawk	Mallard	Mourning dove	Northern harrier	Northern rough-winged swallow	Osprey	Pied-billed grebe	Red-tailed hawk		Red-winged blackbird	Ruddy duck	Sharp-shinned hawk	Snowy egret	Sora	Spotted sandpiper	Turkey vulture	Unidentified dove	Virginia rail	White-throated swift	White-winged dove	Yellow-headed blackbird	Yuma clapper rail
LDCA (cont.)	Reach 01 (cont.)	C4911 (CW)	3	-	-	-	2	5	-	-	-	-	-	1	-	-	-	-	-	-	1	2	1	-	-	-	2	-	-	4	-	-	1	-	-	-	-	1	-	-	-	-	-	-	-	25	-	1	49	
		C4913 (MX)	3	-	-	-	-	2	-	-	-	-	-	0	-	-	-	-	-	-	-	0	-	-	-	-	1	-	-	2	-	-	-	-	-	0	-	-	-	-	-	-	-	-	-	-	3	-	1	12
		Site total	15	-	-	1	2	11	-	-	7	-	-	-	1	-	-	2	0	1	-	1	10	1	-	-	4	4	3	-	7	-	-	2	1	-	1	0	1	-	-	1	4	-	29	-	4	114		
	Reach 02	C4915 (MQ)	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	3
		C4916 (MX)	6	-	-	-	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	9	-	2	1	1	1	-	-	4	-	17	-	-	1	-	1	-	-	1	-	1	-	-	51	
		C4921 (MQ)	-	-	-	-	-	1	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	1	-	2	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	12	
		C4922 (MX)	3	-	1	-	2	2	-	2	-	-	-	-	-	3	-	-	-	1	5	-	-	-	4	0	3	-	5	-	-	-	1	-	8	-	-	-	-	-	-	-	-	-	-	6	-	1	47	
		C4924 (MX)	3	-	-	-	2	1	-	-	1	-	-	-	1	-	-	0	0	0	0	-	1	-	-	2	2	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	0	1	18		
		C4926 (MX)	8	-	-	-	-	-	-	-	2	-	-	-	-	1	-	0	-	-	2	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	3	-	-	21		
		Site total	20	-	1	-	6	5	-	2	3	-	-	-	1	-	-	8	0	0	0	1	11	-	-	-	16	5	7	1	8	1	-	-	5	-	25	-	-	1	-	1	-	1	6	-	17	3	2	152
Area total (n = 31)	36	-	1	2	8	18	-	2	15	-	-	-	2	-	-	10	0	1	0	2	22	1	-	-	21	10	10	1	15	1	-	2	6	-	26	1	1	2	2	1	-	1	6	-	46	3	8	283		
PVER	Phase 02	C2302 (CW)	-	1	-	-	-	4	-	-	-	1	0	0	-	-	2	0	-	1	-	-	-	2	-	0	-	1	-	5	-	-	0	-	-	3	-	0	-	-	-	-	-	-	-	3	-	-	23	
	Phase 04	C2308 (CW)	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	0	1	-	-	-	3	-	-	-	-	-	25	-	-	-	-	-	-	-	-	-	-	4	0	-	36	
		C2311 (MQ)	-	-	-	-	-	1	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	6	
		Site total	-	-	-	-	-	3	-	-	-	-	-	-	-	1	-	-	-	-	1	-	-	0	1	-	-	-	4	-	-	-	-	-	25	-	-	-	-	-	-	-	-	-	7	0	-	42		
	Phase 05	C2312 (CW)	-	1	-	-	-	3	-	-	-	-	-	-	-	0	4	-	-	-	-	-	-	0	-	-	-	-	-	2	-	-	-	-	-	0	-	-	-	-	-	-	-	-	-	2	-	-	12	
		C2313 (CW)	-	-	-	-	-	10	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	3	-	-	-	-	-	6	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	8	-	-	29	
		C2315 (CW)	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	5	-	-	10	
C2316 (MX)		-	-	-	-	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	2	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	5	-	-	15		

Riparian Bird Surveys at Conservation Areas
in the Lower Colorado River Region, 2017

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Conservation area ²	Site	Plot ID (habitat type)	Non-territorial species (n = 46) ¹																																		Total														
			American coot	American kestrel	Barn swallow	Black-crowned night-heron	Black-necked stilt	Brown-headed cowbird	Cattle egret	Cliff swallow	Common gallinule	Common ground-dove	Common raven	Cooper's hawk	Double-crested cormorant	Eurasian collared-dove	European starling	Gambel's quail	Great blue heron	Great egret	Great horned owl	Greater roadrunner	Great-tailed grackle	Green heron	House finch	Inca dove	Killdeer	Western least bittern	Lesser nighthawk	Mallard	Mourning dove	Northern harrier	Northern rough-winged swallow	Osprey	Pied-billed grebe	Red-tailed hawk		Red-winged blackbird	Ruddy duck	Sharp-shinned hawk	Snowy egret	Sora	Spotted sandpiper	Turkey vulture	Unidentified dove	Virginia rail	White-throated swift	White-winged dove	Yellow-headed blackbird	Yuma clapper rail	
PVER (cont.)	Phase 05 (cont.)	C2317 (MX)	-	-	-	-	6	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	1	2	-	-	-	-	-	-	-	-	-	5	-	-	17		
		C2319 (MX)	-	-	-	-	4	-	-	-	-	-	-	-	-	-	1	-	-	1	0	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	5	-	-	13
		Site total	-	1	-	-	32	-	-	-	-	-	-	-	-	0	6	-	-	1	1	-	-	3	-	-	-	-	-	15	-	-	-	-	2	5	-	-	-	-	-	-	-	-	-	-	30	-	-	96	
	Phase 06	C2322 (MX)	-	-	-	-	10	-	-	-	-	-	-	-	-	4	-	-	2	-	1	-	0	-	-	-	-	-	3	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	6	-	-	27		
		C2324 (CW)	-	-	-	-	5	-	-	-	-	-	-	-	-	-	-	-	1	-	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18	-	-	24			
		Site total	-	-	-	-	15	-	-	-	-	-	-	-	-	4	-	-	3	-	1	-	0	-	-	-	-	-	3	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	24	-	-	51		
	Phase 07	C2328 (CW)	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	21	-	-	26			
		C2329 (CW)	-	-	-	-	4	-	-	-	-	0	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	0	0	-	-	-	-	-	-	-	-	-	-	3	-	-	9	
		C2332 (CW)	-	-	-	-	5	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13	-	-	18			
		C2334 (MX)	-	-	-	-	5	-	-	-	-	-	-	-	-	0	-	-	1	1	-	-	-	-	-	-	-	-	-	7	-	-	1	-	1	1	-	-	-	-	-	-	-	-	-	7	-	-	24		
		Site total	-	-	-	-	18	-	-	-	-	0	-	-	-	0	-	-	3	1	-	-	-	-	-	-	-	-	-	8	-	-	1	-	1	1	-	-	-	-	-	-	-	-	-	44	-	-	77		
	Area total (n = 15)		-	2	-	-	72	-	-	-	1	0	0	-	-	0	13	0	-	8	3	1	-	5	1	0	-	1	-	35	-	-	1	-	3	35	-	0	-	-	-	-	-	-	108	0	-	289			
	Parker Dam Camp	Parker Dam Camp	C2002 (MQ)	-	0	-	-	2	-	1	-	-	-	-	9	1	10	-	-	-	1	-	-	3	-	-	-	-	4	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	6	-	-	40			
			C2003 (MX)	-	-	-	-	3	-	2	-	-	-	-	-	10	-	3	-	-	-	-	-	7	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	32		
		Area total (n = 10)		-	0	-	-	5	-	3	-	-	-	-	19	1	13	-	-	-	1	-	-	10	-	-	-	-	7	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	10	-	-	72			
PWCA	PWCA	C2906 (MX)	-	-	-	-	1	-	-	-	-	-	-	-	1	-	-	-	-	3	-	-	-	-	0	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	9				
		C2909 (MQ)	-	-	-	0	2	-	-	-	-	-	-	-	-	1	-	-	-	-	8	-	-	-	0	1	-	1	-	-	-	-	-	0	-	-	-	-	-	-	-	-	-	3	0	-	16				
		C2910 (MQ)	-	-	-	-	1	-	-	-	-	-	-	-	-	3	1	-	1	-	-	-	-	-	-	1	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	11				
		C2911 (MQ)	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	1	-	-	5			

mixed habitat plot (see table 7). The most numerous territorial species in cottonwood-willow was blue grosbeak (7.25 territories), while the most numerous species in mixed habitat was Lucy's warbler (13 territories) (see table 7). Surveyors estimated 3.7 times more non-territorial species pairs in cottonwood-willow habitat (417 estimated pairs) than in mixed habitat (114 estimated pairs) (see table 9). The red-winged blackbird was the most numerous non-territorial species in cottonwood-willow habitat (255 estimated pairs), while the white-winged dove was the most numerous in mixed habitat (62 estimated pairs) (see table 9).

Cibola Valley Conservation Area

The only focal species recorded in the Cibola Valley Conservation Area (CVCA) was Arizona Bell's vireo (three territories) (see table 6). Surveyors recorded an additional 16 non-covered, territorial species (see table 6). The 3 most numerous territorial species were Abert's towhee (30.75 territories), black-tailed gnatcatcher (*Polioptila melanura*) (19.5 territories), and blue grosbeak (9.75 territories). Surveyors also recorded 13 non-territorial species (see table 8). The 3 most numerous non-territorial species were white-winged dove (125 estimated pairs), brown-headed cowbird (69 estimated pairs), and mourning dove (65 estimated pairs) (see table 8).

Surveyors recorded 3.4 times more breeding territories in mesquite habitat (85 territories) than in cottonwood-willow (25 territories), and few in mixed habitat (3 territories) (see table 7). All three Arizona Bell's vireo territories were recorded in mesquite habitat (see table 7). The most numerous territorial species in both cottonwood-willow and mesquite habitat was Abert's towhee (9.25 and 21.5 territories, respectively) (see table 7). A total of four species made up the three total territories in mixed habitat, and no species was more abundant than another (see table 7). Surveyors also estimated more non-territorial species pairs in mesquite habitat (174 estimated pairs) than in cottonwood-willow (146 estimated pairs) and mixed habitat (31 estimated pairs) (see table 9). The most numerous non-territorial species in cottonwood-willow and mixed habitats was white-winged dove (75 and 18 estimated pairs, respectively) (see table 9). The most numerous species in mesquite habitat was brown-headed cowbird (44 estimated pairs) (see table 9).

Laguna Division Conservation Area

No focal species breeding territories were recorded in the LDCA (see table 6). Surveyors recorded 12 breeding territorial species. The 3 most numerous territorial species were marsh wren (*Cistothorus palustris*) (67.75 territories), common yellowthroat (57.75 territories), and song sparrow (32.75 territories) (see table 6). Surveyors also recorded 31 non-territorial species (see table 8). The

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3 most numerous non-territorial species were white-winged dove (46 estimated pairs), American coot (*Fulica americana*) (36 estimated pairs), and red-winged blackbird (26 estimated pairs) (see table 8).

Surveyors recorded 2.4 times as many breeding territories in mixed habitat (134 territories) than in cottonwood-willow habitat (57 territories), and had few total territories in mesquite habitat (3 territories) (see table 7). The most numerous territorial species recorded in mixed habitat was marsh wren (64.5 territories), while the most numerous in cottonwood-willow habitat was song sparrow (18.75 territories) (see table 7). Four species made up the three total territories recorded in mesquite habitat, and no species was more abundant than another (see table 7). There were 3.3 times as many estimated breeding pairs of non-territorial species in mixed habitat (206 estimated pairs) compared with cottonwood-willow habitat (62 estimated pairs), and fewer still in mesquite habitat (15 estimated pairs) (see table 9). The white-winged dove was the most numerous non-territorial species in cottonwood-willow habitat (25 estimated pairs) and mesquite habitat (5 estimated pairs) (see table 9). In mixed habitat, the American coot was the most numerous non-territorial species (31 estimated pairs) (see table 9).

Palo Verde Ecological Reserve

Three focal species (Arizona Bell's vireo, Sonoran yellow warbler, and summer tanager) were recorded breeding in the Palo Verde Ecological Reserve (PVER) (see table 6). The most numerous of these was summer tanager (3.25 territories). Arizona Bell's vireo and Sonoran yellow warbler had 1.75 territories each. Surveyors recorded an additional 16 non-covered, territorial species (see table 6). The 3 most numerous non-covered, territorial species were blue grosbeak (25.75 territories), Abert's towhee (18.5 territories), and ladder-backed woodpecker (*Picoides scalaris*) (17.5 territories) (see table 6). Surveyors also recorded 15 non-territorial species (see table 8). The 4 most numerous non-territorial species were white-winged dove (108 estimated pairs), brown-headed cowbird (72 estimated pairs), and mourning dove and red-winged blackbird (35 estimated pairs each) (see table 8).

Surveyors recorded almost twice as many total territories in cottonwood-willow habitat (75.5 territories) compared with mixed habitat (39.5 territories), and had only 6.5 total territories in mesquite habitat (see table 7). Of the focal species, all territories for Arizona Bell's vireo and Sonoran yellow warbler were in cottonwood-willow habitat (see table 7). Summer tanager territories were recorded in both cottonwood-willow habitat (2.5 territories) and mixed habitat (0.75 territories) (see table 7). The blue grosbeak and Abert's towhee were the most numerous territorial species in cottonwood-willow habitat (14.5 and 14 territories, respectively) (see table 7). In mixed habitat, blue grosbeak was the most numerous territorial species (10.25 territories) (see table 7). In mesquite habitat, only five species were recorded breeding, with black-tailed gnatcatcher

the most numerous (two territories) (see table 7). For non-territorial species, more estimated pairs were recorded in cottonwood-willow habitat (187 estimated pairs) than in mixed (96 estimated pairs) or mesquite habitat (6 estimated pairs) (see table 9). The most numerous non-territorial species in cottonwood-willow and mesquite habitats was white-winged dove (77 and 3 estimated pairs, respectively), while the most numerous species in mixed habitat was brown-headed cowbird (31 estimated pairs) (see table 9).

Parker Dam Camp

Only one focal species was recorded breeding in Parker Dam Camp: the Gila woodpecker (two territories) (see table 6). Fourteen non-covered, territorial species were also recorded in Parker Dam Camp (see table 6). The four most numerous territorial species were Abert's towhee (6.75 territories), Lucy's warbler (5.25 territories), phainopepla (*Phainopepla nitens*) (4.75 territories), and verdin (*Auriparus flaviceps*) (4.75 territories) (see table 6). Surveyors recorded 10 non-territorial species (see table 8). The 4 most numerous non-territorial species were Eurasian collared-dove (*Streptopelia decaocto*) (19 estimated pairs), Gambel's quail (*Callipepla gambelii*) (13 estimated pairs), and house finch (*Haemorhous mexicanus*) and white-winged dove (10 estimated pairs each) (see table 8).

Mixed habitat had about the same number of territories as mesquite habitat (21.75 versus 22.25 territories, respectively) (see table 7). Surveyors recorded one Gila woodpecker territory each in the mesquite and mixed habitat plots (see table 7). The most numerous territorial species in mesquite habitat was phainopepla (4 territories), and the most numerous species in mixed habitat was Abert's towhee (4.5 territories) (see table 7). Surveyors estimated more breeding pairs of non-territorial species in mesquite habitat (40 estimated pairs) than in mixed habitat (32 estimated pairs) (see table 9). The most numerous non-territorial species in mesquite habitat was Gambel's quail (10 estimated pairs), while the most numerous in mixed habitat was Eurasian collared dove (10 estimated pairs) (see table 9).

