Coachella Valley
Multiple Species Habitat Conservation Plan/
Natural Community Conservation Plan

2014 Annual Report

Submitted by
Coachella Valley Conservation Commission

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I. Introduction

The Coachella Valley Multiple Species Habitat Conservation Plan/Natural Community Conservation Plan (CVMSHCP) is a regional multi-agency conservation plan that provides for the long-term conservation of ecological diversity in the Coachella Valley region of Riverside County. The California Department of Fish and Wildlife (CDFW) issued the Natural Community Conservation Plan (NCCP) Permit for the CVMSHCP on September 9, 2008. The U.S. Fish and Wildlife Service (USFWS) issued the federal permit on October 1, 2008, completing a planning process that was initiated in 1996. The term of the permits is 75 years, which is the length of time required to fully fund implementation of the CVMSHCP.

The CVMSHCP includes an area of approximately 1.1 million acres in the Coachella Valley region within Riverside County. The plan area boundaries were established to incorporate the watersheds of the Coachella Valley within the jurisdictional boundaries of CVAG and within Riverside County. Indian Reservation Lands are not included in the CVMSHCP although coordination and collaboration with tribal governments has been ongoing.

The Coachella Valley Conservation Commission (CVCC) is the agency responsible for CVMSHCP implementation. The CVCC is comprised of elected representatives of the Local Permittees including Riverside County, the cities of Cathedral City, Coachella, Desert Hot Springs, Indian Wells, Indio, La Quinta, Palm Desert, Palm Springs, and Rancho Mirage, the Coachella Valley Water District, and the Imperial Irrigation District. The Riverside County Flood Control and Water Conservation District (County Flood Control), Riverside County Regional Park and Open Space District (County Parks), and Riverside County Waste Resources Management District (County Waste) are also Local Permittees. Other Permittees include three state agencies, the California Department of Parks and Recreation (State Parks), the Coachella Valley Mountains Conservancy (CVMC), and the California Department of Transportation (CalTrans). A major amendment to include all of the City of Desert Hot Springs and Mission Springs Water District as Permittees was approved by the CVCC in March 2014 and all local Permittees have approved the major amendment in 2014. The final approval of the major amendment by USFWS and CDFW is expected to occur in 2015.

The CVMSHCP involves the establishment of an MSHCP Reserve System to ensure the conservation of the covered species and conserved natural communities in perpetuity. The existing conservation lands managed by local, state, or federal agencies, or non-profit conservation organizations form the backbone of the MSHCP Reserve System. To complete the assembly of the MSHCP Reserve System, lands are acquired or otherwise conserved by the CVCC on behalf of the Permittees, or by Permittee contributions in three major categories:

- Lands acquired or otherwise conserved by the CVCC on behalf of the Permittees, or through Permittee contributions
- Lands acquired by state and federal agencies to meet their obligations under the CVMSHCP
- Complementary Conservation lands including lands acquired to consolidate public ownership in areas such as Joshua Tree National Park and the Santa Rosa and San Jacinto Mountains National Monument. These acquisitions are not a Permittee obligation but are complementary to the Plan.

In addition to acquisition, land in the MSHCP Reserve System may be conserved through dedication, deed restriction, granting a conservation easement, or other means of permanent conservation. To meet the goals of the CVMSHCP, the Permittees are obligated to acquire or otherwise conserve 100,600 acres in the Reserve System. State and federal agencies are expected to acquire 39,850 acres of conservation land. Complementary conservation is anticipated to add an additional 69,290 acres to the MSHCP Reserve System. Figure 1 shows the progress as of December 31, 2014 toward the land acquisition goals identified in Table 4-1 of the CVMSHCP. Table 1 shows the breakdown of Conservation Credit since the issuance of the federal permit in October 2008. Significant progress has been made with over 85,000 acres of conservation lands acquired since 1996.

CVCC completed a major update of the Acquisition Database in cooperation with CVMC, CDFW and USFWS in 2013. Most of the land conserved since 1996 has been accomplished by entities other than CVCC and the records associated with acquisitions have not always been complete or consistent. All acquisition records and the acreage figures used thoughout the 2014 Annual Report have now been updated and made consistent with the rules shown in Appendix 1.

Figure 1: CVMSHCP Conservation Progress Toward Goals

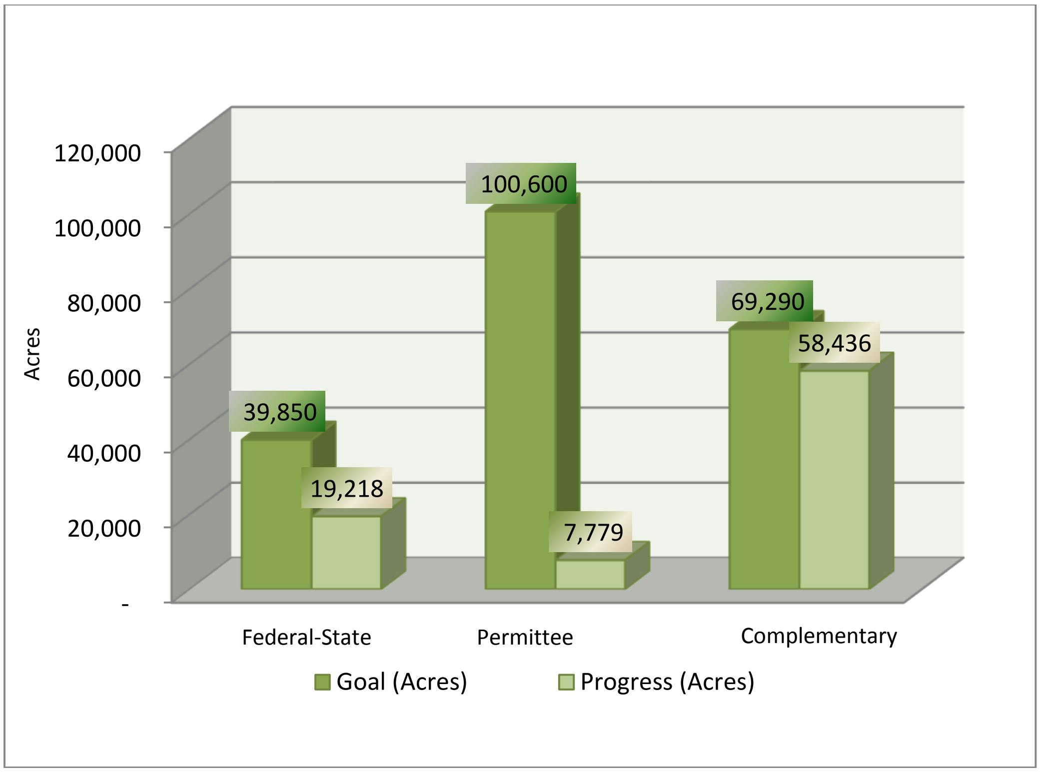


Table 1: Acres of Conservation Credit

Conservation Credit	Goal	Total Progress	1996 - 2010	2011	2012	2013	2014
Federal - State	39,850	19,218	14,680	164	1,597	1,096	1,681
Permittee	100,600	7,779	6,235	395	388	510	251
Complementary	69,290	58,436	49,937	4,900	1,916	726	957
Total	**209,740**	**85,434**	**68,785**	**5,280**	**4,022**	**2,372**	**2,889**

Table 2: Acres of Management Credit

Management Credit	Progress
Federal - State	50,959
Permittee	10,133
Complementary	24,341
Total	**85,433**

Reporting Requirements:

This Annual Report describes the activities for the period from January 1, 2014 to the end of the calendar year on December 31, 2014. As required by Section 6.4 of the CVMSHCP, this Annual Report will be presented at the CVCC meeting of May 14, 2015, where the report will be made available to the public. The report is also posted on the CVMSHCP website, www.cvmshcp.org.

II. Status of Conservation Areas: Conservation and Authorized Disturbance

The CVMSHCP identifies both qualitiative and quantitative conservation goals and objectives that must be met to ensure the persistence of the Covered Species and natural communities. The CVMSHCP is based on a very quantitative approach that is designed to be as objective as possible. The CVMSHCP includes specific acreage requirements for both the amount of authorized disturbance that can occur and the acres that must be conserved within each Conservation Area. These acreage requirements are identified in conservation objectives for each Covered Species and natural community as well as for essential ecological processes and biological corridors and linkages. The conservation objectives provide one measure of the progress toward meeting the requirements of the CVMSHCP under the state and federal permits. This report provides a detailed accounting of the status of the conservation objectives for each of the Conservation Areas up to December 31, 2014.

The planning process for the CVMSHCP was initiated on November 11, 1996, which is the baseline date for the acreages listed in the tables in Sections 4, 9, 10 and throughout the CVMSHCP document. This Annual Report provides an update of these baseline tables to account for all the Conservation and Authorized Disturbance that has occurred between January 1, 2014 and December 31, 2014.

Table 3 provides a summary of the amount of conservation and the acres of disturbance authorized within Conservation Areas in 2014. Authorized disturbance results from development projects in the Conservation Areas. In 2014, there was no Authorized Disturbance reported. The Total Authorized Disturbance in Table 3 includes Authorized Disturbance in years since 1996 that had not been reported to CVCC in the year in which the Disturbance occurred.

Table 3: Conservation and Authorized Disturbance Within Conservation Areas

Conservation Area	Conserva-tion Goal	Conserved in 2014	Conserved Since 1996	Allowed Authorized Disturbance	Authorized Disturbance in 2014	Total Authorized Disturbance since 1996
Cabazon	2,340	0	0	260	0	0
CV Stormwater Channel and Delta	3,870	0	0	430	0	5
Desert Tortoise and Linkage	46,350	123	3,563	5,150	0	0
Dos Palmas	12,870	1,188	3,393	1,430	0	0
East Indio Hills	2,790	0	0	310	0	0
Edom Hill	3,060	29	2,069	340	0	1
Highway 111/I-10	350	1	54	40	0	0
Indio Hills Palms	2,290	0	1,039	250	0	0
Indio Hills/Joshua Tree National Park Linkage	10,530	65	8,980	1,170	0	5
Joshua Tree National Park	35,600	309	12,625	1,600	0	0
Long Canyon	0	0	0	0	0	0
Mecca Hills/Orocopia Mountains	23,670	268	6041	2,630	0	0
Santa Rosa and San Jacinto Mountains	55,890	694	30,175	5,110	0	9
Snow Creek/Windy Point	2,340	0	889	260	0	0
Stubbe and Cottonwood Canyons	2,430	13	875	270	0	29
Thousand Palms	8,040	50	3,653	920	0	54
Upper Mission Creek/Big Morongo Canyon	10,810	5	6,562	990	0	21
West Deception Canyon	1,063	80	834	100	0	0
Whitewater Canyon	1,440	0	956	160	0	1
Whitewater Floodplain	4140	0	567	460	0	32
Willow Hole	4920	63	2,197	540	0	6
Total	234,793	2,889	84,475	22,420	0	163

III. Biological Monitoring Program

The CVMSHCP outlines a scientifically-based monitoring program for species, natural communities and landscapes listed under the Plan. To ensure long-term conservation goals are attained, monitoring activities are based on a three-phased approach and consist of: 1) assessing baseline conditions and developing threat assessments; 2) performing focused monitoring when/if threats are determined; and, 3) conducting adaptive management actions whereby the scientific method is employed to develop and implement best management practices.

In 2014, the CVCC continued to hold meetings of the CVMSHCP Biological Working Group as a mechanism to improve communication and collaboration with our partners. The Biological Working Group, which includes Wildlife Agency and other professional biologists, capitalizes on the expertise and resources of all our agency partners as well as the UC Riverside - Center for Conservation Biology. The Biological Working Group meets monthly to discuss updates on biological issues and adaptive management strategies. They assess current monitoring protocols to align them with research goals outlined within the CVMSHCP, and vetting of completed monitoring activities. During the spring the Biological Working Group assesses the monitoring priorities to be brought forth to the Reserve Management Unit Committees and the Reserve Management Oversight Committee as the recommended annual work plan. A three to five year strategic plan provides an outline of what monitoring has been completed, and describes future monitoring needs. This strategic monitoring plan lists specific objectives for identifying and managing threats and stressors, environmental variables that influence the persistence of the covered species. The CVCC Habitat Conservation Management Analyst continued to manage contracts and logistics for monitoring and land management efforts, including coordinating meetings of the Reserve Management Unit Committees and the Biological Working Group.