Pretty Water Conservation Area

No focal species were detected breeding in the Pretty Water Conservation Area (PWCA). Surveyors recorded 14 non-covered, territorial species (see table 6). The 3 most numerous territorial species were black-tailed gnatcatcher (15 territories), Lucy's warbler (11.5 territories), and Abert's towhee (5.75 territories) (see table 6). Surveyors also recorded 11 non-territorial species (see table 8). The 3 most numerous non-territorial species were white-winged dove (34 estimated pairs), Gambel's quail (33 estimated pairs), and mourning dove (26 estimated pairs) (see table 8).

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Surveyors recorded more total territories in mesquite habitat (29.75 territories) than in mixed habitat (25.25 territories) (see table 7). The most numerous territorial species in mesquite habitat was Lucy's warbler (9 territories), while the most numerous species in mixed habitat was black-tailed gnatcatcher (8.5 territories) (see table 7). Surveyors also estimated more total non-territorial estimated pairs in mesquite habitat (78 estimated pairs) than in mixed habitat (67 estimated pairs) (see table 9). The most numerous non-territorial species in both habitats were white-winged dove (20 estimated pairs in mesquite and 14 estimated pairs in mixed habitat) and Gambel's quail (19 estimated pairs in mesquite and 14 estimated pairs in mixed habitat) (see table 9).

Yuma East Wetlands

Territories for two focal species (Arizona Bell's vireo and Gila woodpecker) were recorded in Yuma East Wetlands (YEW) (see table 6). Surveyors recorded two Arizona Bell's vireo territories and half of a Gila woodpecker territory (see table 6). Fourteen additional non-covered, territorial species were also recorded (see table 6). The 3 most numerous territorial species were verdin (30.5 territories), Anna's hummingbird (*Calypte anna*) (23.5 territories), and Abert's towhee (12.25 territories). Surveyors also recorded 22 non-territorial species (see table 8). The 3 most numerous non-territorial species were white-winged dove (103 estimated pairs), great-tailed grackle (43 estimated pairs), and brown-headed cowbird (24 estimated pairs) (see table 8).

Surveyors recorded 3.7 times as many territories in cottonwood-willow habitat as mixed habitat (76.5 and 20.5 total territories, respectively), and mesquite habitat had fewer still (12.25 territories) (see table 7). One Arizona Bell's vireo territory each was recorded in cottonwood-willow and mixed habitat, and half of a Gila woodpecker territory was located in cottonwood-willow habitat (see table 7). The most numerous territorial species in all three habitats was verdin (18.5 territories in cottonwood-willow, 5 territories in mesquite, and 7 territories in mixed habitat) (see table 7). Surveyors estimated over 5 times as many non-territorial breeding pairs in cottonwood-willow habitat (191 estimated pairs) as in mesquite (23 estimated pairs) and mixed habitat (33 estimated pairs) (see table 9). The most numerous non-territorial species in both cottonwood-willow and mixed habitat was white-winged dove (91 and 10 estimated pairs, respectively) (see table 9). In mesquite habitat, the most numerous non-territorial species was mourning dove (7 estimated pairs) (see table 9).

Intensive Area Search Survey Sections

Surveyors did not detect any probable or confirmed breeding territories for focal species during intensive area search surveys. Four focal species were detected in C2502 (Arizona Bell's vireo, Sonoran yellow warbler, summer tanager, and

vermillion flycatcher), but no possible, probable, or confirmed breeding behavior was observed, and no territories were designated. Similarly, Sonoran yellow warblers were detected in C2315, C2329, and C4916 without any observed breeding behavior.

Surveyors recorded probable or confirmed breeding territories for a total of 16 non-covered, territorial species within intensive survey plots (table 10). The 3 most abundant species across all intensive surveys were marsh wren (13.5 territories), blue grosbeak (13 territories), and Abert's towhee (11 territories) (table 10). A nest site for one cavity nesting species (ash-throated flycatcher [*Myiarchus cinerascens*]) was observed in a nest box in one conservation area plot.

Surveyors recorded 32 non-territorial species across all intensive survey plots (table 11). The three most abundant non-territorial species were white-winged dove (73 estimated pairs), brown-headed cowbird (52 estimated pairs), and mourning dove (31 estimated pairs) (table 11).

Of the eight plots, C2921 had the highest species richness of territorial species (nine species), although C2722 was close with eight territorial species. C4916 had the lowest territorial species richness (two species). For non-territorial species, C4916 and C4922 had the highest species richness (19 species each). C2315 had the lowest species richness (three species).

DISCUSSION

Some patterns in species richness and density were noted across the conservation areas, primarily between habitat types and conservation areas. All observed patterns were expected based upon results from prior survey seasons in the same areas (Great Basin Bird Observatory 2014, 2015, 2017). There was no real pattern in density of non-territorial species among the different conservation areas and habitat types. However, given the variable way non-territorial species were recorded during the 2017 field season, any comparisons between habitat types, conservation areas, or across years for these species are less reliable. Results in paired rapid and intensive plots did differ, but all observed differences were expected given the separate survey methods (Bart et al. 2010).

Tablet Technology

The data collection methods of using a tablet, Collector for ArcGIS, and ArcGIS Online were new for this project in 2017. The benefits of the new data collection methods include all data being digital from the beginning of the process. This

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Table 10.—Number of probable or confirmed breeding territories for territorial species detected during intensive area search surveys by conservation area, site, and plot in 2017 (Number of territories is the sum of the percentages of all territories in the plot. The numbers in parentheses represent the total number of whole [100%] and partial [< 100%] territories in the plot. Dashes indicate no observations, while a 0 means the species was detected but insufficient breeding evidence was observed.)

Conservation area ¹	Site	Plot ID	Non-covered species (n = 16) ²																	Plot total
			Abert's towhee	Anna's hummingbird	Ash-throated flycatcher	Black-chinned hummingbird	Black-tailed gnatcatcher	Blue grosbeak	Bullock's oriole	Common yellowthroat	Crissal thrasher	Ladder-backed woodpecker	Lucy's warbler	Marsh wren	Phainopepla	Song sparrow	Unidentified hummingbird	Verdin	Western kingbird	
Cibola NWR Unit #1	Crane Roost	C2722	5 (5)	-	1 (1)	0.5 (1)	1 (1)	2.5 (3)	0	-	-	2 (2)	0	-	-	4 (4)	-	3 (3)	0	19 (20)
CVCA	Phase 01	C2502	3.5 (5)	1 (1)	0.75 (1)	0	0	0	2 (2)	-	0	0.75 (1)	-	-	-	0	-	0	0	8 (10)
LDCA	Reach 02	C4916	-	0	0	-	-	-	-	3 (3)	-	0	-	0.5 (1)	-	0	-	-	-	3.5 (4)
LDCA	Reach 02	C4922	-	-	0	-	-	0.25 (1)	-	7.5 (8)	-	0	-	13 (13)	-	1 (1)	-	-	-	21.75 (23)
PVER	Phase 05	C2315	1 (1)	-	0	0	-	2 (2)	0	0	-	2 (2)	-	-	-	0	2 (2)	-	-	7 (7)
PVER	Phase 07	C2329	0	-	1.25 (2)	0	-	2.5 (4)	0.25 (1)	-	-	0.5 (1)	-	-	-	0	0	0	-	4.5 (8)
PVER	Phase 07	C2332	0	0	-	0	-	5.25 (6)	0.75 (1)	-	-	2.5 (3)	-	-	-	-	-	-	1 (1)	9.5 (11)
PWCA	PWCA	C2921	1.5 (2)	0	2 (3)	0	6 (6)	0.5 (1)	0	-	1 (1)	1.5 (2)	3.25 (4)	-	1 (1)	0		3 (3)	-	19.75 (23)
Total			11 (13)	1 (1)	5 (7)	0.5 (1)	7 (7)	13 (17)	3 (4)	10.5 (11)	1 (1)	9.25 (11)	3.25 (4)	13.5 (14)	1 (1)	5 (5)	2 (2)	6 (6)	1 (1)	93 (106)

¹ CVCA = Cibola Valley Conservation Area, LDCA = Laguna Division Conservation Area, PVER = Palo Verde Ecological Reserve, and PWCA = Pretty Water Conservation Area.

² The detection of an unknown hummingbird species is recorded as a separate column, but it is not counted as a separate species based on the probability that it is the same as one of the other two hummingbird species.

Table 11.—Estimated number of pairs of 32 non-territorial species detected during intensive area search surveys by conservation area, site, and plot in 2017
(Dashes indicate no observations, while a 0 means the species was detected but insufficient breeding evidence was observed.)

Conservation area ²	Site	Plot ID	Non-territorial species (n = 32) ¹																																Plot total					
			American coot	Black-necked stilt	Brown-headed cowbird	Common gallinule	Common ground-dove	Cooper's hawk	Eared grebe	European starling	Gambel's quail	Great blue heron	Great horned owl	Greater roadrunner	Great-tailed grackle	Green heron	Inca dove	Killdeer	Lesser nighthawk	Mallard	Mourning dove	Osprey	Red-winged blackbird	Sharp-shinned hawk	Snowy egret	Sora	Turkey vulture	Unidentified hawk	Virginia rail	Western least bittern	White-faced ibis	White-winged dove	Wilson's snipe	Yellow-headed blackbird		Yuma clapper rail				
Cibola NWR Unit #1	Crane Roost	C2722	-	-	20	-	-	1	-	4	-	-	-	-	-	-	-	-	-	-	15	-	10	1	-	-	2	1	-	-	-	15	-	-	-	-	69			
CVCA	Phase 01	C2502	-	-	4	-	-	-	-	-	1	-	1	0	-	-	1	-	-	-	3	-	1	-	-	-	-	-	-	-	-	-	-	-	-	10	-	-	-	21
LDCA	Reach 02	C4916	5	1	-	6	-	-	2	-	1	1	-	-	5	1	-	1	-	-	2	-	-	-	1	2	-	-	1	2	4	4	1	3	1	-	44			
LDCA	Reach 02	C4922	3	2	3	3	-	-	-	-	1	1	-	-	9	-	-	3	1	1	2	1	1	-	1	-	-	-	0	1	1	3	-	2	2	-	41			
PVER	Phase 05	C2315	-	-	2	-	-	0	-	-	-	0	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	5	-	-	-	9			
PVER	Phase 07	C2329	-	-	12	-	-	-	-	-	-	-	1	-	-	-	-	-	3	-	1	-	-	-	-	-	-	-	-	-	-	-	14	-	-	-	31			
PVER	Phase 07	C2332	-	-	7	-	-	-	-	-	-	-	1	-	-	-	-	-	-	3	-	5	1	-	-	3	-	-	-	-	-	7	-	-	-	27				
PWCA	PWCA	C2921	-	-	4	-	1	-	-	-	6	-	-	2	-	-	-	-	2	-	3	-	-	-	-	-	-	-	-	-	-	15	-	-	-	33				
Total			8	3	52	9	1	1	2	4	9	2	3	2	14	1	1	4	6	1	31	1	17	2	2	2	5	1	1	3	5	73	1	5	3	275				

¹ The detection of an unidentified hawk species is reported separately, but it is not counted as a separate species based on the probability that it is the same as of the already detected hawk species.

² CVCA = Cibola Valley Conservation Area, LDCA = Laguna Division Conservation Area, PVER = Palo Verde Ecological Reserve, and PWCA = Pretty Water Conservation Area.

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allows data to be more easily queried throughout the process and reduces the likelihood of transcription error when data are summarized in the MS Access database. The largest concern prior to employing the new data collection methods was the possibility that using the tablet would slow down surveyors in the field. Using the tablet requires the surveyor to fill out a short form with every detection rather than simply drawing a quick dot or symbol on a paper map as a place holder if bird density is high in a plot. However, surveyors reported that they did not believe using the tablets instead of paper slowed them down. They found navigation to be easier because they could see a track of where they had been overlaid on a satellite image of the area at all times. As with paper maps, surveyors had to visually approximate offset detection locations on the tablet screen, and some estimation error is still likely present.

Prior to employing the new data collection methods, it was presumed that using the tablet technology would speed up the daily data process at the field house. It was found, however, that data processing was likely not much faster than it was in previous years. This was primarily due to slow Internet speed and limited surveyor familiarity with ArcMap software. By the end of the field season, troubleshooting had improved the speed at which the computers processed commands to a tolerable level, though improvements could still be made. Surveyor efficiency in using the software also improved during the field season. Thoroughly training surveyors in how to collect and process data is key to efficient data processing during the field season.

The overall opinion at the end of the field season was that the tablet technology offered a viable alternative for this project. There were both benefits and drawbacks to using the tablet technology, and they were simply different from those associated with the previous method of using paper maps.