To support these goals, CVCC has actively pursued grant funding for monitoring programs. CVCC received funding for three projects from the Natural Community Conservation Planning Local Assistance Grant (LAG) program. In March of 2014, a grant request for $40,000 to the CVCC to provide GPS collars for "*Monitoring Peninsular Bighorn Sheep in the Santa Rosa and San Jacinto Mountains*" was approved. The collars were placed on bighorn sheep in the La Quinta area in October 2014 and additional collars will be placed in fall 2015. In November 2014, CVCC was awarded two LAG grants, one for $70,000 to support the "*Development of an Effective Agassiz's Desert Tortoise Monitoring Program,*" and the other for $99,236 to support "*Vegetation Mapping of Peninsular Bighorn Sheep Habitat*." These projects will be initiated in 2015. A Bureau of Reclamation Grant for $48,750 was also awarded to the CVCC in July 2014 for "*Genetic and Health Profiles of Peninsular Bighorn Sheep in the Northern Peninsular Range*." This project will provide health status and genetic analysis of Peninsular Bighorn Sheep using recently collected and stored tissue samples from sheep in the Santa Rosa and San Jacinto Mountains.

A contract with UC Riverside (UCR) - Center for Conservation Biology was approved for continued monitoring of species, developing focused research questions for protocols and providing science advisory input through June 2015. A study focused on, "*Assessing Climate-Related Changes in Water Resources of the Santa Rosa and San Jacinto Mountains,*" supported by a grant from the Bureau of Land Management National Landscape Conservation System, was completed by UCR for the CVCC in July 2014. This water resource study was completed with valuable assistance of volunteers from the College of the Desert and Friends of the Desert Mountains. A CVCC funded study assessing the "*Status of Riparian Bird Species in the Coachella Valley*" was completed by San Diego Natural History Museum in December of 2014. In coordination with the Biological Working Group, UCR provides guidance and input on the development of the monitoring program tasks and performs the majority of monitoring efforts with their team of ecologists who have specialties in various aspects of the Coachella Valley desert ecology. The 2013-2014 Annual Monitoring Report submitted by UCR can be found in Appendix 2A, the final report for "*Assessing Climate-Related Changes in Water Resources of the Santa Rosa and San Jacinto Mountains*" can be found in Appendix 2B, and the "*Status of Riparian Birds Species in the Coachella Valley*" can be found in Appendix 2C.

2014 Biological Monitoring Activities

Photos: 1 –A palm oasis identified during the assessment of water resources study; 2 –Coachella Valley Jerusalem Cricket; 3 – Little San Bernardino Mountains Linanthus; 4 –Mecca Aster; 5 – Helicopter capture of Peninsular bighorn sheep; 6 – Wildlife biologists taking measurements and samples from a female Peninsular bighorn sheep.

IV. Land Management Program

Management of lands acquired by CVCC and other local Permittees is coordinated with management of the existing conservation lands owned by state, federal and non-profit agencies. The Reserve Management Oversight Committee (RMOC) is the inter-agency group that provides a forum for coordination of management and monitoring lands within the Reserve System and makes recommendations to the CVCC. The Reserve Management Oversight Committee is supported by the Reserve Management Unit Committees.

The Reserve Management Oversight Committee held regular quarterly meetings on January 22, April 23, and October 22, 2014. Each RMOC meeting included a report regarding the Monitoring Program and the Land Management Program. A meeting was held on May 28, 2014 for approval of the monitoring and management annual plan. At the May meeting, the RMOC reviewed the Reserve Management and Monitoring work plans and priority activities. The recommendations from the RMOC were incorporated into the CVCC budget for FY 2014/15 and presented to the CVCC at their June 2014 meeting. The July 2014 RMOC meeting was cancelled due to a lack of agenda items. CVCC staff continues to coordinate with the RMOC and RMUCs to ensure that monitoring and research activities inform and support management of the Reserve Management Units.

Reserve Management Unit Committees

The six Reserve Management Units (RMUs) facilitate coordinated management by local, state and federal agencies to achieve the Conservation Objectives within the MSHCP Reserve System. The Reserve Management Unit Committee meetings were combined to reduce demands on staff time and provide for better coordination. The combined RMUC met on March 19, and September 9, 2014. The March 6 RMUC meeting included a visit to some of the wildlife corridor study sites in the Stubbe, Cottonwood, Whitewater, and Dry Morongo Canyons. At the March 19, 2014 meeting, the RMUC held a joint meeting with the Trails Management Subcommittee to coordinate on trails issues for the Santa Rosa and San Jacinto National Monument. Because many of the same staff members are involved in both the Biological Working Group and the RMUC and staff resources are limited, these meetings will be coordinated for efficiency in the future. The group discussed prioritizing invasive species control efforts, volunteer activities, and grant opportunities.

Trails Management Subcommittee

The Trails Management Subcommittee (TMS) meetings were held on February 19, March 19, May 21, September 17, and November 19, 2014. The Subcommittee continued working with jurisdictions on existing ordinances that relate to trail use. Finalizing the revised Trails Plan which was initiated in spring of 2012 was the primary focus of the Subcommittee's efforts through March 2014. The CVCC approved the revised Trails Plan in June 2014. Completion of conditions in the Bump and Grind Trail MOU, assessment of water sources by UCR, and preliminary data from the Human Use of Trails were focal points for discussion in the May-November meetings. CVCC worked with the CDFW to develop and finalize an MOU for the Mirage/Bump and Grind Trail that outlines conditions that needed to be met before the upper portion of the trail could legally be open to the public nine months of the year from May through January. Conditions included installation of fencing, signage and information about the Peninsular bighorn sheep habitat. The Trails Management Subcommittee supported installation of a low post and cable fence, similar to those found along the boundaries of trails at National Parks. A small working group was created to work out wording of signs that would inspire hikers to stay on the trails and respect the ecological reserve. In 2014, the Bureau of Land Management National Landscape Conservation System funded a focused research program on human use of trails in the National Monument. Preliminary data was shared in fall of 2014 in order to refine protocols for 2015. The CVCC will continue support for this project through 2015.

Land Improvement: Acquisition Cleanups

In 2014 the CVCC Acquisitions Manager performed pre-acquisition site inspections and job walks on 18 parcels and 10 projects in multiple Conservation Areas. During these inspections the Land Acquisitions Manager identified illegal dumping, hazardous conditions, OHV & equestrian activity, and the existence of listed species, as well as determined property fencing requirements. As per CVCC's standard Purchase & Sale Agreements, willing sellers are required to clean up illegal dumping and blight prior to closing. Contractors are met in the field by the Acquisitions Manager prior to a required cleanup to review the agency's standards and specifications for the particular site in question. After cleanup, the job site is re-inspected to certify that cleanups meet the requirements, and if they are found lacking, the seller is notified if additional work will be necessary. After closing, CVCC monitors the sites at least annually for ongoing management/fencing requirements. This year, CVCC was directly responsible for removing an estimated 8.63 tons of refuse, including over 127 tires, from the Coachella Valley, covering more than 574.29 acres and generating over $7,270.00 in contractor revenue from sellers' property sales.

Property Management & Monitoring

Monitoring the status of CVCC conservation lands is an essential and ongoing activity. Regular site visits and patrols are conducted on a biweekly basis to various CVCC properties. Unfortunately, illegal dumping and vehicle access continue to be a problem on some of the Reserve lands. In 2014, an additional 23.63 tons of refuse and 89 tires were removed from illegal dump sites on 160 acres in the Upper Mission Creek/Big Morongo Canyon Conservation Area. A fencing and signage plan was then implemented by the CVCC to ensure the properties remained clean. The initial project involved installation of 30 signs and 13,600 linear feet of post and cable fence, gates, and large boulders. Staff coordinated with CVMC, city and county staff, utilities, and others to identify any concerns or access issues that needed to be addressed. The following photos illustrate the completed post and cable fence, and a series of before and after images highlight the many dump sites that were cleaned.

Upper Mission Creek / Big Morongo Canyon Conservation Area
Cleanup, Fencing and Signage

Photos: 1 – Single strand post and cable fencing and signage along northern boundary of CVCC conservation properties; 2 – Dumpsite on west end of property; 3 –same site on west end after clean up and gating road; 4 –Burrowing owl habitat in Big Morongo Wash littered with tires and trash before cleanup; 5 –Burrowing owl habitat after cleanup ; 6 – West end of property in troubled dumping area within Big Morongo Wash after fencing before cleanup; 7-West end of property after fencing and cleanup were complete.

Mirage / Bump and Grind Trail Fencing

In 2014, the CVCC approved a Memorandum of Understanding with the California Department of Fish and Wildlife (CDFW) in which CVCC agreed to serve as the lead entity to coordinate implementation of the required conditions on the Mirage/Bump and Grind Trail. The trail is within the Santa Rosa and San Jacinto Mountains Conservation Area. The MOU was developed in coordination with CDFW staff and outlined the roles and responsibilities for both CVCC and CDFW in the implementation of AB 880 and AB 1097 (legislation providing for the trail to be open nine months of the year once certain conditions are met). Under the terms of the MOU, CVCC was responsible for funding the signage, fencing and educational materials if funding cannot be obtained from other sources. CVCC worked with CDFW, BLM, the Trails Management Subcommittee and trail user groups to implement the conditions described in the legislation and the MOU. To avoid the bighorn sheep lambing season, installation of the fence was completed by December 31, 2014; 170 linear feet of low single strand post and cable fence was installed along the perimeter of the south side of the upper Bump and

Grind terminus, to dissuade hikers from continuing up Ramon Peak or travelling into habitat areas. Completion of signage and other interpretative materials will continue in 2015 to highlight the ecologically sensitive nature of the area, and encourage trail users to stay on the trails to limit impacts on the species, soil and vegetation.

Photos: 1 – Single strand post and cable fencing and signage; view is looking east from overlook at upper Mirage/Bump and Grind; 2 –sign at overlook of Mirage/Bump and Grind Trail designed to encourage hikers to stay on the established trail

Proposed La Quinta Bighorn Sheep Fence

On February 28, 2014, the CVCC and the City of La Quinta received a letter from the U.S. Fish and Wildlife Service and the California Department of Fish and Wildlife as official notice that bighorn sheep are using artificial sources of food and water in unfenced areas in the City of La Quinta. The letter referred to the CVMSHCP requirement for a barrier to sheep access to be constructed within 2 years of the letter. The proposed fencing to limit bighorn sheep access to golf courses in the La Quinta area will require environmental analysis, route planning and approval from property owners/public agencies. A status report was provided to the wildlife agencies in August 2014. Staff developed a list of proposed alternatives that could be considered in the environmental review and submitted these alternatives in a letter to the wildlife agencies in November 2014. We are currently working with the City of La Quinta, U.S. Fish and Wildlife Service, California Department of Fish and Wildlife, and BLM to review these alternatives and determine those that will be included in the environmental documents. We are working with Coachella Valley Water District and Bureau of Reclamation as fencing associated with the Coachella Canal will require their input and approval. One section of the fence has been installed by CVWD adjacent to Silver Rock golf course as part of their work on the canal in fall 2014. Staff will be reaching out to the homeowners' associations in the area to get their input.

V. Land Acquisition to Achieve the Conservation Goals and Objectives of the CVMSHCP

In 2014, CVCC completed 8 transactions acquiring 19 parcels totaling 278 acres (251 acres Permittee credit due to inclusion of California grant on one parcel) at a cost of $400,000 in CVCC funds. Friends of the Desert Mountains acquired 26 parcels totaling 2,401 acres with $1.2 million in funds from grants by the State of California Wildlife Conservation Board and the Coachella Valley Mountains Conservancy and approximately $250,000 in private donations. All of these acquisitions are listed in Table 4. The Friends of the Palm Springs Mountains conserved 3 parcels totally 209 acres of the site of the failed Shadowrock project with $2.8 million funded by grants from the State of California Wildlife Conservation Board and the Coachella Valley Mountains Conservancy. A table of CVCC acquisitions and/or otherwise conserved lands recorded during the period from January 1, 2014 to December 31, 2014 can be found in Appendix 3. Parcels acquired are listed by Assessor Parcel Number (APN**).** The acreage listed in Appendix 3 is the recorded acreage from the Riverside County Assessor.

Table 4: Lands Acquired by CVCC in 2014

Project	Acres	Conservation Area	Purchase Price
Caldwell	9.75	Thousand Palms	$ 20,328
Flynn	20.93	Thousand Palms	$ 80,000
Kaplan	45.56	Willow Hole	$ 205,470
Leone	4.83	Thousand Palms	$ 56,218
Richter-James	4.91	Thousand Palms	$ 328
Uriostegui #2	4.85	Thousand Palms	$ 425
Verity	10.31	Willow Hole	$ 70,750
Tax Default Purchase	20.01	Dos Palmas	$ 2,400
Tax Default Purchase	10.52	Dos Palmas	$ 4,945
Tax Default Purchase	1.25	HWY 111/I10	$ 2,906
Tax Default Purchase	4.97	Mecca Hills/Orocopia Mountains	$ 2,694
Tax Default Purchase	4.86	Thousand Palms	$ 39,617
Tax Default Purchase	5.01	Willow Hole	$ 3,741
Tax Default Purchase	123.20	Desert Tortoise and Linkage	$ 26,440
Tax Default Purchase	5.00	Upper Mission Creek/Big Morongo Canyon	$ 5,460
Tax Default Purchase	2.52	Willow Hole	$ 3,728
Total Purchases	**278.47**		**$ 525,449***

*includes $125,100 from California state grant.

Figure 2: Total Acquisitions in 2014 by Conservation Area

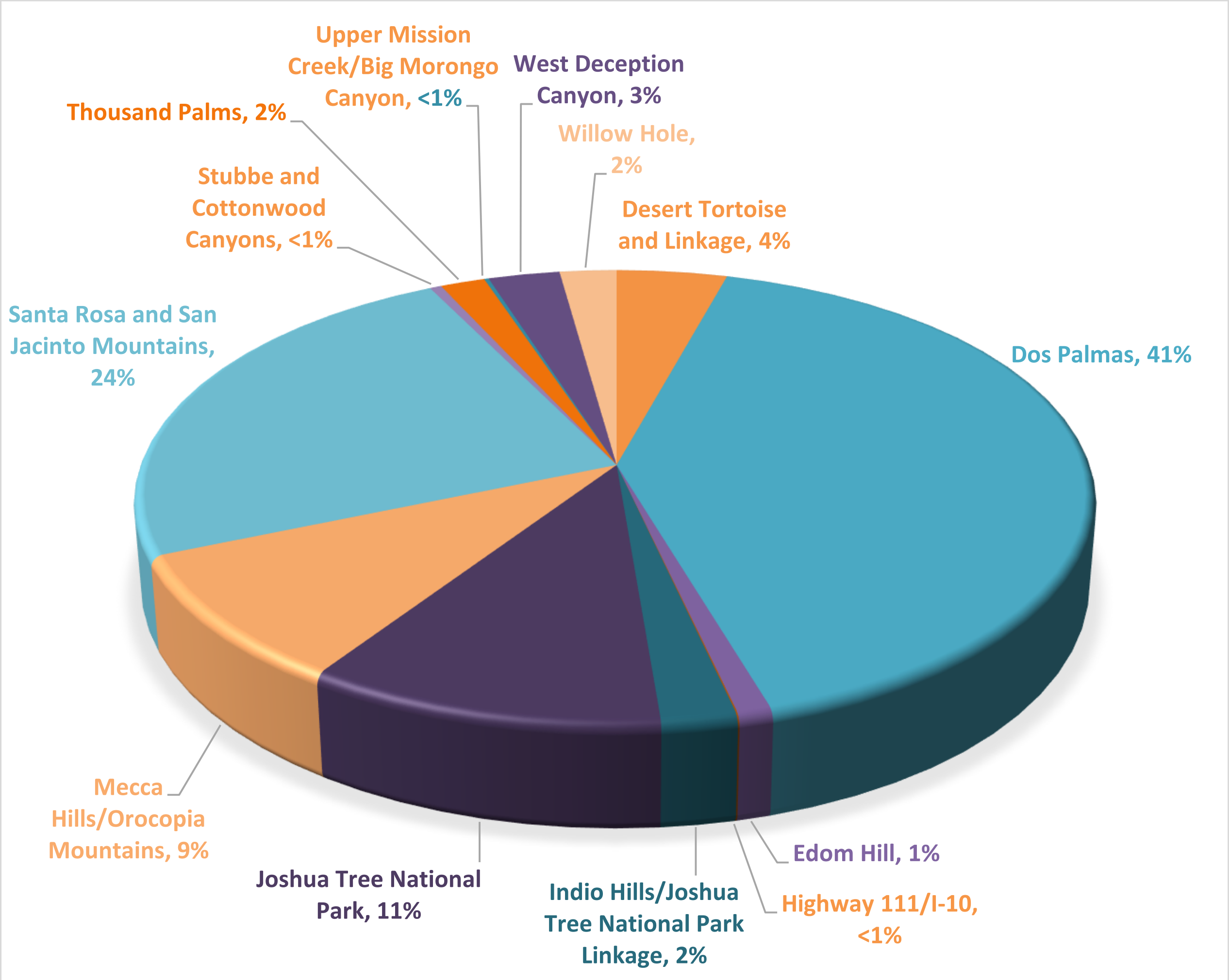


Figure 3: CVCC Acquisitions in 2014 by Conservation Area

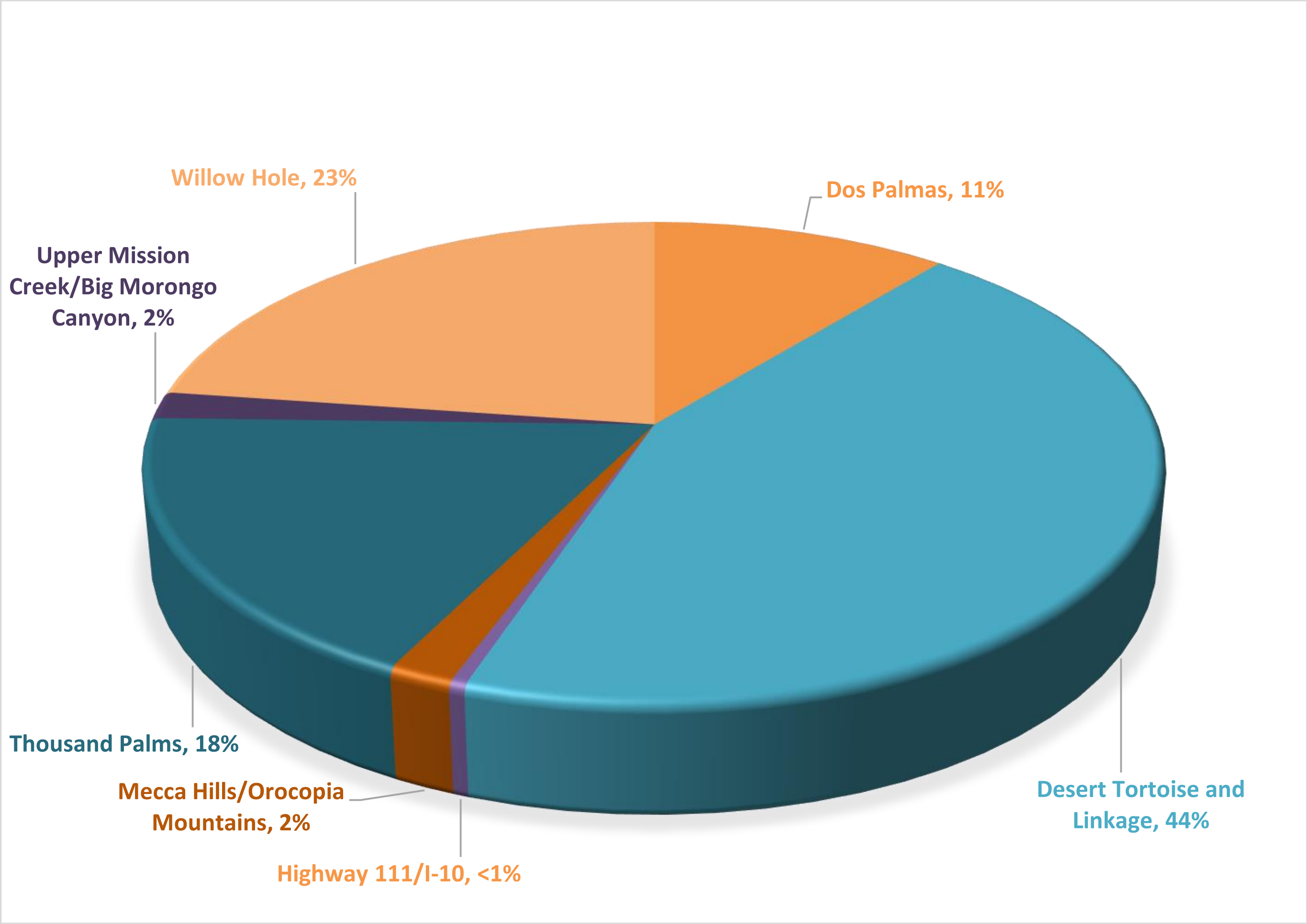
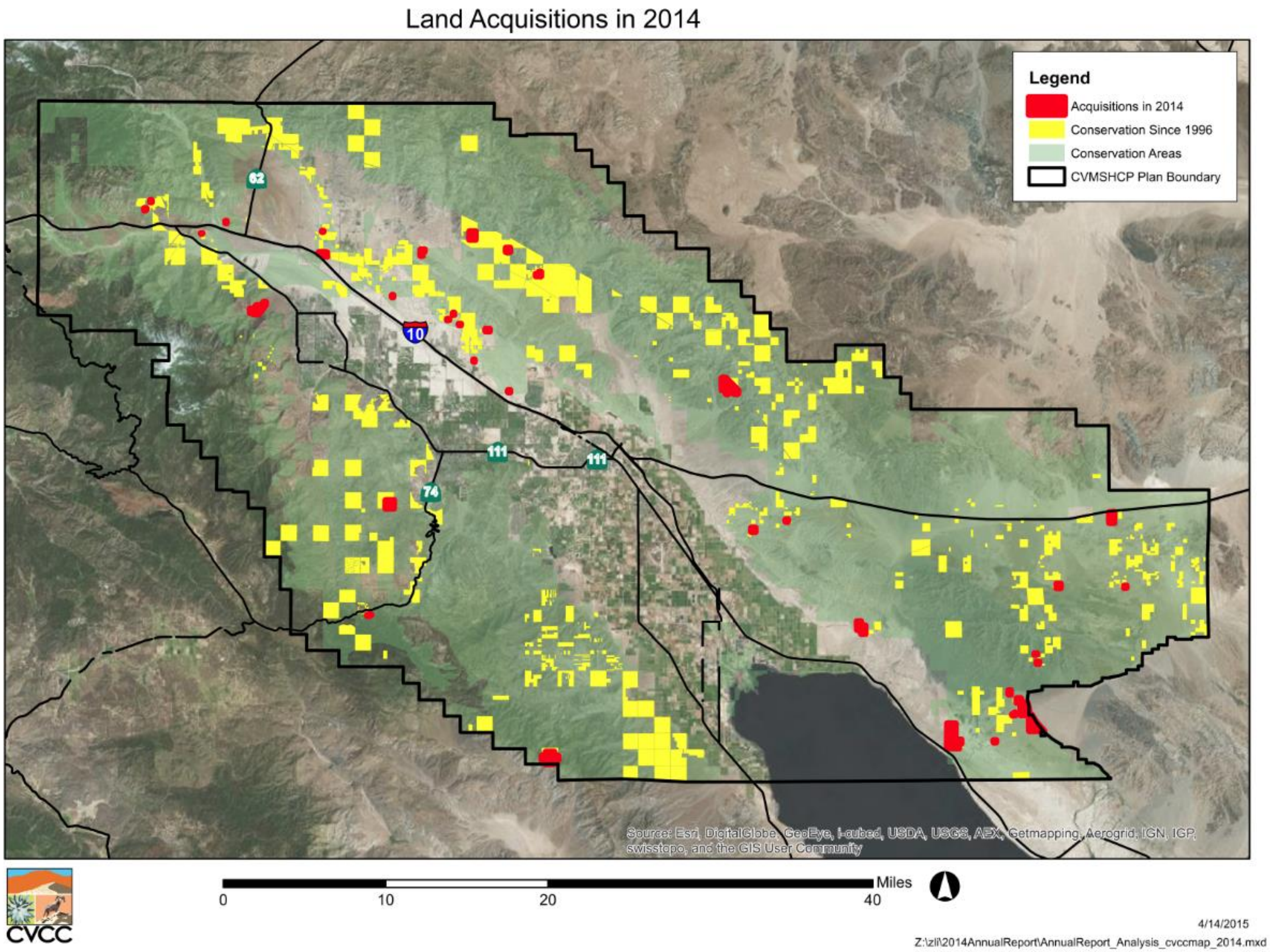


Figure 4: Land Acquisitions in 2014



VI. Conservation and Authorized Disturbance Within Conservation Areas

The progress toward achieving the Conservation Goals and Objectives for the CVMSHCP is reported here from two different perspectives, by Conservation Objective and by Covered Species or natural community. The CVMSHCP includes Conservation Objectives for conserving Core Habitat for Covered Species and conserved natural communities, Essential Ecological Processes necessary to maintain habitat viability, and Biological Corridors and Linkages within each of the 21 Conservation Areas. The amount of conservation and the amount of disturbance are reported in the same tables for comparative purposes. This Annual Report includes the conservation and authorized disturbance from January 1 to December 31, 2014.