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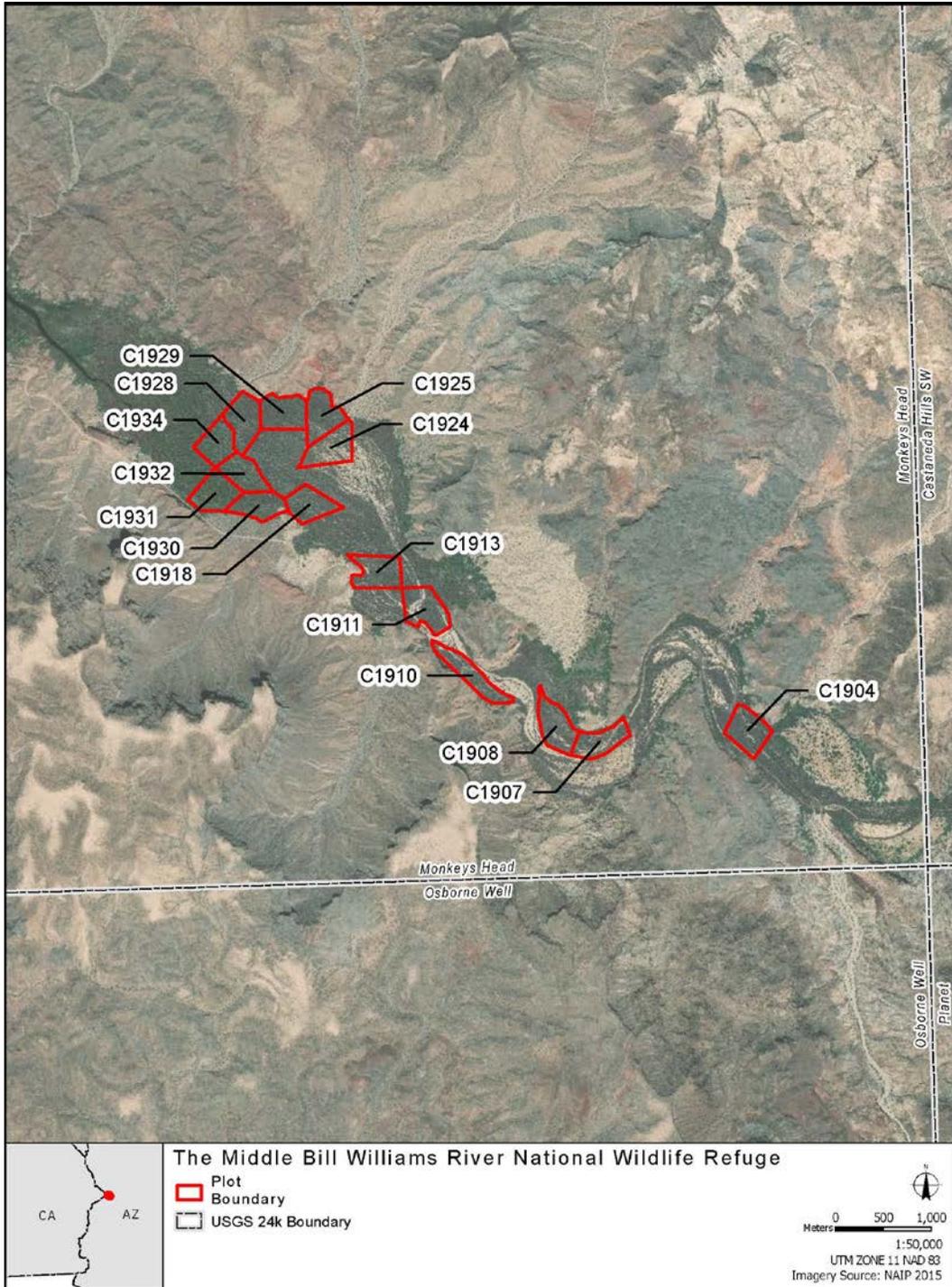
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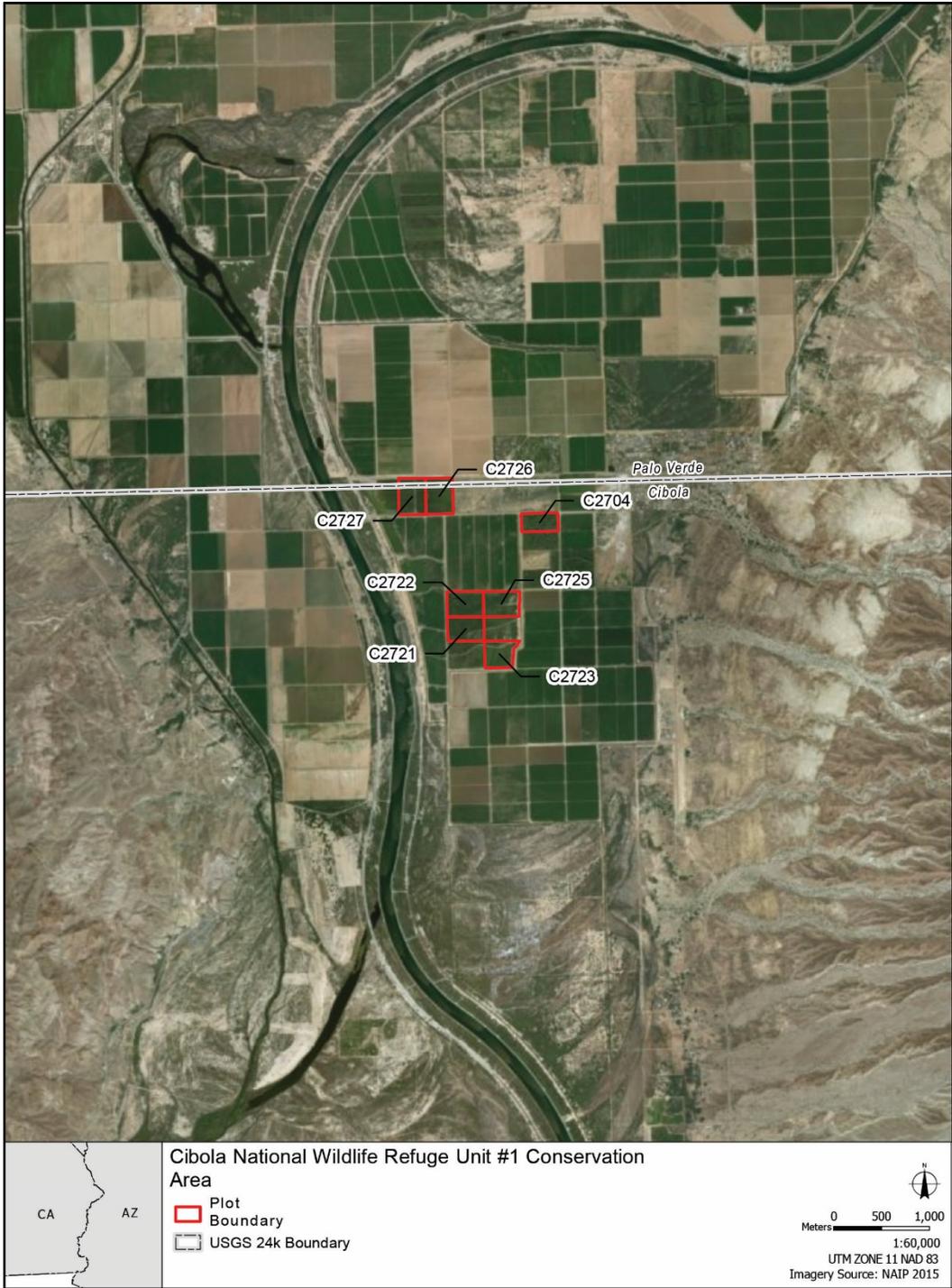
This project would not be a success without SWCA's dedicated staff and field personnel. Many thanks to Jacque Muehlbauer for going above and beyond her administrative duties to coordinate housing, vehicles, safety, and telecommunications. A very special thanks to Clay Donaldson and Glenn Dunno for their Geographic Information System talents. Thanks also to Paul Johnson for his accounting support. And sincere thanks to Amber Gillett, Corina Anderson, Evan Gunn, Garrett Moss, Jon Orona, Mike Swink, Tom Gleason, and Trevor Hinckley for their hard work, dedication, and sweat.

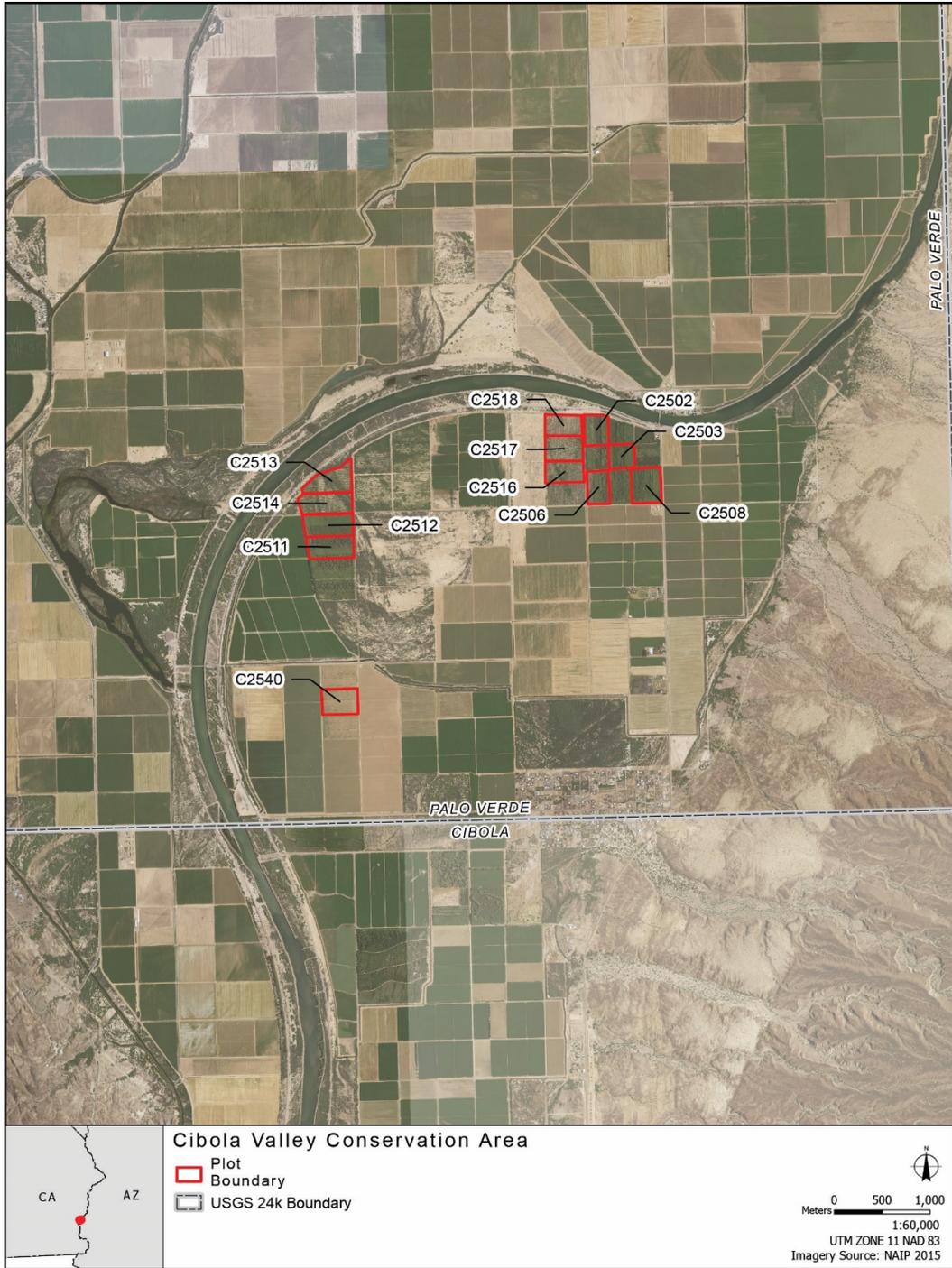
ATTACHMENT 1

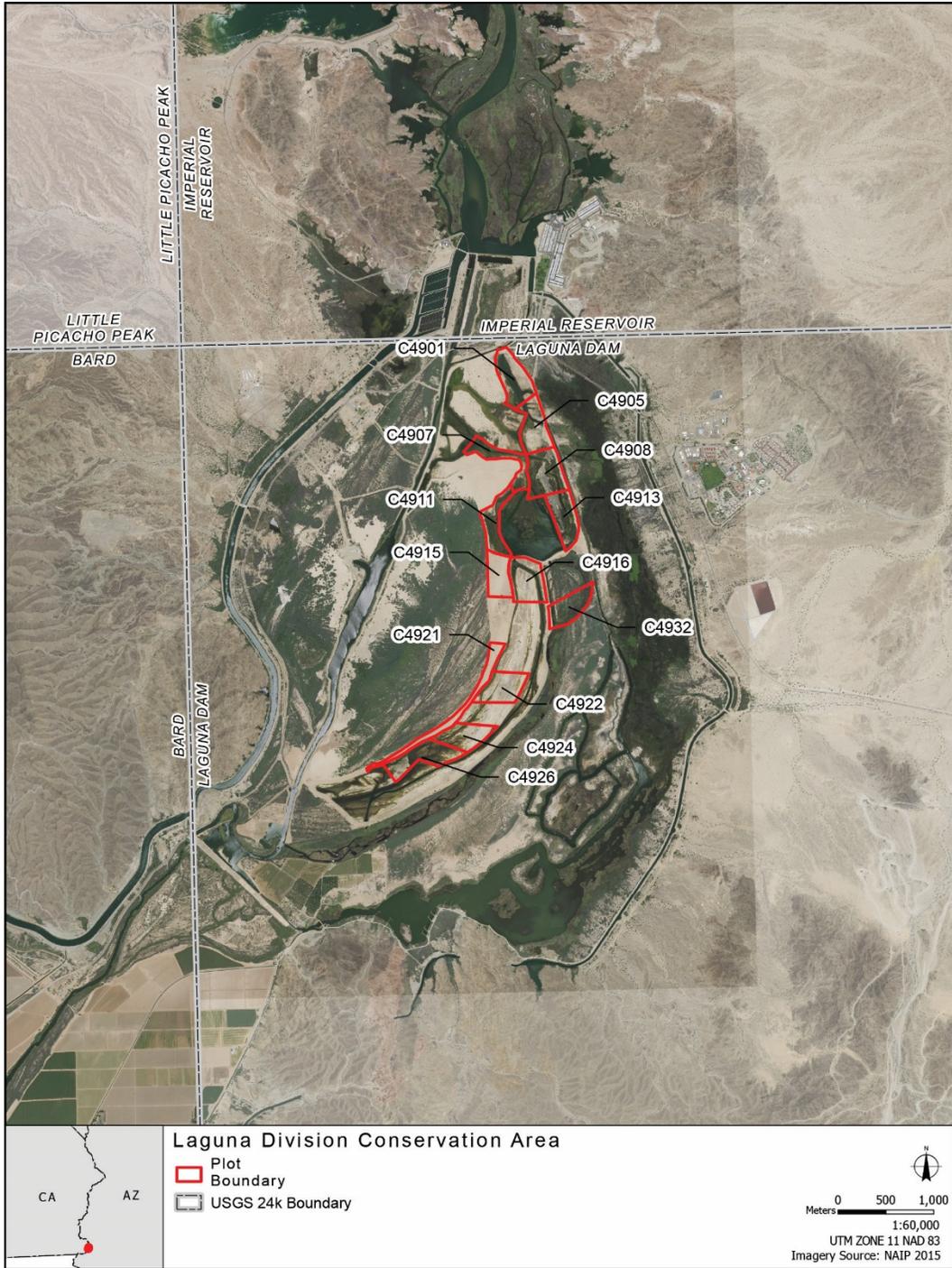
Orthophotos Showing Boundaries of Selected Plots in
Conservation Areas, 2017