The progress toward our goals in terms of the Conservation Objectives is presented in Appendix 4.

VII. Covered Activities Outside Conservation Areas

The CVMSHCP allows for development and other Covered Activities outside the Conservation Areas which does not have to meet specific conservation objectives A table that includes an accounting of the number of acres of Core Habitat and Other Conserved Habitat for the Covered Species and conserved natural communities that have been developed or impacted by Covered Activities outside the Conservation Areas can be found in Appendix 5. This information is listed for each of the Permittees with lands impacted by covered activities outside the Conservation Areas.

Development inside Conservation Areas has been carefully tracked and subject to review under the 1996 Memorandum of Understanding that began the planning process for the CVMSHCP. For development outside Conservation Areas, the acre figures in the table are estimates derived from the Developed area of the California Department of Conservation, Division of Land Resource Protection, Farmland Mapping and Monitoring Program GIS coverages from 1996 and 2012.

See http://www.conservation.ca.gov/dlrp/FMMP/Pages/Index.aspx for more detail on the Farmland Mapping and Monitoring Program.

VIII. Status of Covered Species

An overview of the status of each of the Covered Species for each Conservation Area can be found in Appendix 4.

IX. Significant Issues in Plan Implementation

In 2014, CVCC completed the Enabling Instrument for an In-Lieu Fee Program (ILFP) with the U.S. Army Corps of Engineers. The ILFP would allow organizations that need to mitigate for unavoidable Impacts to Waters of the U.S. that result from activities authorized under section 404 of the Clean Water Act and section 401 of the Clean Water Act water quality certifications to do so by paying a fee to CVCC. CVCC will perform restoration projects that are pre-approved as mitigation by ACOE and the cost of these projects, including endowment, contingency, planning and staff time would be paid from the ILFP. Much like the CVMSHCP, the ILFP will replace piecemeal mitigations that often require years to be approved with a coordinated approach that complements other conservation efforts.

X. Expenditures for CVMSHCP: 2014/2015 Budget

https://www.cvag.org/library/pdf_files/admin/CVCC%20Financials%20Reports%20FY_2014_2015/CVCC%20FY%2014-15%20Budget.pdf

BUDGET BY PROGRAMS - FY 2014/2015

	MANAGEMENT AND MONITORING	GENERAL ADMINISTRATION	LAND ACQUISITION	ENDOWMENT	LIZARD ENDOWMENT	TRAVERTINE MANAGEMENT	MANAGEMENT CONTINGENCY	TOTAL
BEGINNING FUND BALANCE	$ 315,990	$ 173,495	$ 2,525,103	$ 5,720,834	$ 307,223	$ 501,250	$ 3,360,126	$ 12,904,021
REVENUES:								
Development Mitigation Fees	$ 201,343	$ -	$ 983,028	$ -	$ -	$ -	$ -	$ 1,184,371
Agencies Mitigation Fees	-	-	190,300	570,000	-	-	-	760,300
Tipping Fees	-	420,000	-	-	-	-	-	420,000
Contributions	-	-	-	-	-	-	-	-
Grants	40,000	-	598,000	-	-	-	-	638,000
Other Revenue	-	-	-	-	-	-	-	-
Investment Income	800	500	6,500	20,000	1,000	1,300	2,600	32,700
Total Revenues	$ 242,143	$ 420,500	$ 1,777,828	$ 590,000	$ 1,000	$ 1,300	$ 2,600	$ 3,035,371
EXPENDITURES:								
Administrative Fees	$ 2,013	$ -	$ 9,830	$ -	$ -	$ -	$ -	$ 11,843
Accounting / Bank Service Charges	-	1,560	-	-	-	-	-	1,560
Comprehensive Insurance	-	10,822	-	-	-	-	-	10,822
Per Diem Payments	-	8,775	-	-	-	-	-	8,775
Office Supplies	-	3,000	-	-	-	-	-	3,000
Printing	-	10,000	-	-	-	-	-	10,000
Land Improvements	1,000,000	-	240,000	-	-	-	-	1,240,000
Legal Services	-	72,000	-	-	-	-	-	72,000
Professional Services	-	8,541	25,000	-	-	-	-	33,541
Consultants (Regular funds)	426,519	338,968	249,971	-	-	-	-	1,015,458
Consultants (Grant funds)	70,189	-	-	-	-	-	-	70,189
Land Acquisitions	-	-	1,788,300	-	-	-	-	1,788,300
Furniture and Equipment	41,000	-	-	-	-	-	-	41,000
Sub-Total Expenditures	$ 1,539,721	$ 453,666	$ 2,313,101	$ -	$ -	$ -	$ -	$ 4,306,488
OTHER								
Operating Transfers Out	$ -	$ -	$ -	$ 231,458	$ -	$ -	$ 1,000,000	$ 1,231,458
Operating Transfers In	(1,231,458)	-	-	-	-	-	-	(1,231,458)
Sub-Total Other	$ (1,231,458)	$ -	$ -	$ 231,458	$ -	$ -	$ 1,000,000	$ -
Total Expenditures and Other	$ 308,263	$ 453,666	$ 2,313,101	$ 231,458	$ -	$ -	$ 1,000,000	$ 4,306,488
Net Excess (Deficit)	$ (66,120)	$ (33,166)	$ (535,273)	$ 358,542	$ 1,000	$ 1,300	$ (997,400)	$ (1,271,117)
ENDING FUND BALANCE	$ 249,870	$ 140,329	$ 1,989,830	$ 6,079,376	$ 308,223	$ 502,550	$ 2,362,726	$ 11,632,904

XI. Compliance Activities of Permittees

All Permittees are in compliance with requirements of the CVMSHCP. CVCC completed seven Joint Project Reviews in 2014.

All the cities are complying with the fee exemption language in the new ordinances (there are no exempted projects under county jurisdiction). All jurisdictions report their Local Development Mitigation Fee (LDMF) activity and remit the revenue to CVCC monthly. CVCC reviews all LDMF reports and receipts monthly. In 2014, a total of $1,920,169 was collected under the LDMF program, a 72% increase over 2013 collections.

XII. Annual Audit

CVCC approved their Fiscal Year 2013/2014 budget at the June 13, 2013 meeting.

The audit of the expenditures for the period July 1, 2013 to June 30, 2014 was approved by CVCC on February 12, 2015. The financial report was designed to provide citizens, members, and resource providers with a general overview of the CVCC's finances, and to show accountability for the money it receives. Questions about this report or for additional financial information can be obtained by contacting the CVCC Auditor, at 73-710 Fred Waring Drive, Suite 200, Palm Desert, CA 92260.

XIII. Unauthorized Activities and Enforcement

Off road vehicles and dumping continue to be issues. Currently CVCC forwards reports of ORVs and dumping to the appropriate law enforcement agency. CVCC is working to develop an agreement with the Bureau of Land Management (BLM) under which CVCC would contribute funds to hire additional BLM law enforcement rangers to focus on the Conservation Areas.

Appendix I
Rules for Land Acquisition and Management Credit

Acquisition Credit

In general, the source of funds for acquisition gets the credit of acres with the following modifications:

1) Per Plan Section 4.2.1 (p. 4-10), purchases with state or federal funding will be considered Complementary in Joshua Tree National Park, the Santa Rosa and San Jacinto Mountains National Monument, and the Mecca Hills and Orocopia Mountains Wilderness areas. Purchases within these areas with CVCC funds will be considered Permittee.
    a. If land purchased with non-federal/state funding in these areas is transferred to CVCC ownership, it will be considered a donation and CVCC will receive Permittee credit if they take title. Examples include:
        i. Purchases by Friends of Desert Mountains (FODM) – only if funds are from private foundations (e.g. Resources Legacy Fund);
        ii. Donations from landowners.

2) Acquisitions in Fluvial Sand Transport Only Areas will be credited to the funding entity (Permittee, Complementary, and Federal/State). Any overlap between Fluvial Sand Transport Only Areas and Joshua Tree National Park, the Santa Rosa and San Jacinto Mountains National Monument, and the Mecca Hills and Orocopia Mountains Wilderness areas, would counted as Complementary otherwise it will be counted as Federal/State or Permittee as appropriate.
    a. If federal/state funds will be counted as federal/state acquisition
    b. If land purchased with non-federal/state funding in these areas is transferred to CVCC, it will be considered a donation and CVCC will receive Permittee credit.

3) For 2013 Annual Report parcels adjacent to Conservation Areas will not be counted but will be included in the overall database and flagged for consideration after the issue of a legal instrument for conservation is resolved.

4) If a grant requires a matching amount, that portion of the grant will be credited to the source of the match . This includes cash contributions and in-kind contributions from bargain sales (not addressed in the plan). This does not include non-federal/state matches of land for a Section 6 grants.
    a. For example, if CVCC has 30% match for a Section 6 grant in-kind from bargain sales then 30% credit of the purchase would be credited to the Permittee category.
        i. Case study: Strommen-Palmwood (the section that contains Big Morongo Canyon, about 1/3 of the entire Palmwood project). It was appraised at $5.155M and sold for $4M and the $1.115M donation was used as a 30% match on federal Section 6 grant. The Permittees get 30% of the acreage credit and Federal/State gets 70% acreage credit for everything purchased with that Section 6 grant.

5) Mitigation for projects outside Plan Area (Wildlands, Inc. is the only current example ~ 7,000 acres) or mitigation for project not Covered as part of the Plan (Southern California Edison purchase of the mitigation value of CVCC in 2014) are included in the database but are zero for all credit and noted “conserved but it does not count for the Annual Report or Plan acreage numbers.”

6) No Acres within any Tribal Land are counted for the CVMSHCP under any circumstances as Tribal Land is “Not A Part” of the CVMSHCP Plan Area.

Management Credit

The land owner will be considered the managing entity except in the case of written agreement, including conservation easements, which transfer management responsibility to another entity. Fluvial Sand Transport Only Areas and conserved parcels adjacent to Conservations Areas will be included in Management Credit.

All acreage amounts are determined by calculating the acreage of a parcel using the most recent GIS layer from the Riverside County Assessors Office projected in the Universal Transverse Mercator (UTM) projection, Zone 11 North, North American Datum of 1984.

Some Relevant Sections of the Plan:

4.2.1 Complementary Conservation
Several acquisition efforts for Conservation purposes are ongoing. These acquisition programs have broader rationales than the MSHCP program and are independent of the MSHCP effort, though they may be coordinated with it. They complement implementation of the MSHCP, but the acquisition is not a Permittee obligation for purposes of the authorization of Take. In the case of public agencies, the goal of these acquisition programs is to consolidate public ownership of lands within Joshua Tree National Park, the Santa Rosa and San Jacinto Mountains National Monument, and the Mecca Hills and Orocopia Mountains Wilderness areas. Other Complementary Conservation includes acquisitions by non-profit organizations and possibly Tribal acquisition of land for Conservation purposes outside reservation boundaries. Between 1996 and November 2006, Complementary Conservation has accounted for the conservation of approximately 36,900 acres in the Conservation Areas. Table 4-5 shows where this Complementary Conservation has occurred, as well as where future Complementary Conservation is projected to occur.

During the term of the Permits, approximately 29,990 acres of additional Complementary Conservation is projected to occur in the Conservation Areas after November 2006. Based on past performance, this is a reasonable estimate of the acquisitions that might be accomplished through these programs over the life of the Permits. For purposes of projecting acquisition costs for the Plan, it has been assumed that future Complementary Conservation will occur in Joshua Tree National Park, the Santa Rosa and San Jacinto Mountains National Monument, and the Mecca Hills and Orocopia Mountains Wilderness areas. Figure 4-3 shows the location of these projected future Complementary Conservation areas. Acquisitions by non-profit organizations or Tribes may also occur in the Conservation Areas. Any such acquisitions will be considered as part of the Complementary Conservation acres projected under the Plan, as long as the Conservation is not for mitigation for projects or other HCPs. CVCC shall note in its Annual Report to the Wildlife Agencies how much land, if any, non-profit organizations and the Tribes have acquired in the Conservation Areas. If, during the course of Plan implementation, Complementary Conservation is not occurring as anticipated, the Parties will meet and confer regarding impacts to meeting Conservation Objectives.

4.2.1.1 Tribal Land outside the Reservation

Between 1996 and 2003, the Agua Caliente Band of Cahuilla Indians purchased approximately 3,800 acres of land outside the Indian Reservation and within the Santa Rosa and San Jacinto Mountains Conservation Area. This land is the subject of a proposed land exchange between the Agua Caliente Band and the Bureau of Land Management. It is not known at this time how much of the 3,800 acres may ultimately be included in the exchange. The purpose of the proposed land exchange is to consolidate tribal land inside the external boundaries of the reservation, and for BLM to consolidate its land within the Santa Rosa and San Jacinto Mountains National Monument. BLM would obtain some or all of the 3,800 acres of tribal lands outside the reservation. Upon completion of the land exchange, the CVCC will coordinate with the Agua Caliente Band of Cahuilla Indians regarding the preparation of a Minor Amendment without Wildlife Agency concurrence to adjust land ownership and conservation acreages in this Conservation Area.

4.2.2 Additional Conservation Lands

A minimum of 129,690 acres in the Conservation Areas will be conserved as Additional Conservation Lands after November 2006, to be acquired or otherwise conserved through state and federal acquisitions, Permittee contributions, and the Conservation of public and quasi-public lands.

4.2.2.1 The Role of Federal and State Governments in Assembly of the Reserve System

Sensitive species and their Habitats are public resources; the benefits of protecting these resources accrue broadly to the citizens of the state and the nation. The federal and state governments have acknowledged their role in Habitat Conservation and agree to assist in creating an MSHCP Reserve System that reduces or avoids the need to list additional species and contributes to the recovery of Covered Species. Between 1996 and November 2006, the state and federal governments have acquired or funded the acquisition of 37,700 acres in the Conservation Areas (in addition to Complementary Conservation). Through the MSHCP and its IA, the federal and state governments have agreed to partner with the Permittees in assembling, managing, and monitoring the MSHCP Reserve System. The federal and state governments will undertake the following actions:

- Acquire 21,390 acres of privately owned lands in the Conservation Areas after November 2006, as a contribution to Plan implementation.
- Manage certain federal and state lands in the MSHCP Reserve System.
- Participate in the Monitoring and Adaptive Management Program for the MSHCP Reserve System.

Biological value, cost, vulnerability to Development, and proximity to existing state and federal lands will be considered in determining which lands are acquired. State and federal potential funding sources and programs for land acquisition are described in Section 5 of the Plan.

4.2.2.2 Permittees’ Obligation in Assembly of the MSHCP Reserve System

As of 2006, the Permittees have an obligation to conserve approximately 115,140 acres in the Conservation Areas through:

- Conservation of 7,500 acres of currently non-conserved Local Permittee-owned lands. [See Section 4.2.2.2.1.]
- Conservation of 88,900 acres of Additional Conservation Lands by the Local Permittees and Caltrans through acquisition or other means, such as planning tools and land use regulation and the acquisition of 640 acres by State Parks, of which 100 acres can be developed for State Park facilities. [See Section 4.2.2.2.2.]

- Management of 18,200 acres of Local and State Permittee Existing Conservation Lands consistent with the MSHCP. [See Section 4.2.2.2.3.]

In addition, the Permittees will maintain the fluvial sand transport Essential Ecological Process in the Cabazon, Long Canyon, and West Deception Canyon Conservation Areas as described in Section 4.2.2.2.4.

Appendix 2A
Biological Monitoring Program 2013-2014 Year-End Report

Coachella Valley Conservation Commission

September 2014

Coachella Valley Multiple Species Habitat Conservation Plan & Natural Community Conservation Plan

Biological Monitoring Program

2013-2014 Year-End Report

Prepared by the University of California Riverside's Center for Conservation Biology

for the Coachella Valley Conservation Commission

Permittees and Partners to the
Coachella Valley Multiple Species Habitat Conservation Plan and
Natural Communities Conservation Plan

Permittees

Coachella Valley Association of Governments
Coachella Valley Conservation Commission
California Department of Parks and Recreation
Coachella Valley Mountains Conservancy
California Department of Transportation

Riverside County Flood Control
Riverside County Waste Resources Management District
Riverside County Regional Park & Open-Space District

City of Palm Springs
City of Cathedral City
City of Rancho Mirage
City of Palm Desert
City of Indian Wells
City of La Quinta
City of Indio
City of Coachella

Coachella Valley Water District
Imperial Irrigation District

Partners

United States Department of Fish and Wildlife
California Department of Fish and Wildlife
United States Bureau of Land Management
United States Forest Service
Joshua Tree National Park
Friends of the Desert Mountains
Center for Natural Lands Management

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I. Biological Monitoring Program Overview

The Coachella Valley Multiple Species Habitat Conservation Plan and Natural Communities Conservation Plan (CVMSHCP/NCCP, or Plan) was established in 2008 to ensure regional conservation of plant and animal species, natural communities and landscape scale ecological processes across the Coachella Valley. Areas where conservation must occur throughout the life of the Plan are designated by a Conservation Area Reserve system which is designed to include representative native plants, animals and natural communities across their modeled natural ranges of variation in the valley. The types and extent of Conservation requirements for covered species, natural communities and landscapes within these reserves are defined by specific goals and objectives that are intended to support the following guiding ecologically-based principles:

1) maintaining or restoring self-sustaining populations or metapopulations of covered species;

2) sustaining ecological and evolutionary processes necessary to maintain the functionality of the natural communities and Habitats for the species included in the Plan;

3) maximizing connectivity among populations and avoiding habitat fragmentation to conserve biological diversity, ecological balance, and connected populations;

4) minimizing adverse impacts from off road vehicle use, illegal dumping, edge effects, exotic species and other disturbances;

5) ensuring management is responsive to short-term and long-term environmental changes, and new science.

The CVMSHCP uses ongoing biological monitoring and land management programs to assure these general conservation principles and species-specific Conservation Goals and Objectives, are met and maintained throughout the life of the Plan. To ensure that ecological drivers and communities are maintained and species populations are vigorous, a biological monitoring framework was designed to inform the Coachella Valley Conservation Commission, wildlife agencies, and resource managers of the status of the plan's covered species, and also to provide clear analysis of the ecological drivers and threats that may explain any spatial and temporal fluctuations observed. The goals and objectives of the monitoring and management programs is prescribed in CVMSHCP Chapter 8, "MSHCP Reserve System Management & Monitoring Program.".

Data from the Biological Monitoring program also feed into the Land Management program and assist Reserve managers with developing best management practices that are intended to ensure the Conservation Goals and Objectives for each species are met and maintained. This linkage between the monitoring and management programs enables the capacity to support an adaptive, self-updating process. As management prescriptions are employed and the biological monitoring program continues evaluating Covered Species, the effects from installed management prescriptions can be measured, evaluated, and fed back into the management program so that managers can review and revise conservation practices, as needed.

Scientific Principles

Section 8.3.2 of the CVMSHCP defines eight scientific principles "that will establish the standard for collection, analysis, and interpretation of data generated in this program. These principles will ensure a program that is scientifically rigorous, question-based, and with the strongest inference possible. These principles will also ensure that monitoring efforts efficiently provide data that are relevant and enable valid comparisons between populations separated by distance and time." The principles are:

1. Define the question. Monitoring strategies will be designed to address specific hypotheses. Conceptual, statistical, and spatially explicit models will define those hypotheses.
2. Define the area, also known as the target population, and create a sampling frame to which the statistical inference will be made.
3. Develop and state the assumptions in the hypotheses and models *a priori* to collecting monitoring data or conducting manipulations such as experiments and adaptive management.
4. When designing an experiment or using adaptive management, randomly select the units, randomize the allocation of treatments to the units, and use controls.
5. Use probability-based sampling to allocate sampling effort and incorporate spatial variation in the data. Using probability-based sampling allows unbiased inferences to the larger area (Morrison et al. 2001).
6. Replicate in space and time the number of sites surveyed during monitoring (e.g. survey sampling) and those receiving a treatment/management action.
7. Adjust the sensitivity of the data to reflect true changes in the resource being sampled. Adjust counts, measures of species richness, and patch occupancy (i.e., presence/absence) with an estimate of detection probability, such as those described by Lancia et al. (1994), Yoccoz et al. (2001), and Pollock et al. (2002).
8. Describe the methods and the assumptions of the methods used to collect and analyze data.

The CVMSHCP Biological Monitoring program developed a novel framework which uses a unique, science-based approach that not only assesses species distributions and population fluctuations but also employs the peer-reviewed scientific research process to develop hypotheses and address information gaps relating to the ecology of covered species. These information gaps are species-dependent and could include (but are not limited to) certain aspects of life-cycle requirements, gene flow barriers, population threats and stressors, resiliency and resistance to threats and stressors, population drivers and responses to drivers. A science-based monitoring framework is a process that follows steps that serve to ensure that the findings meet sufficient rigor. Those steps begin with questions and hypotheses and culminate with external peer review and reporting of results. This final step of peer review and then reporting is an essential means of establishing that the methods, analyses, and interpretations meet currently accepted levels of science. The following are publications based on monitoring-based species scale research conducted through the development and now implementation of the CVMSHCP that serve as a resource to the CVCC, habitat managers, and regulatory agencies to evaluate both the progress of the CVMSHCP at meeting conservation goals, to set habitat management priorities, and guide actions. The research element of the monitoring program is therefore value-added, as it provides the additional capacity to revise and refine the Plan's habitat models, survey locations, monitoring protocols, and develop additional research questions concurrently with data collection.

Barrows, C.W., M.B. Swartz, W.L. Hodges, M.F. Allen, J.T. Rotenberry, B. Li, T. A. Scott and X. Chen. 2005. A framework for monitoring multiple species conservation plans. Journal of Wildlife Management 69:1333-1345.

Barrows, C.W. 2006. Population dynamics of a threatened dune lizard. Southwestern Naturalist 51:514-523.

Barrows, C.W., M.F. Allen and J.T. Rotenberry. 2006. Boundary processes between a desert sand dune community and an encroaching suburban landscape. Biological Conservation 131:486-494.

Barrows, C.W. and M.F. Allen. 2007. Community complexity: stratifying monitoring schemes within a desert sand dune landscape. Journal of Arid Environments 69:315-330.

Barrows, C.W. and M.F. Allen. 2007. Biological monitoring and bridging the gap between land management and science. Natural Areas Journal 27:194-197.

Barrows, C.W. and M. F. Allen. 2007. Persistence and local extinctions of an endangered lizard on isolated habitat patches. Endangered Species Research 3:61-68.

Barrows C.W., K.L. Preston, J.T. Rotenberry, M.F. Allen. 2008. Using occurrence records to model historic distributions and estimate habitat losses for two psammophilic lizards. Biological Conservation 141:1885-1893.

Barrows, C.W., E.B. Allen, M.L. Brooks, and M.F. Allen. 2009. Effects of an invasive plant on a desert sand dune landscape. Biological Invasions 11:673-686.

Barrows, C.W. and M.F. Allen. 2009. Conserving Species in Fragmented Habitats: Population Dynamics of the Flat-tailed Horned Lizard, *Phrynosoma mcallii.* Southwestern Naturalist 54: 307-316.

Barrows, C.W. and M.F. Allen. 2010. Patterns of occurrence of reptiles across a sand dune landscape. Journal of Arid Environments 74:186-192.

Barrows, C.W., J. T. Rotenberry, and M. F. Allen. 2010. Assessing sensitivity to climate change and drought variability of a sand dune endemic lizard. Biological Conservation 143:731-743.

Barrows, C.W. 2011. Sensitivity to climate change for two reptiles at the Mojave-Sonoran Desert interface. Journal or Arid Environments. 75:629-635.

Barrows, C.W., K.D. Fleming, and M.F. Allen. 2011. Identifying Habitat Linkages to Maintain Connectivity for Corridor Dwellers in a Fragmented Landscape. Journal of Wildlife Management 75:682-691.

Barrows, C.W. 2012 Temporal abundance of arthropods on desert sand dunes. Southwestern Naturalist 57:263-266.

Barrows, C.W. 2013. An Ecosystem Approach to Defining Conservation Boundaries: Concepts and a Case Study. Natural areas Journal 33:344-347.

Chen, X., C. W. Barrows and B. Li. 2006. Is the Coachella Valley Fringe-toed Lizard (*Uma inornata*) on the Edge of Extinction at Thousand Palms Preserve? Southwestern Naturalist 51: 28-34.

Chen, X., C. W. Barrows and B. Li. 2006. Phase coupling and spatial synchrony of subpopulations of an endangered dune lizard. Landscape Ecology 21:1185-1193.

Hulton, H.L., A.M. Hansen, C.W. Barrows, Q. Latif, M.W. Simon, and K. E. Anderson. 2013. Shifts in arthropod community structure during an invasion of desert ecosystems by Sahara mustard (*Brassica tournefortii*). Biological Invasions 16:1675-1687.

Latif, Q.S., K.D. Fleming, C. Barrows, and J.T. Rotenberry. 2012. Modeling seasonal detection patterns for burrowing owl surveys. Wildlife Society Bulletin 36-1: 155-160.