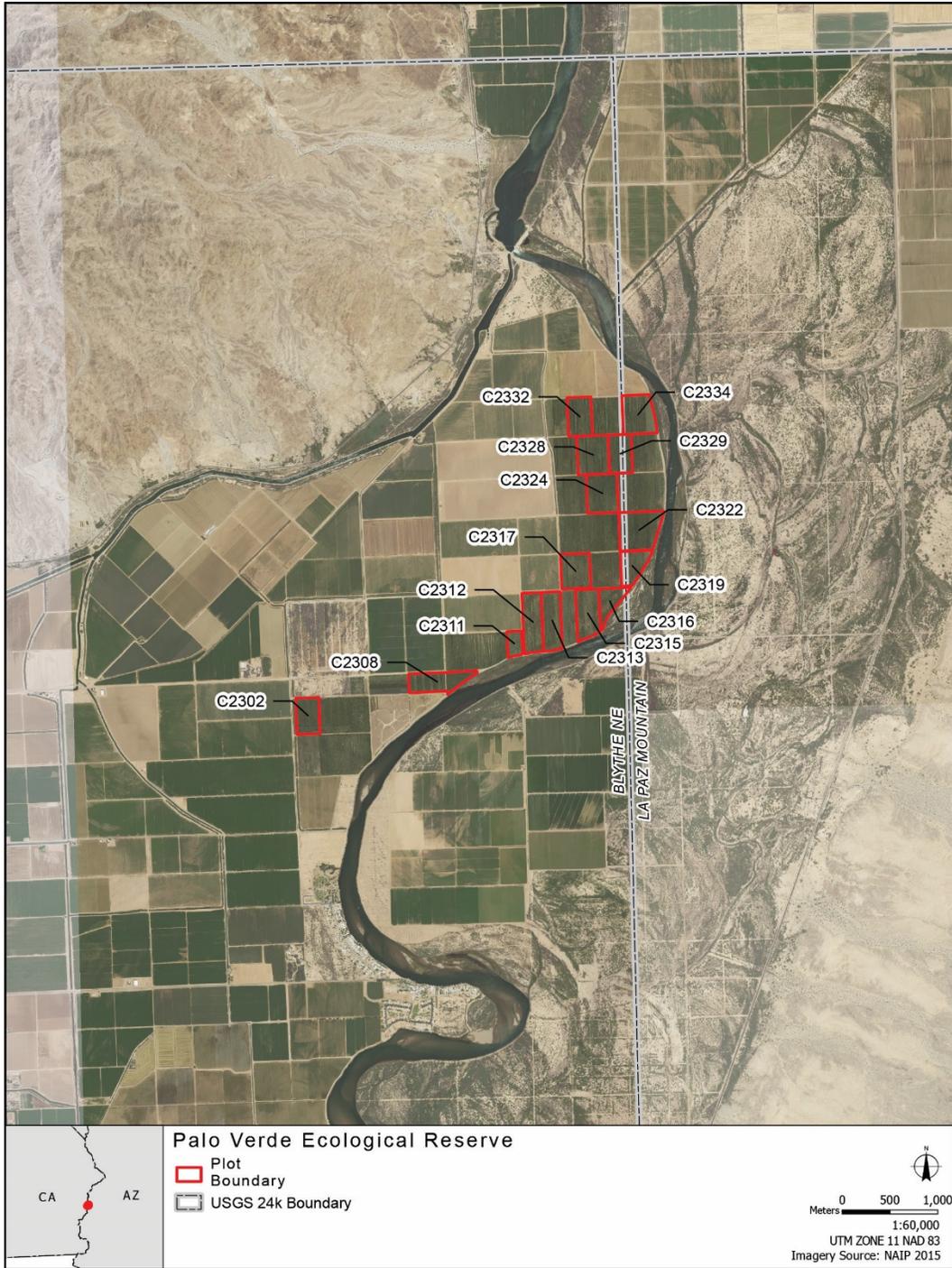






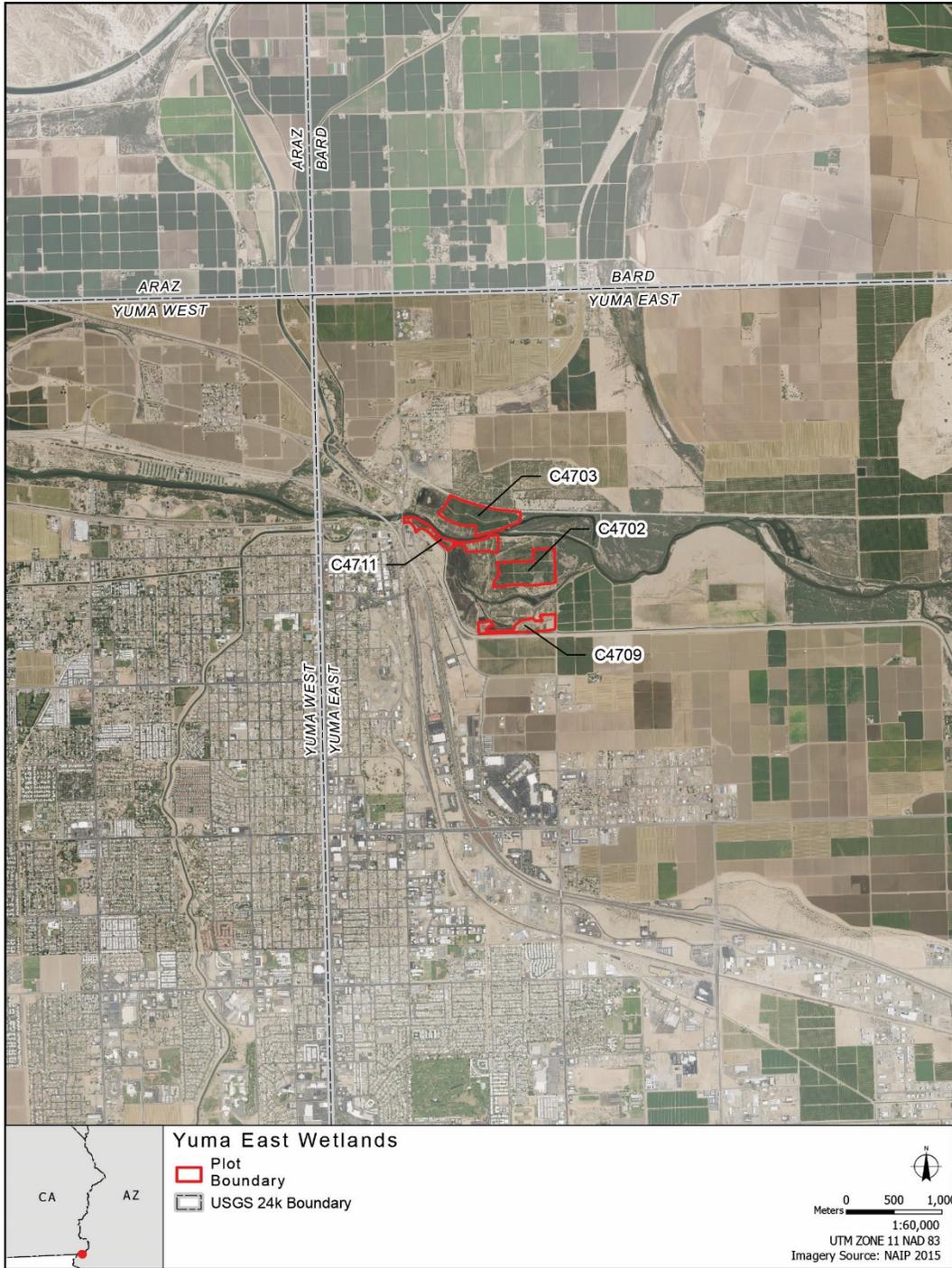












ATTACHMENT 2

Reference and Attribute Tables Used During Survey
Season, 2017

Table 2-1.—Beaufort wind scale

Code	Wind speed (mph) ¹	Wind description	Conditions on land
0	< 1	Calm	Calm. Smoke rises vertically.
1	1–3	Light air	Smoke drift indicates wind direction. Leaves are stationary.
2	4–7	Light breeze	Wind felt on exposed skin. Leaves rustle.
3	8–12	Gentle breeze	Leaves and small twigs constantly moving.
4	13–18	Moderate breeze	Dust and loose paper raised. Small branches begin to move.
5	19–25	Fresh breeze	Branches of a moderate size move. Small trees with leaves begin to sway.
6	26–31	Strong breeze	Large branches in motion. Whistling heard in overhead wires. Empty plastic bins tip over.
7	32–38	High wind	Whole trees in motion. Effort needed to walk against the wind.
8	39–46	Gale	Some twigs broken from trees. Progress on foot is seriously impeded.

¹ mph = miles per hour.

Table 2-2.—Sky conditions

Code	Sky conditions
0	Clear/few clouds
1	Partly cloudy variable
2	Cloudy/overcast
3	Fog
4	Drizzle
5	Showers

Table 2-3.—ArcGIS line attribute values, 2017

Code	Description
1	Seen flying
2	Same singing bird at two locations
3	Possible pair
4	Possibly same individual
5	Two separate singing birds
6	Counter-singing males
7	Suspect different individuals

Table 2-4.—Complex symbols used in ArcMap and associated behavior codes, 2017

Symbol ^{1,2}	Behavior code
	Seen
	Singing
	Nest
	Territory Dispute
	Calling
	Calling Male
	Calling Female
	“Vocalizing Other” = vocalizing (not song) with likely territorial/reproductive significance
	“Vocalizing Other, Female” = female vocalizing (not song) with likely territorial/reproductive significance
	“Vocalizing Other, Male” = male vocalizing (not song) with likely territorial/reproductive significance
	Pair
	Carrying Nest Material
	Female, Carrying Nest Material
	Male, Carrying Nest Material
	Incubating Female

Table 2-4.—Complex symbols used in ArcMap and associated behavior codes, 2017

Symbol ^{1,2}	Behavior code
	Young Found in Nest
	Carrying Food
	Carrying Food, Female
	Carrying Food, Male
	Carrying Fecal Sac
	Dependent Young
	Copulation
	Squeal Duet
	Mate Guarding
	Agitation
	Independent Young

¹ Abert's Towhee (*Melospiza aberti*) is used as an example species only. Each symbol is populated by the alpha code of the species selected in the detection location.

² Behavior codes with a red "X" next to them were added at the beginning of the field season and did not have an associated complex symbol in 2017.

Table 2-5.—Locally breeding species, 2017*

Common name	Scientific name
Abert's towhee	<i>Melospiza aberti</i>
Anna's hummingbird	<i>Calypte anna</i>
Black phoebe	<i>Sayornis nigricans</i>
Black-tailed gnatcatcher	<i>Poliophtila melanura</i>
Cactus wren	<i>Campylorhynchus brunneicapillus</i>
Canyon wren	<i>Catherpes mexicanus</i>
Crissal thrasher	<i>Toxostoma crissale</i>
Gila woodpecker	<i>Melanerpes uropygialis</i>
Gilded flicker	<i>Colaptes chrysoides</i>
Ladder-backed woodpecker	<i>Picoides scalaris</i>
Northern cardinal	<i>Cardinalis cardinalis</i>
Verdin	<i>Auriparus flaviceps</i>

* Table includes species known to breed along the lower Colorado River and tributaries, which are not known to migrate during the survey season. The table is limited to focal species and species detected during the 2017 survey season.

Table 2-6.—Breeding species potentially occurring as migrants during the survey season, 2017*

Common name	Scientific name
American robin	<i>Turdus migratorius</i>
Arizona Bell's vireo	<i>Vireo bellii arizonae</i>
Ash-throated flycatcher	<i>Myiarchus cinerascens</i>
Bewick's wren	<i>Thryomanes bewickii</i>
Black-chinned hummingbird	<i>Archilochus alexandri</i>
Black-throated sparrow	<i>Amphispiza bilineata</i>
Blue grosbeak	<i>Passerina caerulea</i>
Blue-gray gnatcatcher	<i>Polioptila caerulea</i>
Brown-crested flycatcher	<i>Myiarchus tyrannulus</i>
Bullock's oriole	<i>Icterus bullockii</i>
Common yellowthroat	<i>Geothlypis trichas</i>
Costa's hummingbird	<i>Calypte costae</i>
Elf owl	<i>Micrathene whitneyi</i>
Hooded oriole	<i>Icterus cucullatus</i>
Horned lark	<i>Eremophila alpestris</i>
House wren	<i>Troglodytes aedon</i>
Indigo bunting	<i>Passerina cyanea</i>
Lark sparrow	<i>Chondestes grammacus</i>
Lazuli bunting	<i>Passerina amoena</i>
Lesser goldfinch	<i>Spinus psaltria</i>
Loggerhead shrike	<i>Lanius ludovicianus</i>
Lucy's warbler	<i>Oreothlypis luciae</i>
Marsh wren	<i>Cistothorus palustris</i>
Northern mockingbird	<i>Mimus polyglottos</i>
Phainopepla	<i>Phainopepla nitens</i>
Rock wren	<i>Salpinctes obsoletus</i>
Say's phoebe	<i>Sayornis saya</i>
Song sparrow	<i>Melospiza melodia</i>
Sonoran yellow warbler	<i>Dendroica petechia sonora</i> = <i>Setophaga petechia sonora</i>
Summer tanager	<i>Piranga rubra</i>
Vermilion flycatcher	<i>Pyrocephalus rubinus</i>
Western kingbird	<i>Tyrannus verticalis</i>
Yellow-billed cuckoo	<i>Coccyzus americanus occidentalis</i>
Yellow-breasted chat	<i>Icteria virens</i>

* Table includes species known to breed along the lower Colorado River or tributaries, which could migrate during some portion of the survey season. The table is limited to focal species and species detected during the 2017 survey season.

Table 2-7.—Non-territorial breeding species, 2017*

Common name	Scientific name
American coot	<i>Fulica americana</i>
American kestrel	<i>Falco sparverius</i>
Barn swallow	<i>Hirundo rustica</i>
Black-crowned night-heron	<i>Nycticorax nycticorax</i>
Black-necked stilt	<i>Himantopus mexicanus</i>
Brown-headed cowbird	<i>Molothrus ater</i>
Cattle egret	<i>Bubulcus ibis</i>
Cliff swallow	<i>Petrochelidon pyrrhonota</i>
Common gallinule	<i>Gallinula galeata</i>
Common ground-dove	<i>Columbina passerina</i>
Common poorwill	<i>Phalaenoptilus nuttallii</i>
Common raven	<i>Corvus corax</i>
Cooper's hawk	<i>Accipiter cooperii</i>
Double-crested cormorant	<i>Phalacrocorax auritus</i>
Eared grebe	<i>Podiceps nigricollis</i>
Eurasian collared-dove	<i>Streptopelia decaocto</i>
European starling	<i>Sturnus vulgaris</i>
Gadwall	<i>Mareca strepera</i>
Gambel's quail	<i>Callipepla gambelii</i>
Great blue heron	<i>Ardea herodias</i>
Great egret	<i>Ardea alba</i>
Great horned owl	<i>Bubo virginianus</i>
Greater roadrunner	<i>Geococcyx californianus</i>
Great-tailed grackle	<i>Quiscalus mexicanus</i>
Green heron	<i>Butorides virescens</i>
House finch	<i>Haemorhous mexicanus</i>
Inca dove	<i>Columbina inca</i>
Killdeer	<i>Charadrius vociferus</i>
Least bittern	<i>Ixobrychus exilis</i>
Lesser nighthawk	<i>Chordeiles acutipennis</i>
Mallard	<i>Anas platyrhynchos</i>
Mourning dove	<i>Zenaida macroura</i>
Northern harrier	<i>Circus hudsonius</i>

Table 2-7.—Non-territorial breeding species, 2017*

Common name	Scientific name
Northern rough-winged swallow	<i>Stelgidopteryx serripennis</i>
Osprey	<i>Pandion haliaetus</i>
Pied-billed grebe	<i>Podilymbus podiceps</i>
Red-tailed hawk	<i>Buteo jamaicensis</i>
Red-winged blackbird	<i>Agelaius phoeniceus</i>
Ruddy duck	<i>Oxyura jamaicensis</i>
Sharp-shinned hawk	<i>Accipiter striatus</i>
Snowy egret	<i>Egretta thula</i>
Spotted sandpiper	<i>Actitis macularius</i>
Sora	<i>Porzana carolina</i>
Turkey vulture	<i>Cathartes aura</i>
Virginia rail	<i>Rallus limicola</i>
White-faced ibis	<i>Plegadis chihi</i>
White-throated swift	<i>Aeronautes saxatalis</i>
White-winged dove	<i>Zenaida asiatica</i>
Wilson's snipe	<i>Gallinago delicata</i>
Yellow-headed blackbird	<i>Xanthocephalus xanthocephalus</i>
Yuma clapper rail	<i>Rallus longirostris yumanensis</i> (also known as Yuma Ridgway's rail = <i>R. obsoletus yumanensis</i>)

* Table includes species whose breeding biology is not conducive to spot-mapping techniques. The table is limited to species detected during the 2017 survey season.

ATTACHMENT 3

Species Breeding in Conservation Areas, 2017

Table 3-1.—Species detected breeding in conservation areas, 2017*

(A total of 32 territorial and 49 non-territorial species were detected in breeding territories [territorial species] or as estimated pairs [non-territorial species] in 2017. For “Species type,” N = non-territorial, and T = territorial.)

Common name	Scientific name	Species type	BLCA	Middle Bill Williams River NWR	Cibola NWR Unit #1	CVCA	LDCA	Parker Dam Camp	PVER	PWCA	YEW
Abert's towhee	<i>Melospiza aberti</i>	T	X	X	X	X	X	X	X	X	X
American coot	<i>Fulica americana</i>	N	-	-	-	-	X	-	-	-	X
American kestrel	<i>Falco sparverius</i>	N	-	-	-	-	-	-	X	-	-
Anna's hummingbird	<i>Calypte anna</i>	T	-	X	-	X	-	X	-	-	X
Arizona Bell's vireo	<i>Vireo bellii arizonae</i>	T	X	X	-	X	-	-	X	-	X
Ash-throated flycatcher	<i>Myiarchus cinerascens</i>	T	-	X	X	X	X	X	X	X	X
Barn swallow	<i>Hirundo rustica</i>	N	-	-	-	-	X	-	-	-	-
Bewick's wren	<i>Thryomanes bewickii</i>	T	X	X	-	-	-	-	-	-	-
Black-chinned hummingbird	<i>Archilochus alexandri</i>	T	-	X	X	X	X	X	X	X	X
Black-crowned night-heron	<i>Nycticorax nycticorax</i>	N	X	-	-	-	X	-	-	-	-
Black-necked stilt	<i>Himantopus mexicanus</i>	N	-	-	-	-	X	-	-	-	X
Black-tailed gnatcatcher	<i>Polioptila melanura</i>	T	X	X	X	X	X	X	X	X	X
Blue grosbeak	<i>Passerina caerulea</i>	T	-	X	X	X	X	-	X	X	X
Blue-gray gnatcatcher	<i>Polioptila caerulea</i>	T	-	-	-	-	-	-	-	-	X
Brown-crested flycatcher	<i>Myiarchus tyrannulus</i>	T	-	X	-	-	-	-	-	-	-
Brown-headed cowbird	<i>Molothrus ater</i>	N	X	X	X	X	X	X	X	X	X
Bullock's oriole	<i>Icterus bullockii</i>	T	X	X	X	X	-	-	X	X	-
Canyon wren	<i>Catherpes mexicanus</i>	T	-	X	-	-	-	-	-	-	-
Cattle egret	<i>Bubulcus ibis</i>	N	-	-	-	-	-	-	-	-	X
Cliff swallow	<i>Petrochelidon pyrrhonota</i>	N	-	X	X	-	X	X	-	-	X
Common gallinule	<i>Gallinula galeata</i>	N	-	-	-	-	X	-	-	-	-
Common ground-dove	<i>Columbina passerina</i>	N	X	-	-	X	-	-	X	X	-
Common raven	<i>Corvus corax</i>	N	-	X	-	-	-	-	-	X	-
Common yellowthroat	<i>Geothlypis trichas</i>	T	X	X	X	-	X	X	X	X	X
Cooper's hawk	<i>Accipiter cooperii</i>	N	-	X	X	-	-	-	-	-	X

Table 3-1.—Species detected breeding in conservation areas, 2017*

(A total of 32 territorial and 49 non-territorial species were detected in breeding territories [territorial species] or as estimated pairs [non-territorial species] in 2017. For “Species type,” N = non-territorial, and T = territorial.)

Common name	Scientific name	Species type	BLCA	Middle Bill Williams River NWR	Cibola NWR Unit #1	CVCA	LDCA	Parker Dam Camp	PVER	PWCA	YEW
Crissal thrasher	<i>Toxostoma crissale</i>	T	X	X	-	X	-	X	-	X	X
Double-crested cormorant	<i>Phalacrocorax auritus</i>	N	-	-	-	-	X	-	-	-	-
Eared grebe	<i>Podiceps nigricollis</i>	N	-	-	-	-	X	-	-	-	-
Eurasian collared-dove	<i>Streptopelia decaocto</i>	N	-	X	-	X	-	X	-	-	X
European starling	<i>Sturnus vulgaris</i>	N	-	-	X	-	-	X	-	-	-
Gambel's quail	<i>Callipepla gambelii</i>	N	X	X	X	X	X	X	X	X	X
Gila woodpecker	<i>Melanerpes uropygialis</i>	T	-	X	-	-	-	X	-	-	X
Great blue heron	<i>Ardea herodias</i>	N	-	-	-	-	X	-	-	X	X
Great egret	<i>Ardea alba</i>	N	-	-	-	-	X	-	-	-	X
Great horned owl	<i>Bubo virginianus</i>	N	-	X	X	X	-	-	X	X	X
Greater roadrunner	<i>Geococcyx californianus</i>	N	X	X	X	X	X	X	X	X	X
Great-tailed grackle	<i>Quiscalus mexicanus</i>	N	X	-	-	-	X	-	X	X	X
Green heron	<i>Butorides virescens</i>	N	-	-	X	-	X	-	-	-	X
Hooded oriole	<i>Icterus cucullatus</i>	T	-	-	-	X	-	X	-	-	-
Horned lark	<i>Eremophila alpestris</i>	T	-	-	-	-	-	-	-	X	-
House finch	<i>Haemorhous mexicanus</i>	N	-	X	X	X	-	X	X	-	X
Inca dove	<i>Columbina inca</i>	N	-	X	-	X	-	-	X	-	-
Indigo bunting	<i>Passerina cyanea</i>	T	-	-	-	X	-	-	X	-	-
Killdeer	<i>Charadrius vociferus</i>	N	X	-	X	X	X	-	-	-	X
Ladder-backed woodpecker	<i>Picoides scalaris</i>	T	-	X	X	X	X	X	X	X	X
Lazuli bunting	<i>Passerina amoena</i>	T	-	-	-	-	-	-	X	-	-
Western least bittern	<i>Ixobrychus exilis</i>	N	-	-	-	-	X	-	-	-	X
Lesser goldfinch	<i>Spinus psaltria</i>	T	-	X	-	X	-	X	X	-	X
Lesser nighthawk	<i>Chordeiles acutipennis</i>	N	-	X	-	X	X	-	X	X	-
Lucy's warbler	<i>Oreothlypis luciae</i>	T	-	X	X	X	-	X	X	X	-

Table 3-1.—Species detected breeding in conservation areas, 2017*

(A total of 32 territorial and 49 non-territorial species were detected in breeding territories [territorial species] or as estimated pairs [non-territorial species] in 2017. For “Species type,” N = non-territorial, and T = territorial.)

Common name	Scientific name	Species type	BLCA	Middle Bill Williams River NWR	Cibola NWR Unit #1	CVCA	LDCA	Parker Dam Camp	PVER	PWCA	YEW
Mallard	<i>Anas platyrhynchos</i>	N	-	-	-	-	X	-	-	-	-
Marsh wren	<i>Cistothorus palustris</i>	T	-	-	-	-	X	-	-	-	X
Mourning dove	<i>Zenaida macroura</i>	N	X	X	X	X	X	X	X	X	X
Northern cardinal	<i>Cardinalis cardinalis</i>	T	-	X	-	-	-	-	-	-	-
Northern harrier	<i>Circus hudsonius</i>	N	-	-	-	-	X	-	-	-	-
Northern mockingbird	<i>Mimus polyglottos</i>	T	-	-	-	X	X	-	-	-	-
Northern rough-winged swallow	<i>Stelgidopteryx serripennis</i>	N	-	X	-	X	-	X	-	-	-
Osprey	<i>Pandion haliaetus</i>	N	-	-	-	-	X	-	X	-	X
Phainopepla	<i>Phainopepla nitens</i>	T	-	X	-	-	-	X	-	X	-
Pied-billed grebe	<i>Podilymbus podiceps</i>	N	-	-	-	-	X	-	-	-	X
Red-tailed hawk	<i>Buteo jamaicensis</i>	N	-	-	X	-	-	-	X	-	-
Red-winged blackbird	<i>Agelaius phoeniceus</i>	N	X	X	X	X	X	-	X	X	-
Ruddy duck	<i>Oxyura jamaicensis</i>	N	-	-	-	-	X	-	-	-	-
Sharp-shinned hawk	<i>Accipiter striatus</i>	N	-	-	X	-	X	-	X	-	-
Snowy egret	<i>Egretta thula</i>	N	-	-	-	-	X	-	-	-	-
Song sparrow	<i>Melospiza melodia</i>	T	X	X	X	-	X	X	X	-	X
Sonoran yellow warbler	<i>Dendroica petechia sonorana = Setophaga petechia sonorana</i>	T	X	X	-	-	-	-	X	-	-
Sora	<i>Porzana carolina</i>	N	-	-	-	-	X	-	-	-	-
Spotted sandpiper	<i>Actitis macularius</i>	N	-	-	-	-	X	-	-	-	-
Summer tanager	<i>Piranga rubra</i>	T	X	X	X	-	-	-	X	-	-
Turkey vulture	<i>Cathartes aura</i>	N	-	X	X	-	-	-	X	-	-
Verdin	<i>Auriparus flaviceps</i>	T	X	X	X	X	X	X	X	X	X
Virginia rail	<i>Rallus limicola</i>	N	-	-	-	-	X	-	-	-	-
Western kingbird	<i>Tyrannus verticalis</i>	T	-	-	X	X	-	-	X	-	-
White-faced ibis	<i>Plegadis chihi</i>	N	-	-	-	-	X	-	-	-	-

Table 3-1.—Species detected breeding in conservation areas, 2017*

(A total of 32 territorial and 49 non-territorial species were detected in breeding territories [territorial species] or as estimated pairs [non-territorial species] in 2017. For “Species type,” N = non-territorial, and T = territorial.)

Common name	Scientific name	Species type	BLCA	Middle Bill Williams River NWR	Cibola NWR Unit #1	CVCA	LDCA	Parker Dam Camp	PVER	PWCA	YEW
White-throated swift	<i>Aeronautes saxatalis</i>	N	-	X	-	-	-	-	-	-	-
White-winged dove	<i>Zenaida asiatica</i>	N	X	X	X	X	X	X	X	X	X
Wilson’s snipe	<i>Gallinago delicata</i>	N	-	-	-	-	X	-	-	-	-
Yellow-breasted chat	<i>Icteria virens</i>	T	X	X	-	X	X	-	X	X	-
Yellow-headed blackbird	<i>Xanthocephalus xanthocephalus</i>	N	-	-	-	-	X	-	-	-	-
Yuma clapper rail	<i>Rallus longirostris yumanensis</i> (also known as Yuma Ridgway’s rail = <i>R. obsoletus yumanensis</i>)	N	-	-	-	-	X	-	-	-	X

* BLCA = Beal Lake Conservation Area, Middle Bill Williams River NWR = Middle Bill Williams River National Wildlife Refuge, Cibola NWR Unit #1 = Cibola National Wildlife Refuge Unit #1 Conservation Area, CVCA = Cibola Valley Conservation Area, LDCA = Laguna Division Conservation Area, PVER = Palo Verde Ecological Reserve, PWCA = Pretty Water Conservation Area, and YEW = Yuma East Wetlands.

ATTACHMENT 4

Orthophotos Showing Breeding Territories of Focal Species Detected in 2017: Arizona Bell's Vireo (*Vireo bellii arizonae*), Gila Woodpecker (*Melanerpes uropygialis*), Sonoran Yellow Warbler (*Dendroica petechia sonorana* = *Setophaga petechia sonorana*), and Summer Tanager (*Piranga rubra*)



Figure 4-1.—Locations of Arizona Bell's vireo breeding territories in C1501 in the Beal Lake Conservation Area, 2017.

Point locations represent detections that met the criteria for a breeding territory but for which there were insufficient points to delineate the territory with a polygon.



Figure 4-2.—Locations of Arizona Bell’s vireo, Sonoran yellow warbler, and summer tanager breeding territories in C1502 in the Beal Lake Conservation Area, 2017.

Point locations represent detections that met the criteria for a breeding territory but for which there were insufficient points to delineate the territory with a polygon.

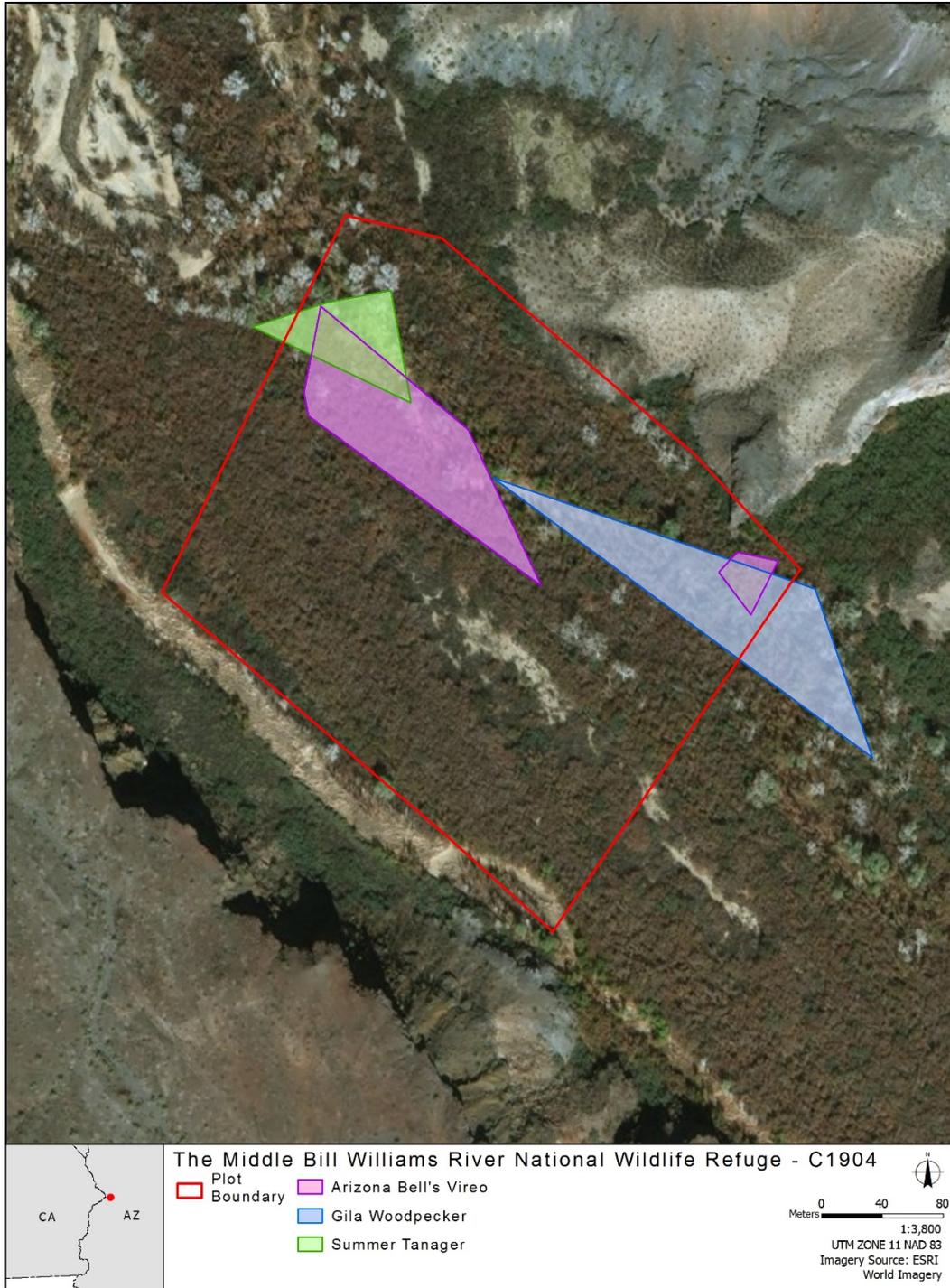


Figure 4-3.—Locations of Arizona Bell's vireo, Gila woodpecker, and summer tanager breeding territories in C1904 in the Middle Bill Williams National Wildlife Refuge, 2017.



Figure 4-4.—Location of the Gila woodpecker breeding territory in C1907 in the Middle Bill Williams National Wildlife Refuge, 2017.