Ortiz, D. D., and C.W Barrows (in press). Western Yellow Bat, *Lasiurus xanthinus*, occupancy patterns in palm oases in the lower Colorado Desert. Southwestern Naturalist

Prentice, T.R.., R.A. Redak, and C.W. Barrows. 2011. Survey methodology and distribution of a cryptic Jerusalem cricket species, *Stenopelmatus cahuilaensis* Tinkham (Orthoptera, Stenopelmatidae). Pan Pacific Entomologist 87:1-14.

Species Monitoring

Under the CVMSHP, monitoring of 27 individual covered species is required and focuses on addressing specific questions including occupancy, habitat use, measures of abundance and in particular species responses to natural and anthropogenic stressors. To efficiently acquire data for a particular community of species, the CVMSHCP monitoring protocols group together individual species protocols within a "community context". That context means that in addition to species-specific occurrence data, information on resource abundance, substrate, disturbances, invasive species, predators, and potential competitors – the context that may explain the occurrence or abundance of a species – are also collected. This community context requires little additional survey time and generates a wealth of critical data for developing and evaluating hypotheses regarding individual species. Thus species monitoring not only provides scientifically defensible estimates of occurrence and/or measures of abundance but also provides critical ecological information, enabling better management, thus increasing the probability of successful conservation. Regular species monitoring tracks responses to resource fluctuations and, when methods are appropriately sensitive, identifies the level of impacts stressors have on individual species.

The conceptual, and later statistical, relationships between species abundance and/or occurrence with potential stressors can be modeled, and models can be used to focus future monitoring and identify thresholds for management actions. This represents the fundamental difference between the CVMSHCP's biological monitoring framework and monitoring elsewhere. Other monitoring programs focus on documenting species abundances or occurrences but often fail to identify the driver/stressors that influence that abundance or occupancy. This leaves a gap between documenting population change over time and understanding what is driving that change, whether that change warrants management action, and importantly identifying thresholds for initiating a change in management. In addition to tracking performance relative to goals and objectives for covered species, species monitoring should facilitate adaptive management, providing information on local-scale or short-term responses to adaptive management experiments.

For each covered species, a sampling design and monitoring methods are specified in the monitoring protocol for each community in which that species is primarily associated. Each protocol also evaluates alternative sampling methodologies, defines conceptual ecological models for each community, and selects and tests habitat metrics based on those ecological models. The details are different for each protocol but each uses quantitative methods that produce data robust enough for statistical analysis, in a manner consistent with the Plan's scientific principles.

Community and Landscape Monitoring

Monitoring of individual communities is necessary in order to understand the effectiveness of the design and to focus management of the CVMSHCP relative to the goals of maintaining and supporting the recovery of communities. Community monitoring focuses on species associations within a particular set of abiotic conditions and measures the aerial extent, functional attributes, species composition, trophic relationships, key ecosystem processes, and responses to variation in natural and anthropogenic stressors within that community context. Examples of how community monitoring has been applied to the Coachella Valley include Barrows and Allen (2007a, 2010) and Barrows et al. (2009). The components of each community within the CVMSHCP are laid out in conceptual ecosystem models providing data addressing the extent to which conservation goals and objectives for communities are being met. These goals and objectives are described in CVMSHCP Section 4.3 and Table 4-111. Community monitoring involves two primary elements. The first is geographically explicit tracking of the extent and composition of communities. This entails refinement and periodic updates of the natural communities (vegetation) map prepared for the CVMSHCP. The second element for community monitoring is the evaluation of overall health of the community and evaluating CVMSHCP goals relative to maintaining habitat connectivity. Community monitoring includes development, testing, and refinement of conceptual ecological models that increase understanding of the relationships between species composition, habitat condition, and stressors affecting communities. Such models identify metrics for both natural and anthropogenically-induced changes in community structure in time and space. Landscape scale relationships are identified in these models for each community, incorporating spatial factors such as patch size and connectivity. Goals and objectives are evaluated in part by compliance monitoring that demonstrates compliance with land acquisition and recovery goals, in part by research that fills gaps in our knowledge of how covered species and communities are distributed at a landscape scale, and finally by monitoring activities specifically aimed at evaluating community patch size, shape, distribution, connectivity and the dynamics of those spatial patterns.

II. 2014-2015 Monitoring Program Activities & Results

In this section we summarize the year's accomplishments, identify specific tasks from the annual work plan, review current knowledge about various species and natural communities, provide protocols (as appropriate) and explain findings.

<u>Monitoring Tasks</u>

- Maintain and update monitoring protocols where needed.
- Pursue grant opportunities.
- Report monitoring results and assist with development of Plan Database.

- Identify and Implement Baseline Monitoring of Other Covered Species as directed by CVCC Staff and RMOC. This year these species include Le Conte's Thrasher, Crissal Thrasher, Orocopia Sage and Mecca Aster.

- Riparian Bird Monitoring.

- Update the CVMSCHP Database and Community GIS Layer.

In 2013, the CVCC established a Biological Working Group as a mechanism to improve communication and collaboration with the Wildlife Agencies and other professional biologists, and capitalize on the expertise and resources of all our agency partners as well as the UC Riverside - Center for Conservation Biology. The Biological Working Group began meeting on a regular basis in November of 2013 and has developed a framework to improve monitoring protocols, the annual work plan, the three to five year strategic plan, and vetting of completed monitoring activities. This year the Biological Working Group reviewed and approved biological monitoring protocols for monitoring the Le Conte's Thrasher, Crissal Thrasher, Mecca Aster and Orocopia Sage species.

Three additional monitoring activities were pursued to augment species monitoring which will result in separate reports. The first was funded by a $25,000 grant from the BLM's National Landscape Conservation System program and a cooperative partnership between BLM and UCR was established to assess climate-related changes in water resources within the Santa Rosa-San Jacinto Mountains National Monument. Project activities began in 2013 and are expected to continue through June 2014. They will fulfill part of the montane natural communities monitoring requirement, to perform habitat assessments in the various natural communities as a component of overall species and natural community monitoring and vegetation assessments in particular will provide points for the essential bighorn sheep habitat vegetation map. Part of the assessment methodology will be included in the habitat assessment section of the monitoring protocol for montane natural communities, and the final report will be posted to the website. Also during this year, the San Diego Natural History Museum in partnership with UCR implemented a study to document presence of Riparian Birds in the Plan area. Project activities began in March 2014 and are expected to conclude in July 2014, and final analysis of data and reports will be finished in the fall. This report as well will be posted as soon as it becomes available. Finally, mapping concluded in the Valley Floor subunit in May 2013 which will result in an individual final report detailing the protocol and standards used for the Vegetation Mapping Project. To assist with mapping the Dos Palmas Reserve Management Unit, a partnership was established between BLM (largest area landowner), UCR (as the research lead) and CVCC (as the coordinating/administrative entity) and vegetation assessment points were collected during point count surveys for thrashers this year, to augment mapping needs in the future. Also to augment monitoring activities through California Department of Fish and Wildlife, the CVMSHP database was updated with Desert Pupfish population trend data for Dos Palmas and Oasis Springs Upper Pond Ecological Preserve, as well as historic datasets for multiple other sites within the Plan area.

Results of 2013-2014 protocol surveys for Le Conte’s Thrasher (*Toxostoma lecontei*) within the Coachella Valley

Introduction

Le Conte’s Thrasher (*Toxostoma lecontei,* LCTH) occur across the deserts of southern Nevada and Utah through California and Arizona into northern Mexico, and have been found to prefer sparsely vegetated desert flats, dunes, and alluvial fans with a high proportion of saltbush (*Atriplex* spp.), desert tea (*Ephedra* spp.) and/or cholla cactus (*Opuntia* spp.). They are occasionally found in habitats with large proportions of rock, or deep silty clays, and commonly use small arroyos, and vegetated margins of large, rolling sand dunes (Sheppard 1970, 1973, Laudenslayer et al. 1992). LCTH are a cryptic species and can be difficult to detect as they typically forage on the ground beneath shrubs and trees (Sheppard 1996). As a result, they tend to blend well with dry vegetation and ground cover, making detection of presence difficult with passive surveys. Studies done in the densely occupied habitats in the Mojave Desert and the San Joaquin Valley have found that LCTH sing frequently throughout the spring, while studies completed in the more sparsely occupied Colorado Desert have found that LCTH tend to sing frequently during the pre-breeding period, and rarely throughout the rest of the year (Allen et al. 2005, Fletcher 2009).

Within the Maricopa Valley, LCTH occur in higher densities of 4.63 pairs/km² (Sheppard 1970) and effective surveys have included ground searches without using call-broadcasts (Jongsomjit et al. 2012). In desert environments, however, they are expected at much lower densities of 0-1.93 pairs/km², and at such low densities passive survey methods have proved ineffective (Hutchinson in Allen et al. 2005, Blackman et al. 2012). Previous studies have found call-broadcast surveys to be extremely effective with this genus however (England and Laudenslayer 1989, Sheppard 1970). Call-broadcast surveys prompt LCTH to move from the ground to the tops of bushes and stimulate these birds to respond vocally and behaviorally. Additionally, call-broadcast surveys were found to be three times more effective at detection than passive surveys during the pre- and post-breeding periods (Blackman et al. 2012, Fletcher 2009, Allen et al. 2005). The LCTH nesting period begins in January and can extend into early June (Sheppard 1970, Sheppard 1996, Blackman et al. 2012), however, in average precipitation years they engage in pair bonding and territorial defense behavior from late November to February (Jongsomjit et al. 2012). The Le Conte’s Thrasher is listed as a species of special concern by the California Department of Fish and Wildlife.

Objectives

These surveys were carried out as part of the Coachella Valley Multiple Species Habitat Conservation Monitoring Plan by the UC Riverside Center for Conservation Biology. Surveys for the LCTH were conducted following the guidelines and objectives outline by the MSHCP and carried out using the December 2013 protocol developed by the Coachella Valley Conservation Commission’s Biological Working Group (BWG). With this baseline effort, the primary objectives were to assess the presence and distribution of Le Conte’s Thrasher within the Plan’s Conservation Areas, and to collect information about potential habitat attributes. These data will help determine habitat suitability in order to facilitate the development of hypotheses and models designed in aiding sustainable conservation.

Methods

Site Selection

Thirty primary and secondary sites were chosen within Conservation Areas using a stratified random sampling design. Strata were defined by previous LCTH detection locations, accessibility of sites within conservation areas, vegetation cover, and proximity to roads and development. Sites were chosen using ArcGIS software (v10.0, ESRI Inc. Redlands, California), overlaying existing vegetation, aerial imagery and conservation maps to identify possible survey locations within several habitat types and with differing proximity to roads and altered habitat. Only the San Jacinto and Santa Rosa Mountains Conservation Area, the Whitewater Canyon Conservation Area, and the Coachella Valley Stormwater Channel-Delta Conservation Area were found not to contain any of the vegetative alliances and associations previously noted for Le Conte's Thrasher. Within the remaining twenty conservation areas, thirty primary and secondary sites were distributed based on the strata described above, with twelve sites identified in the west (Fig. 2), eleven in the central valley (Fig. 3), and seven in the southeast (Fig. 4). Each of the 30 sites has one or more habitat variables positively associated with LCTH sightings in previous studies (Fletcher 2009, Blackman et al. 2012).

The 2013-2014 pilot study prioritized sites with confirmed historic occurrences of LCTH within or adjacent to the habit, and those with *Atriplex* vegetation alliances within conservation areas. This resulted in the identification of 16 primary sites with these characteristics; the 14 remaining sites were classified as secondary sites as they did not have previous accounts of LCTH located in proximity, and/or only had identified vegetation and habitat of either open desert scrub and/or wash, with associations of *Atriplex*, *Ephedra*, or *Opuntia* (Fletcher 2009, Blackman et al. 2012). The primary sites chosen for the 2013-2014 survey effort are the grey parallelograms within the maps, and the green points represent our actual call-broadcast points at those sites (Figs. 2- 4).

Data Collection

Call-broadcast surveys were done at 96 call-broadcast points distributed across 16 sites within the Coachella Valley Multiple Species Conservation Areas (Figs. 2-4). To maximize detection probability and document change in herbaceous and invasive cover, points were visited three times during the sampling period (Conway and Simon 2003). The first round of surveys was completed over 13 days between 6 December 2013 and 15 January 2014. The second round was completed in 11 days, beginning 16 January 2014 and ending 14 February 2014. The third round was completed in 15 days between 12 February and 4 April 2014. Call-broadcast surveys have been shown to be most effective when sustained winds are no greater than Beaufort Scale 4 (20-28 km/hr), and when there is no rainfall. The second and third survey period overlapped owing to windy conditions preventing surveys of the more western sites during the second round of surveys. The third survey period was extended for two days into April to make up for inclement weather resulting in only five days in March where weather was within the boundaries defined by the protocol.

At each site, two 1000m transects were placed 1000m apart, parallel to one another and oriented to best remain within potential suitable habitat. Call-broadcast points were located at the beginning, middle and end of each transect, spaced 500m apart (Fig. 1). Each of the 16 sites resulted in six call-broadcast points for a total of 96 call-broadcast points distributed across the conservation areas.

A local field recording of a singing male Le Conte's Thrasher was collected in 2003 from Desert Hot Springs by UC Riverside - Center for Conservation Biology, and used for the broadcast surveys. The recording was looped to create a 120 second sound file on an mp3 player, which was then broadcast through an amplified field speaker at peak volume. At each broadcast point, two observers surveyed simultaneously beginning with a passive detection period of two minutes where they scanned vegetation and the surrounding landscape for birds, followed by the 120 second song broadcast in either direction perpendicular to the transect for a total of two minutes, followed by a two minute detection period where observers scanned with binoculars and listened for a vocal response. If no response was detected, observers repeated the 2 minute playback / 2 minute detection period twice. If LCTH were detected during the playbacks, data was collected about the time and date, response time, direction and distance, type/duration of vocals, and behaviors of the LCTH.

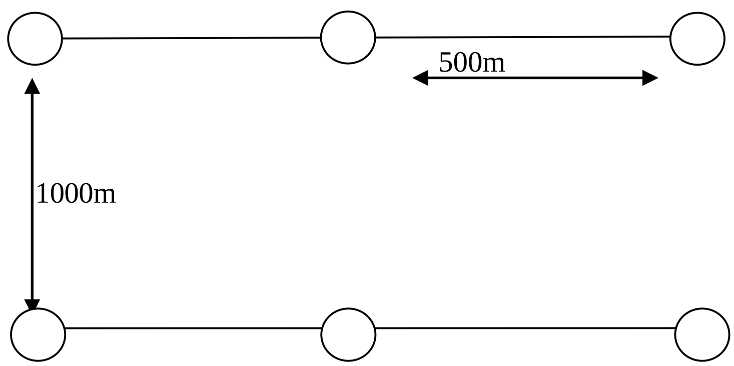

Figure 1. Plot configuration, consisting of two transects and six call-broadcast points, for each LCTH survey site

We employed the CNPS/CDFG Combined Vegetation Rapid Assessment Relevé protocol (Buck-Diaz and Evan 2011) in addition to species-focused methods to document habitat attributes such as vegetation communities, slope and substrate, and measure the presence and extent of invasive plant species. Variables recorded at each point include adjacent land uses (suburban, agriculture, natural open space) and degrees of anthropogenic alteration (as outlined in the CNPS/CDFW protocol). Surveys also documented varying densities of invasive species and attempted to quantify the change in levels of herbaceous cover and invasive plant species infestations. All incidental bird sightings were also recorded (Appendix A).

Results

A total of three Le Conte's Thrasher were detected at two points (LCTH02NM, LCTH02SE) within the same site (LCTH02) at the Stubbe and Cottonwood Canyon Conservation Area (Table 1). The first LCTH was detected within point LCTH02NM at 9:38am on 12 February 2014 on the edge of a riparian area surrounded by a *Larrea tridentata - Encelia farinosa* vegetation alliance (Table 2). After the first call, a LCTH emerged from the scrub and ascended to a tree directly across the wash (~100m away from the broadcast point center) and begin singing in response to the call. The individual did not attempt to further approach the surveyors. The site was within 500m of a private residence and had medium disturbance from cattle moving through. It was also flat in aspect, and the substrate was classified as 1% boulder, 20% stone, 15% cobble, 40% gravel, and 24% fines, following the protocol. The following month, on 20 March 2014, two LCTH were detected at 11:18am at broadcast point LCTH02SE, also a *Larrea tridentata*- *Encelia farinosa* alliance (Table 1, 2). This site was also flat, and 200m from a private residence, with medium disturbance. A dirt road and power lines bisect the point. The substrate was classified as 5% boulder, 10% stone, 15% cobble, 30% gravel, and 50% fines. One thrasher posted itself up on an *Encelia farinosa* and the other ran along the base of the bushes. Both were interested in the call-broadcast but did not make an attempt to call back or approach. Both points had associations of *Ephedra californica* and *Cylindropuntia biglovii*, however LCTH02SE had an additional association of *Ambrosia salsola*, while LCTH02NM also had *Yucca schidigera* and a separate Cottonwood-Willow Riparian Alliance within the relevé point. On 28 January 2014, in a Dry Wash Woodland Alliance at Dos Palmas Conservation Area, one Crissal Thrasher was also detected after it responded behaviorally to the LCTH calls after the second call-broadcast. The individual did not vocally respond to the calls and lost interest quickly.

Habitat Suitability Model

Occurrence records for LCTH were obtained from the Center for Conservation Biology and Joshua Tree National Park spanning from 2004 through 2014. These occurrence records were used to construct a distribution model which displays habitat that has been identified by the model as suitable for this species (Fig. 5). Habitat suitability models are place-based, using a species' location data to construct a spatial model that synthesizes environmental features (such as land cover, soil types, climate, and topography) selected by that species in that area (see Table 3 for the variables used to construct the LCTH draft habitat model). For the modeling process, a GIS (ArcGIS v.10.2, ESRI Inc. Redlands, California) map of the study area was divided into 180 m × 180 m cells and each cell was scored for underlying environmental variables. Cells containing a species observation were used to create a calibration data set. This dataset is then used to construct the habitat suitability model using the Mahalanobis distance statistic (D^2) (Clark et al. 1993, Browning et al. 2005, Rotenberry et al. 2002, 2006). Habitat suitability models are iterative tools that allow us to better understand the extent of suitable habitat and the potential distribution of a species. As additional information pertaining to a species is gained over time, the respective model for that species can, and should, be refined. This draft Le Conte's Thrasher model may be utilized in future focused surveys for this species to identify areas of suitable habitat which may be incorporated into the survey protocol.

Table 1. Count of Le Conte's Thrasher and Crissal Thrasher detected during the three rounds of 2013-2014 surveys

Location	Dec 6 2013- Jan 15 2014		Jan 16 – Feb 14 2014		Feb 14 – April 4 2014	
	LCTH	**CRTH**	**LCTH**	**CRTH**	**LCTH**	**CRTH**
LCTH02			1		2	
LCTH06						
LCTH07						
LCTH08						
LCTH10						
LCTH12						
LCTH13						
LCTH15						
LCTH16						
LCTH17						
LCTH18						
LCTH22						
LCTH23						
LCTH25						
LCTH27						
LCTH28				1		
Total	**0**	**0**	**1**	**1**	**2**	**0**

Discussion

The 2013-2014 year was the third year of an extreme drought in southern California. The survey sites did not receive any precipitation until a large storm system dropped nearly 2.0 inches in the Stubbe Canyon area from 28 February to 1 March 2014, but little to none on sites east of the pass. All sites had dead herbaceous cover during the first round of surveys. LCTH02 in the Stubbe Canyon area was the only site during the 2013-2014 surveys that had significant change in herbaceous cover (from 5% dead to 15% live cover) and the only site that by 20 Mach 2014 had *Schismus barbatus*, *Erodium cicutarium*, *Brassica tournefortii*, *Gerea canescens*, *Cryptantha* spp., and *Malocothrix glabrata* germinating (~15% cover) at that time. Water was seen running in Stubbe Creek by March as well, although several sites would have creeks in wet years including LCTH06, LCTH07, LCTH08 and some had nearby (within a kilometer) anthropogenic water sources this year including LCTH07, LCTH15, LCTH17, LCTH22, LCTH23, and LCTH28. Disturbance and anthropogenic change were documented at both sites where LCTH were detected. More data is needed before we can assess how the different levels of disturbance and roadedness effect the distribution of thrashers in the Coachella Valley.

The 2013-2014 year being the third year of a major drought may have discouraged any immigration from the Mojave or Joshua Tree National Park where LCTH are found in higher densities across their range. Joshua Tree National Park completed simultaneous surveys for LCTH during the Spring of 2014 using the same local LCTH call collected from Desert Hot Springs which was broadcasted from an iPhone device. Several detections occurred in rocky bajadas of the Pinto Basin, but none in the drier Colorado Desert region or in the western part of the Park (Michael Vamstad, pers comm).

It is highly recommended that most of the sites covered in the 2013-2014 monitoring effort are re-surveyed during the spring following a wet year. This would allow ample time for populations to recover from drought conditions so that researchers can better acquire an adequate estimate of the distribution and abundance of LCTH in the Coachella Valley. Notwithstanding the low number of thrashers detected, this protocol was time intensive; implementing as it was approved by the BWG required two months of surveys for two biologists, further complicated by the difficulty of finding days with weather conditions that met the protocol parameters. Before this species is re-surveyed the BWG should discuss the objectives for this species and determine if those objectives warrant the in-depth coverage and time required to implement this protocol.

The 2013 protocol can be streamlined for efficiency, and should be limited to mornings to increase effectiveness. Currently the protocol was too cumbersome to visit 16 sites three times within the allotted time period given inclement weather. Time is likely to remain a constraint in future surveys, so it is our recommendation that researchers should focus on primary sites with previously recorded occurrence records in or near conservation areas, and survey as many secondary sites as possible between January and March. If the protocol remains as it is, reducing the number of sites visited in a year will help to maintain the spring timeline. Limiting to one site a day with three visits, we recommend no more than 10 sites a year. Dos Palmas sites 28 and 30 could also be integrated into the CRTH protocol to cover the dry wash woodlands in the core area, and both the LCTH and CRTH calls could be played during those surveys to better increase the efficiency of monitoring these species for the objectives outlined in the plan.

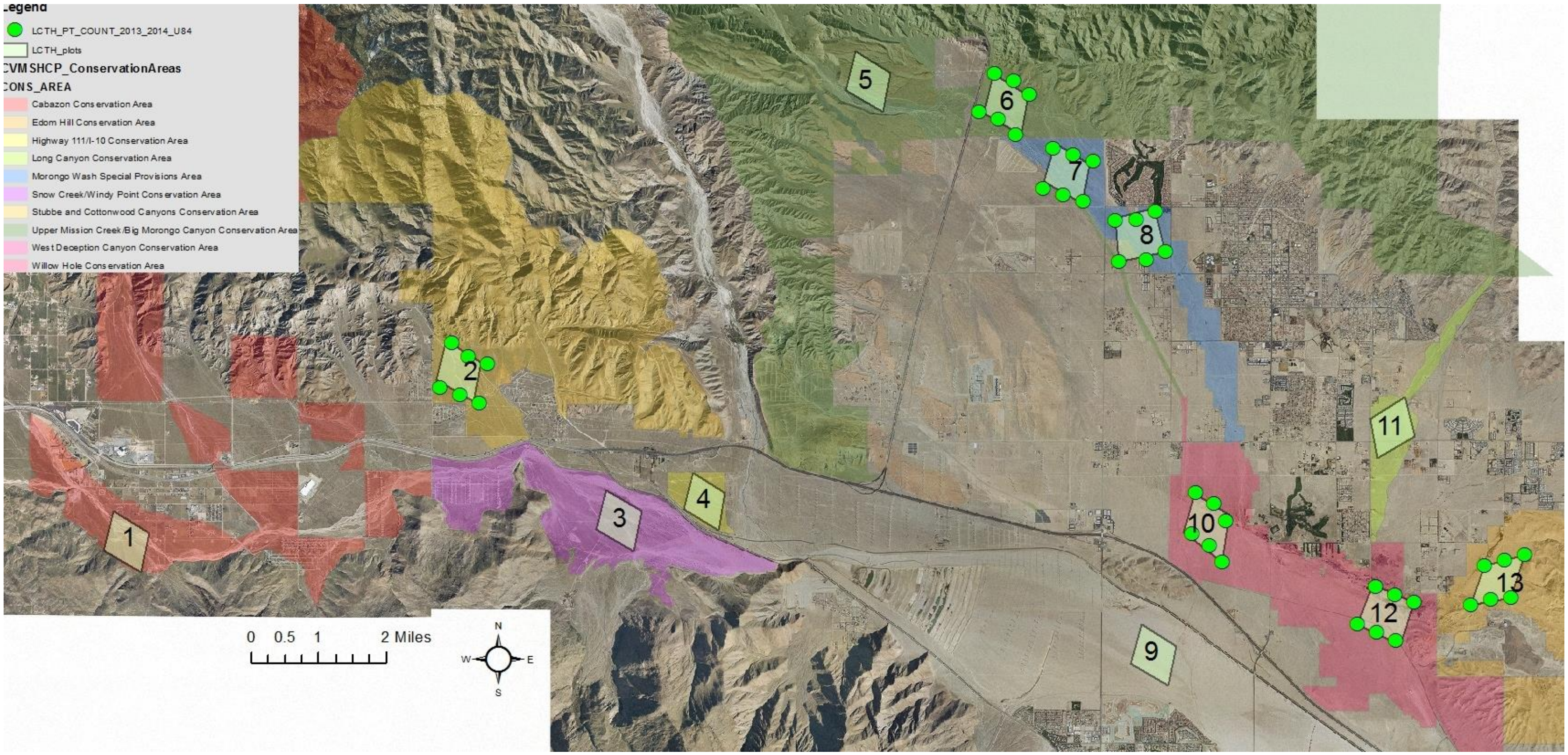

Figure 2. Distribution of LCTH sites in the western Coachella Valley, spanning the Cabazon Conservation Area in the west to the Edom Hill Conservation Area in the east. Green dots indicate call-broadcast points visited during 2013–2014 surveys.