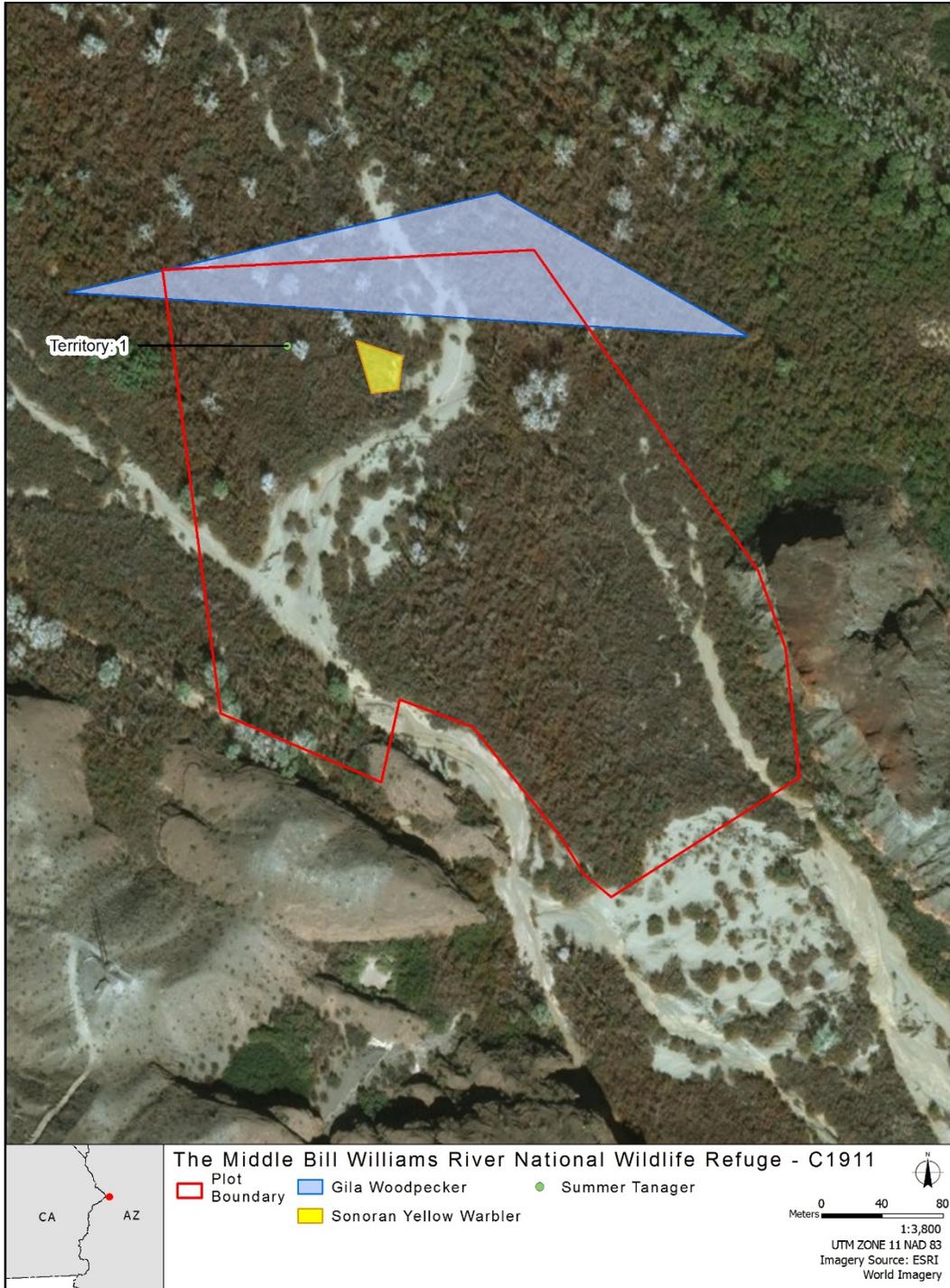


Figure 4-5.—Locations of Gila woodpecker, Sonoran yellow warbler, and summer tanager breeding territories in C1911 in the Middle Bill Williams National Wildlife Refuge, 2017.

Point locations represent detections that met the criteria for a breeding territory but for which there were insufficient points to delineate the territory with a polygon.

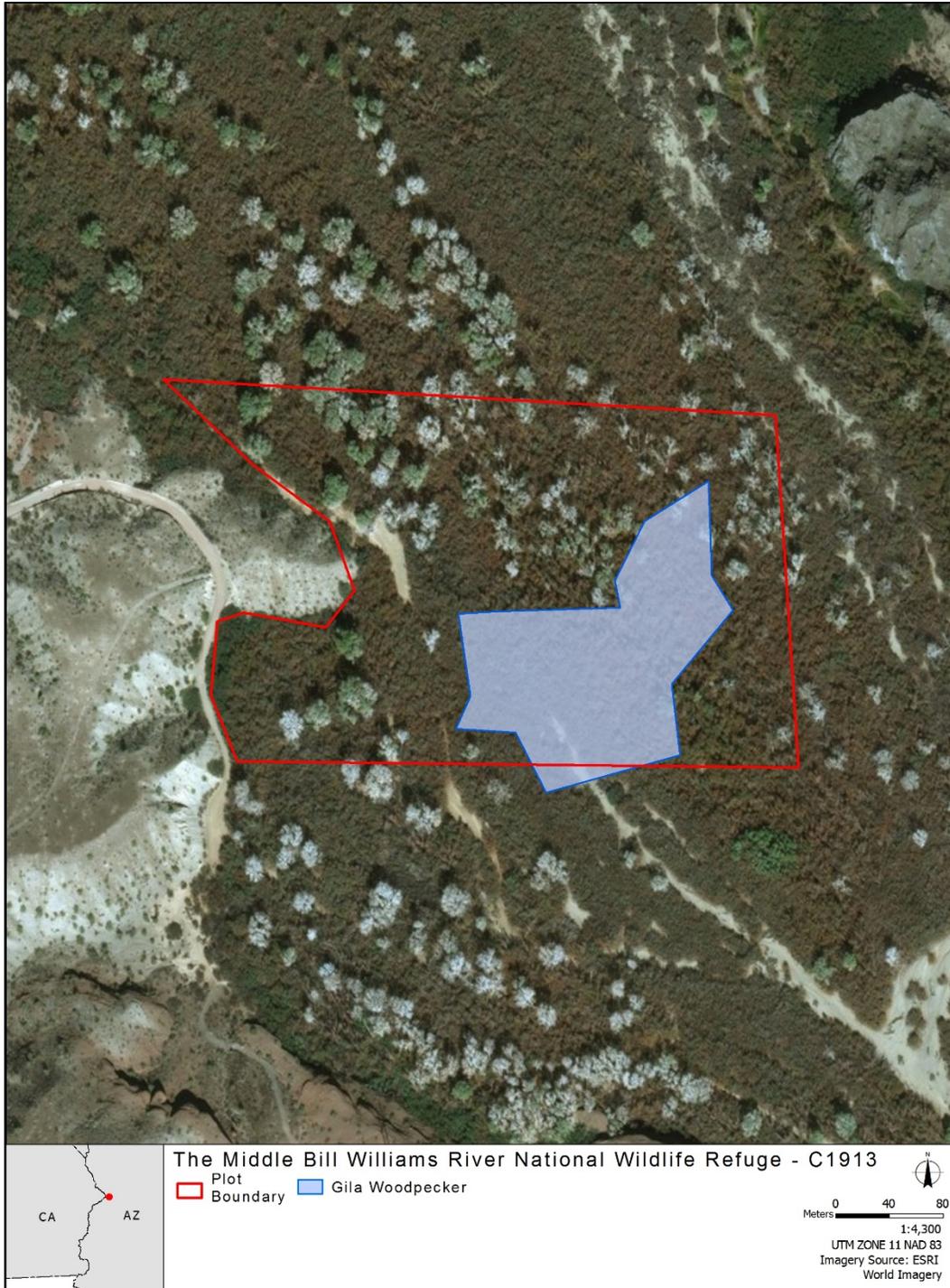


Figure 4-6.—Location of the Gila woodpecker breeding territory in C1913 in the Middle Bill Williams National Wildlife Refuge, 2017.

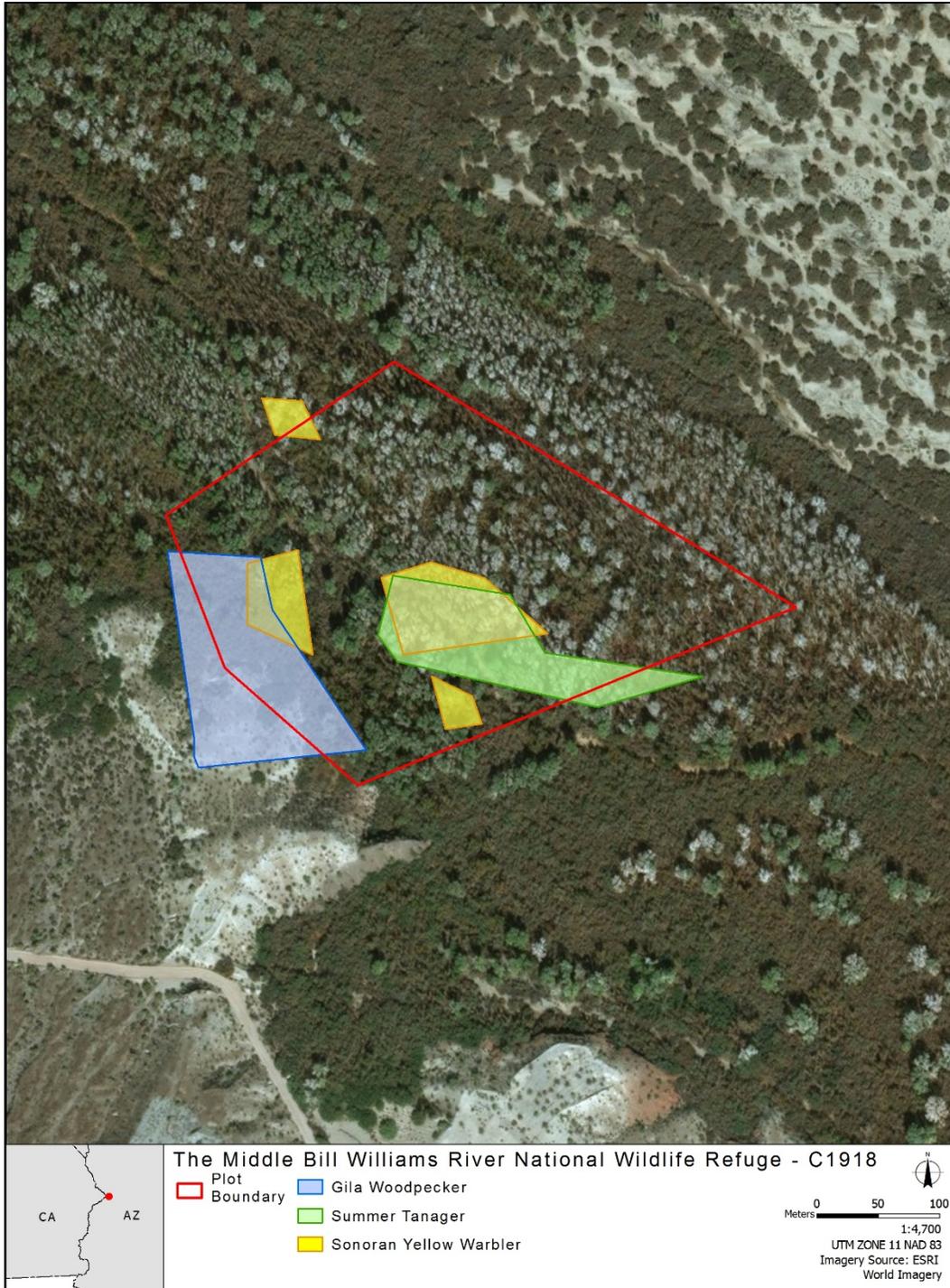


Figure 4-7.—Locations of Gila woodpecker, Sonoran yellow warbler, and summer tanager breeding territories in C1918 in the Middle Bill Williams National Wildlife Refuge, 2017.

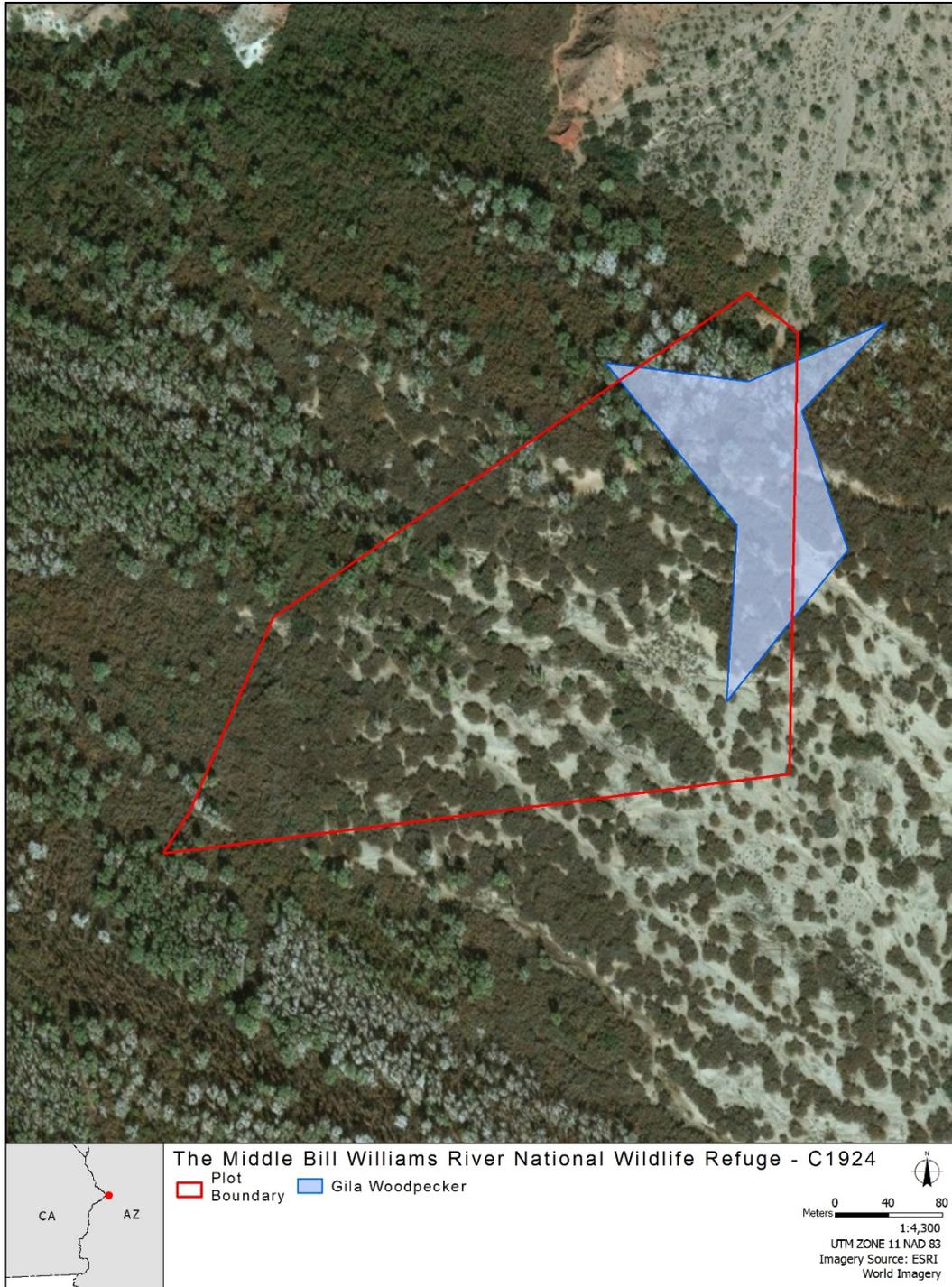


Figure 4-8.—Location of the Gila woodpecker breeding territory in C1924 in the Middle Bill Williams National Wildlife Refuge, 2017.

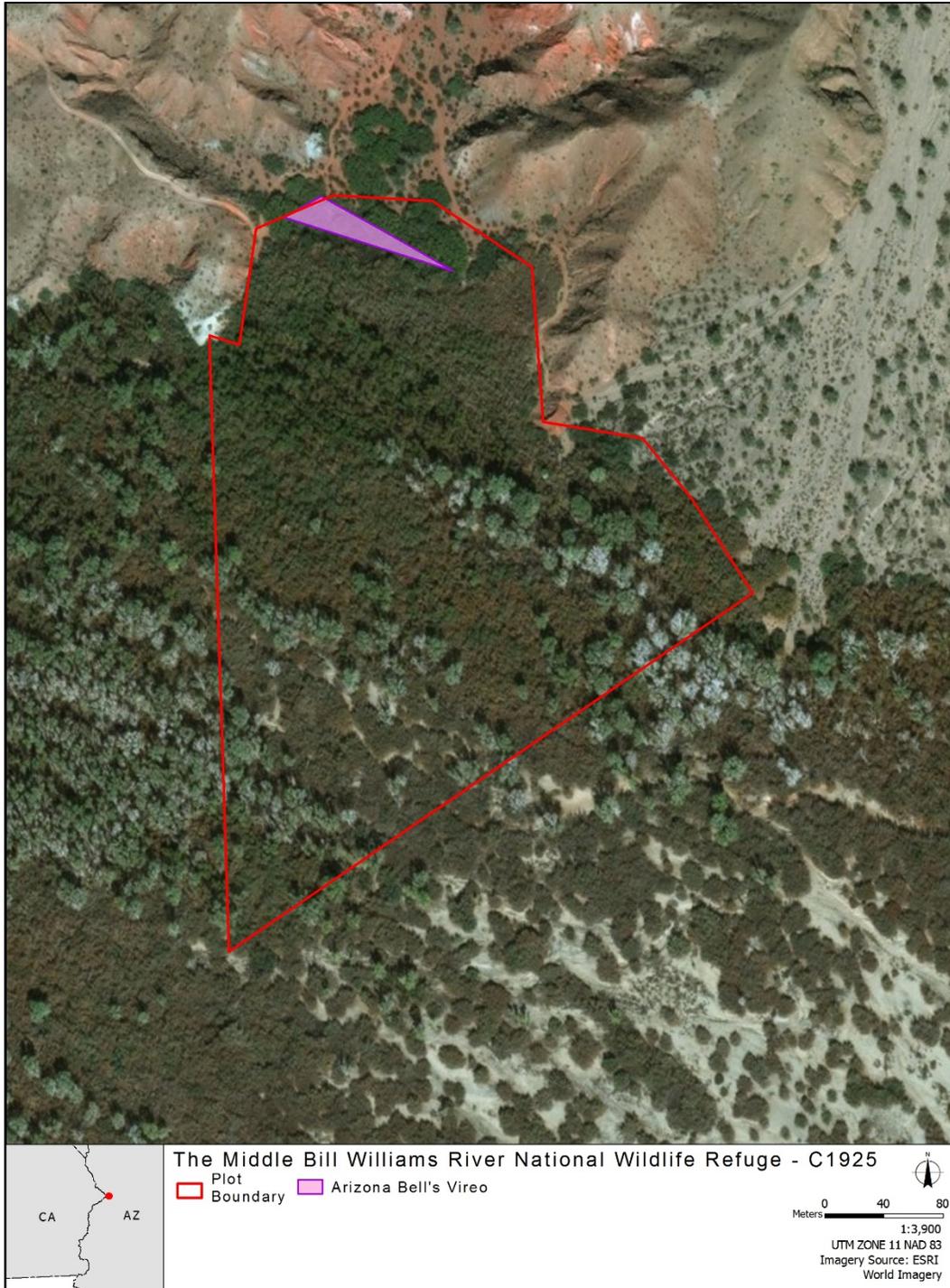


Figure 4-9.—Location of the Arizona Bell's vireo breeding territory in C1925 in the Middle Bill Williams National Wildlife Refuge, 2017.



Figure 4-10.—Locations of Gila woodpecker and Sonoran yellow warbler breeding territories in C1928 in the Middle Bill Williams National Wildlife Refuge, 2017.

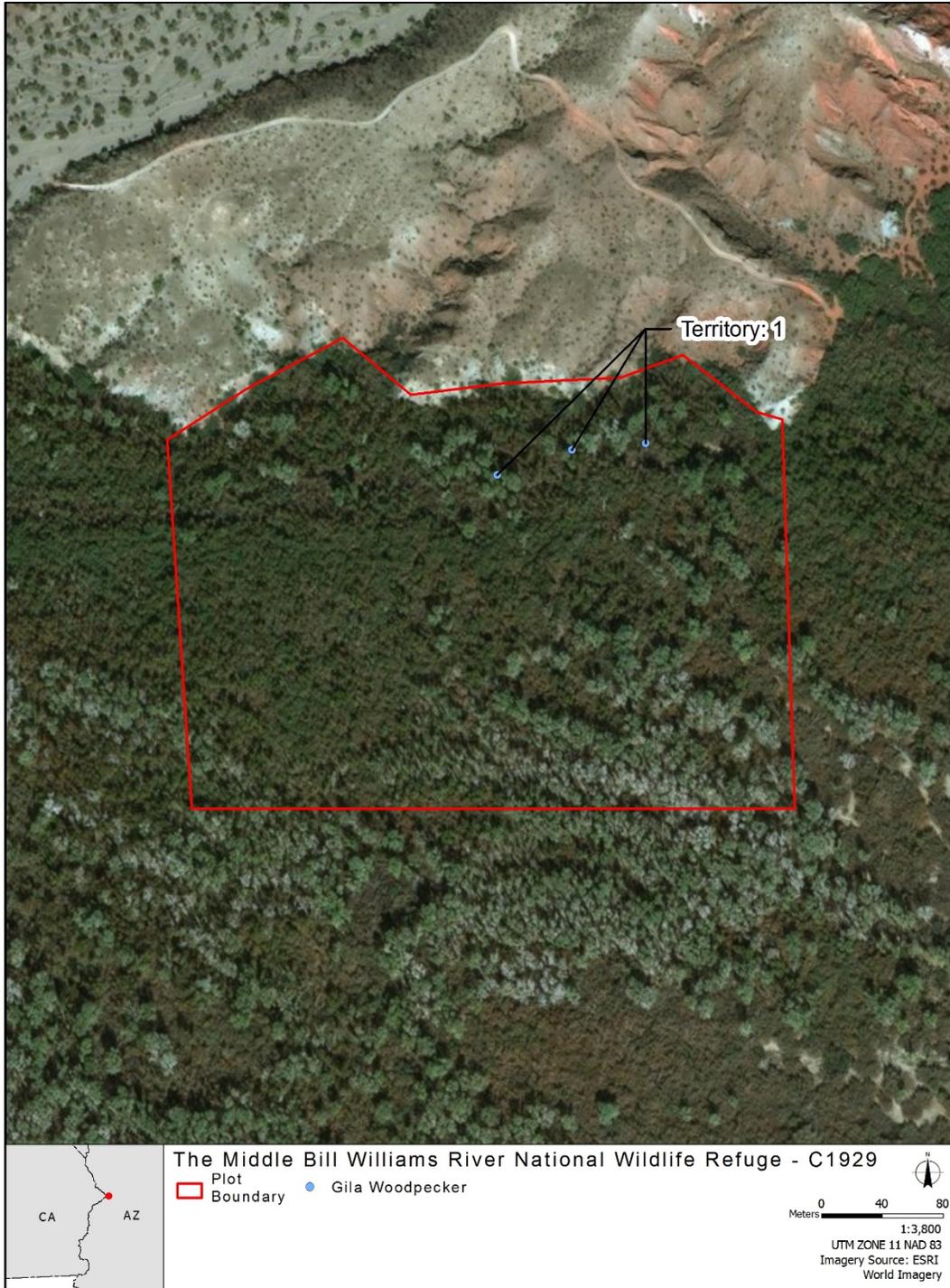


Figure 4-11.—Location of the Gila woodpecker breeding territory in C1929 in the Middle Bill Williams National Wildlife Refuge, 2017.

Point locations represent detections that met the criteria for a breeding territory but for which there were insufficient points to delineate the territory with a polygon.

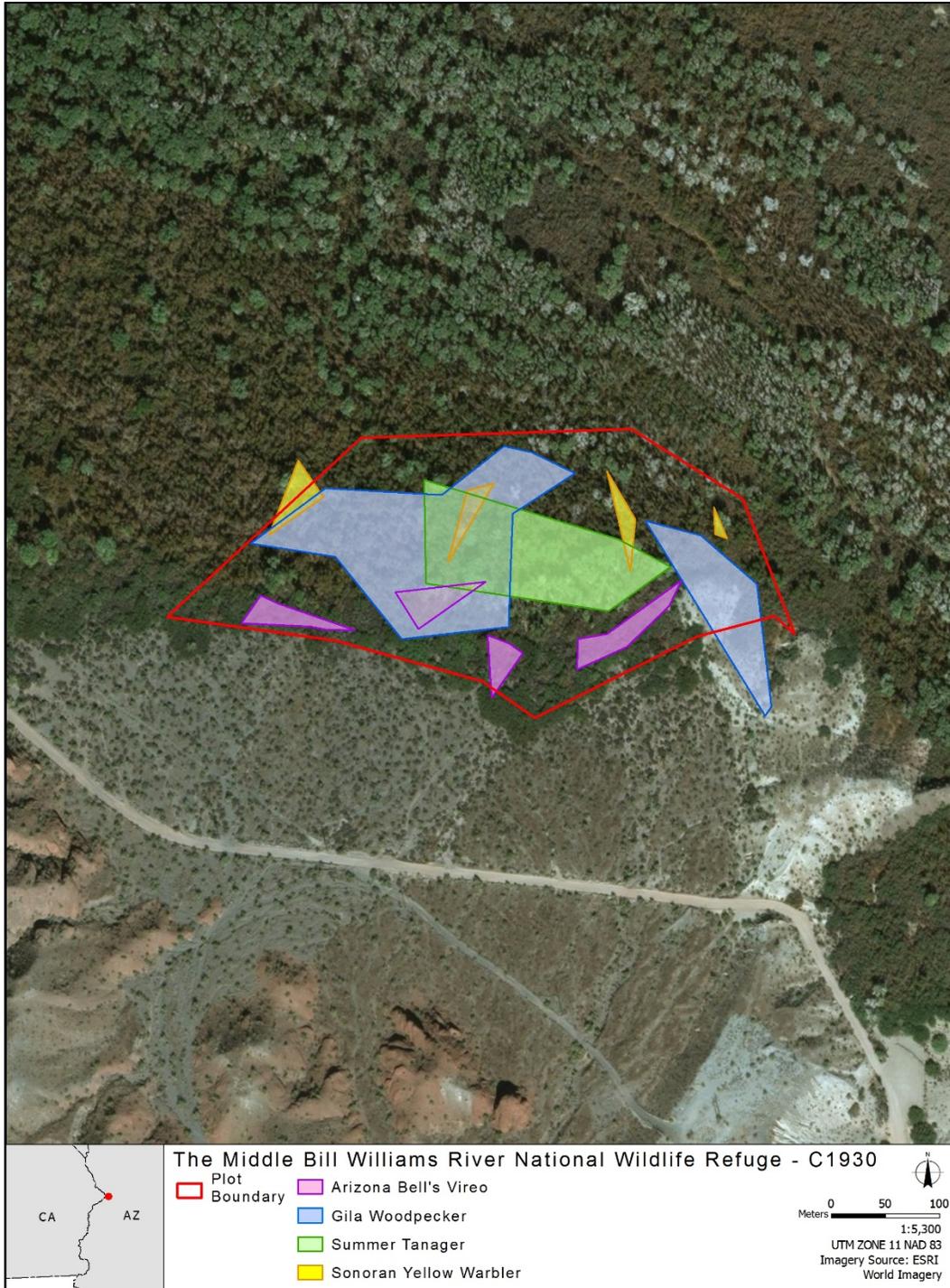


Figure 4-12.—Locations of Arizona Bell's vireo, Gila woodpecker, Sonoran yellow warbler, and summer tanager breeding territories in C1930 in the Middle Bill Williams National Wildlife Refuge, 2017.



Figure 4-13.—Locations of Arizona Bell's vireo, Gila woodpecker, Sonoran yellow warbler, and summer tanager breeding territories in C1931 in the Middle Bill Williams National Wildlife Refuge, 2017.

Point locations represent detections that met the criteria for a breeding territory but for which there were insufficient points to delineate the territory with a polygon.

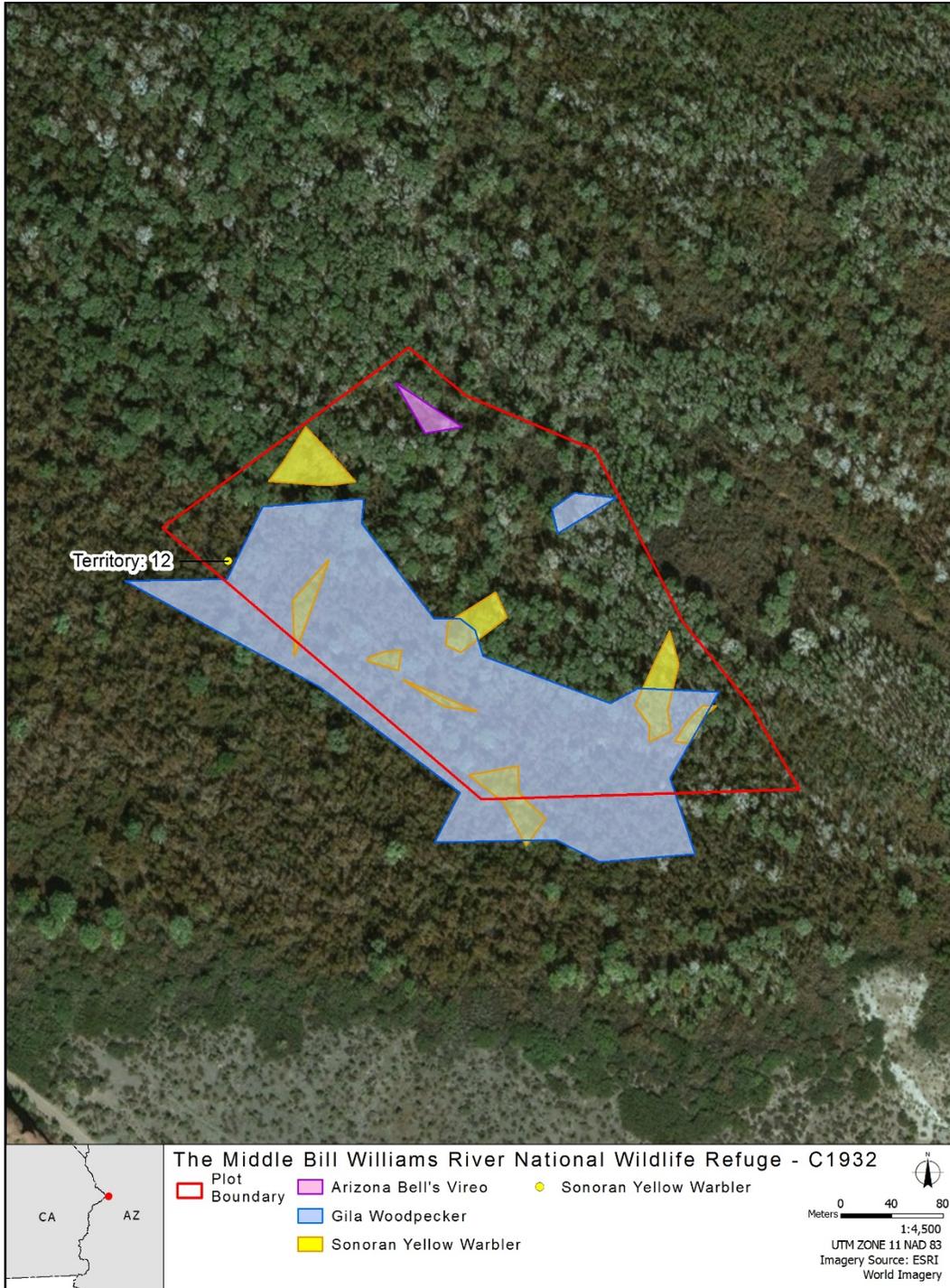


Figure 4-14.—Locations of Arizona Bell's vireo, Gila woodpecker, and Sonoran yellow warbler breeding territories in C1932 in the Middle Bill Williams National Wildlife Refuge, 2017.

Point locations represent detections that met the criteria for a breeding territory but for which there were insufficient points to delineate the territory with a polygon.

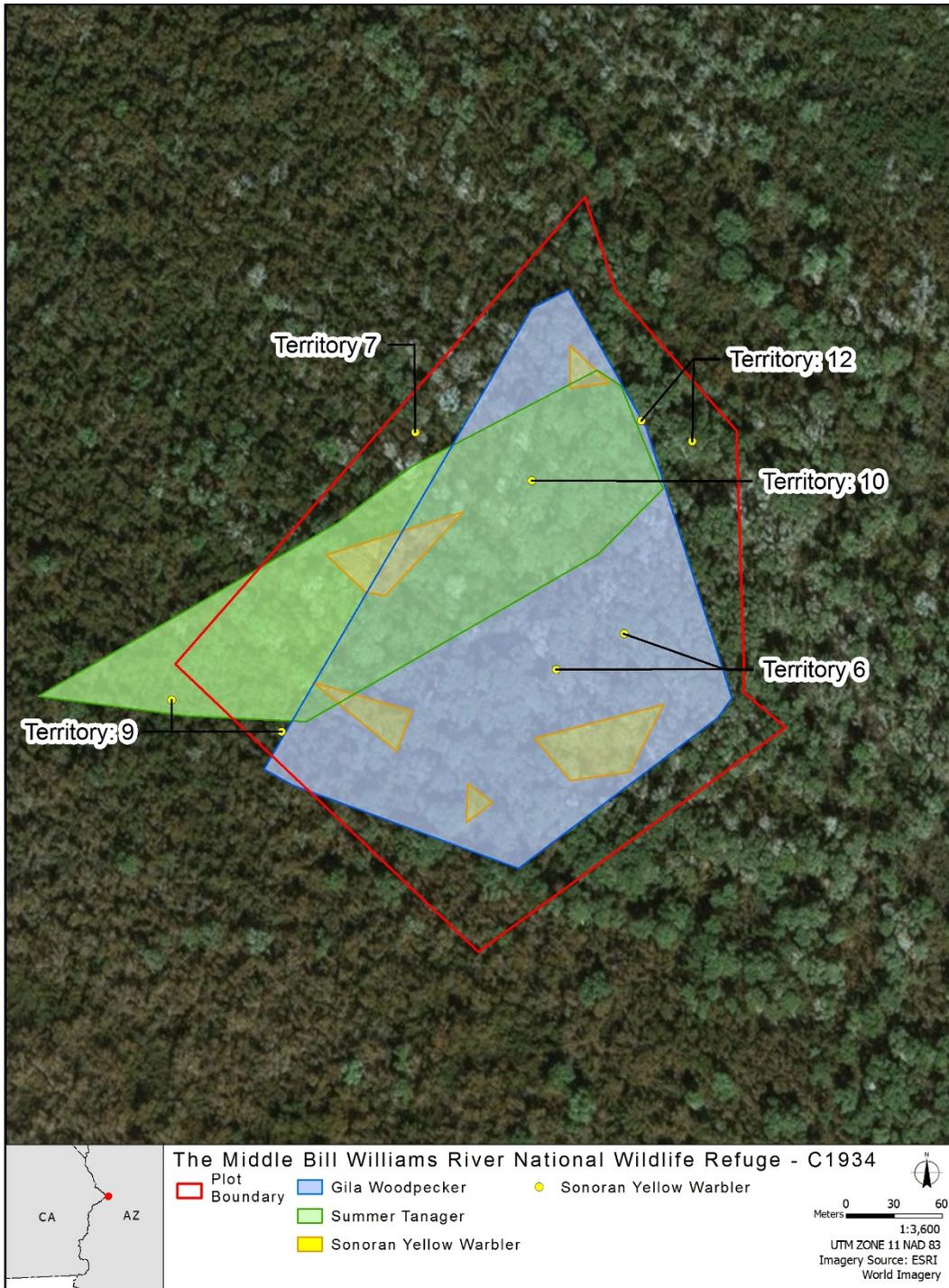


Figure 4-15.—Locations of Gila woodpecker, Sonoran yellow warbler, and summer tanager breeding territories in C1934 in the Middle Bill Williams National Wildlife Refuge, 2017.

Point locations represent detections that met the criteria for a breeding territory but for which there were insufficient points to delineate the territory with a polygon.



Figure 4-16.—Location of the Gila woodpecker breeding territory in C2002 in Parker Dam Camp, 2017.



Figure 4-17.—Location of the Gila woodpecker breeding territory in C2003 in Parker Dam Camp, 2017.

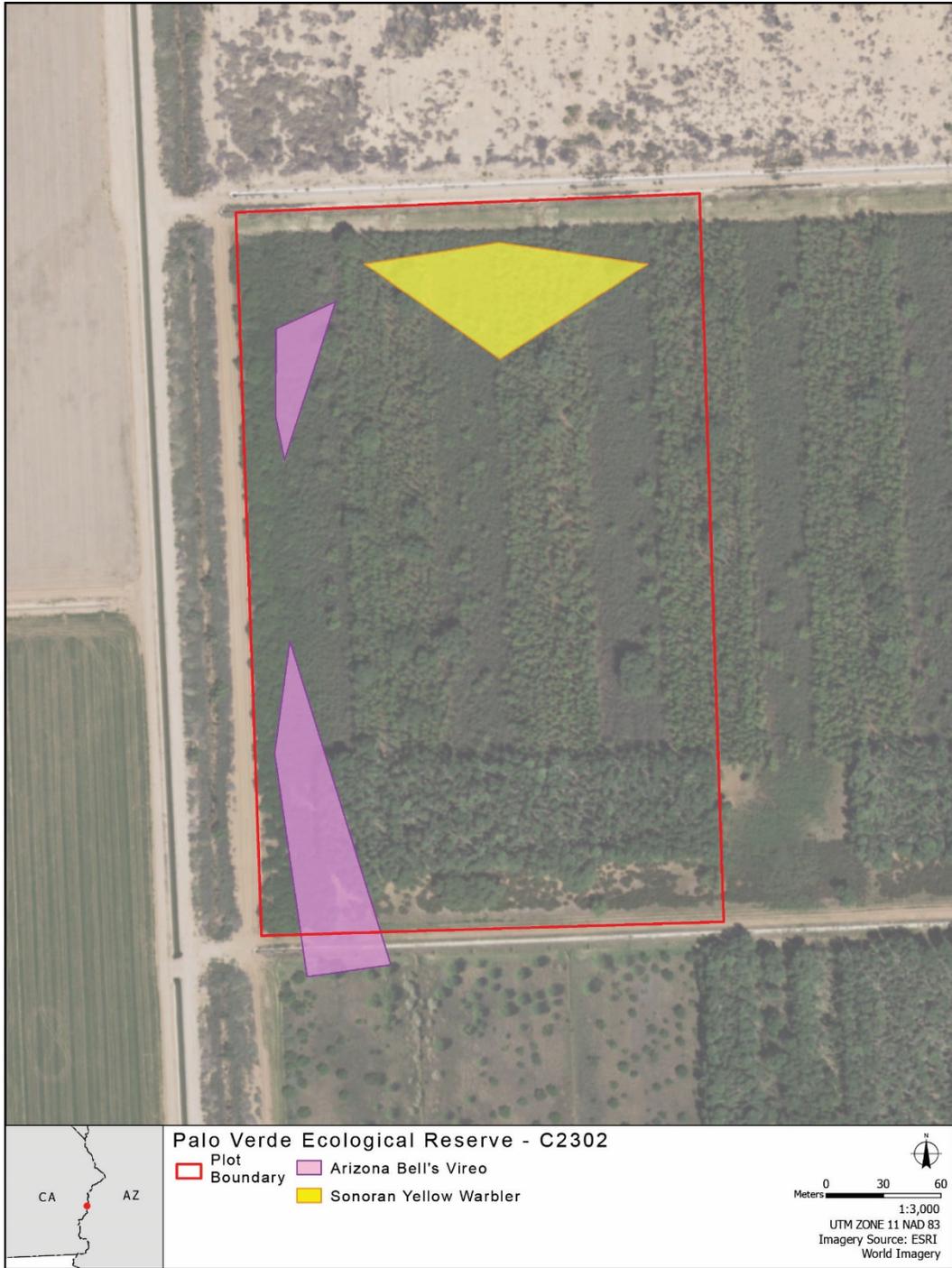


Figure 4-18.—Locations of Arizona Bell’s vireo and Sonoran yellow warbler breeding territories in C2302 in the Palo Verde Ecological Reserve, 2017.



Figure 4-19.—Location of the summer tanager breeding territory in C2315 in the Palo Verde Ecological Reserve, 2017.



Figure 4-20.—Location of the summer tanager breeding territory in C2316 in the Palo Verde Ecological Reserve, 2017.



Figure 4-21.—Locations of Sonoran yellow warbler and summer tanager breeding territories in C2328 in the Palo Verde Ecological Reserve, 2017.

Point locations represent detections that met the criteria for a breeding territory but for which there were insufficient points to delineate the territory with a polygon.

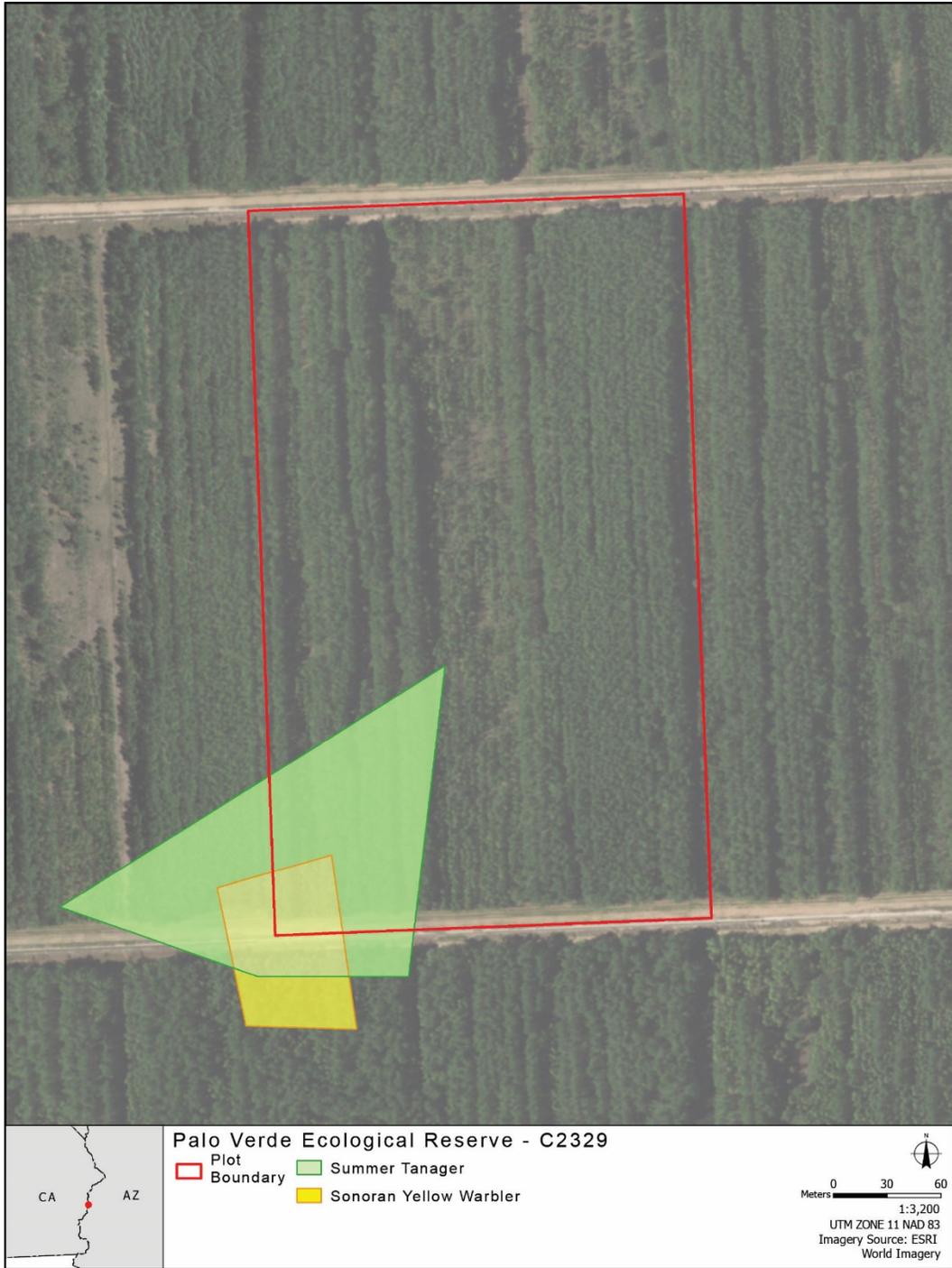


Figure 4-22.—Locations of Sonoran yellow warbler and summer tanager breeding territories in C2329 in the Palo Verde Ecological Reserve, 2017.



Figure 4-23.—Locations of Arizona Bell's vireo breeding territories in C2513 in the Cibola Valley Conservation Area, 2017.

Point locations represent detections that met the criteria for a breeding territory but for which there were insufficient points to delineate the territory with a polygon.



Figure 4-24.—Location of the Arizona Bell's vireo breeding territory in C2517 in the Cibola Valley Conservation Area, 2017.



Figure 4-25.—Location of the summer tanager breeding territory in C2725 in the Cibola National Wildlife Refuge Unit #1 Conservation Area, 2017.

Point locations represent detections that met the criteria for a breeding territory but for which there were insufficient points to delineate the territory with a polygon.



Figure 4-26.—Location of the Arizona Bell's vireo breeding territory in C4702 in Yuma East Wetlands, 2017.



Figure 4-27.—Locations of Arizona Bell's vireo and Gila woodpecker breeding territories in C4711 in Yuma East Wetlands, 2017.

Point locations represent detections that met the criteria for a breeding territory but for which there were insufficient points to delineate the territory with a polygon.