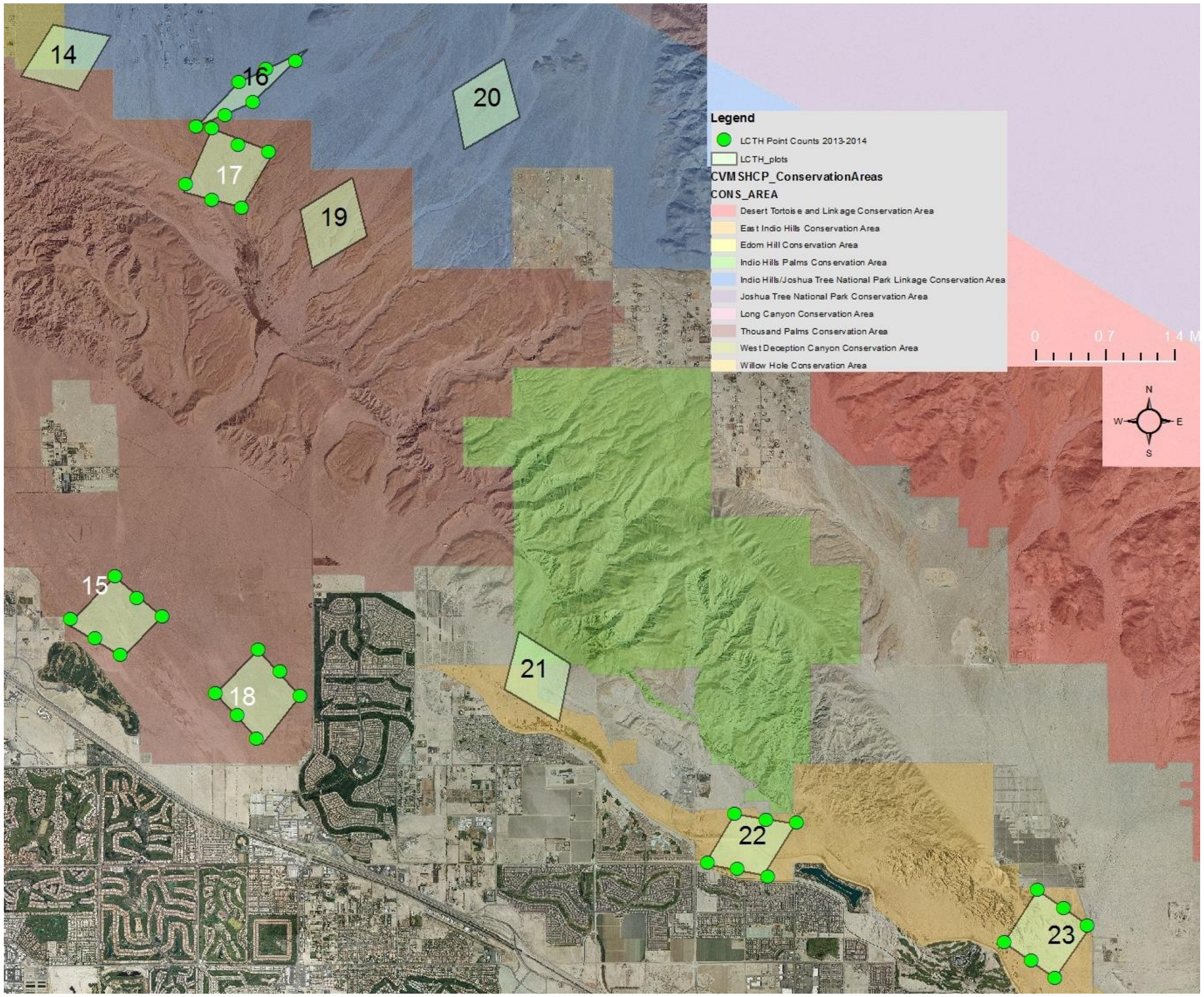

Figure 3. Distribution of LCTH sites in the central Coachella Valley, spanning the Thousand Palms Conservation Area in the west to the East Indio Hills Conservation Area in the east. Green dots indicate call-broadcast points visited during 2013-2014 surveys.

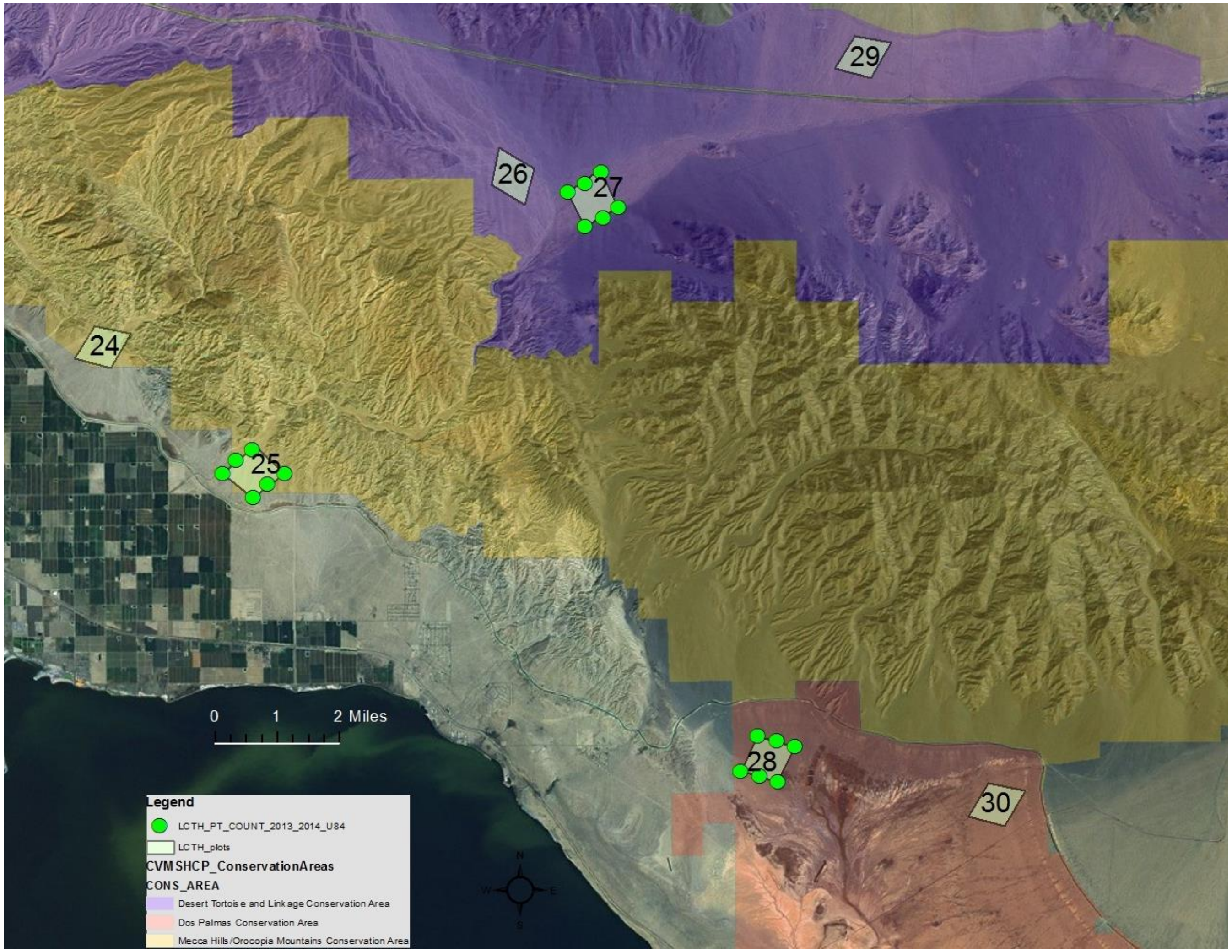

Figure 4. Distribution of LCTH plots in the southeastern Coachella Valley, spanning the Mecca Hills Conservation Area in the west to the Dos Palmas Conservation Area in the southeast. Green dots indicate call-broadcast points visited during 2013-2014 surveys.

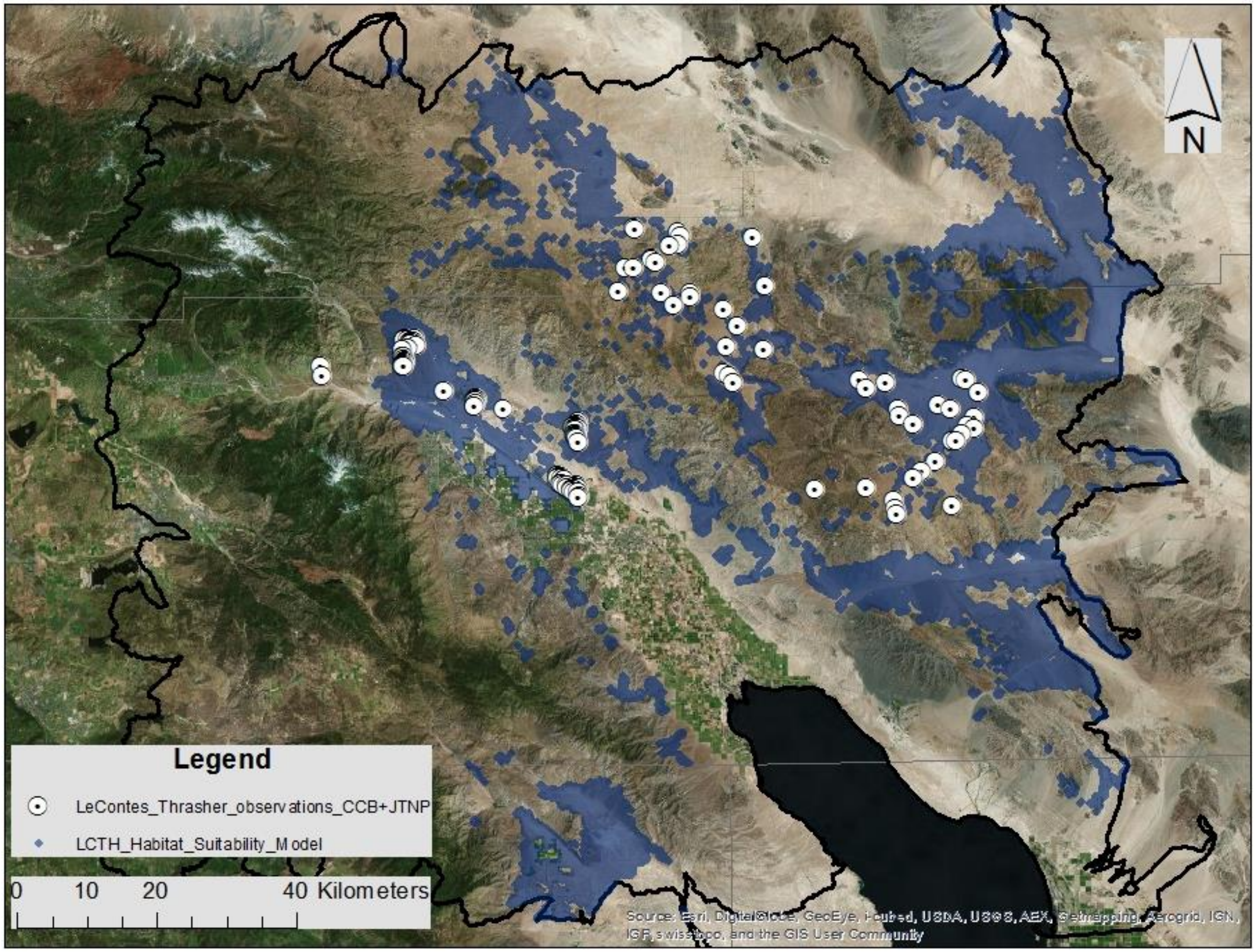

Figure 5. LCTH habitat suitability model and current occurrence points obtained from the Center for Conservation Biology and Joshua Tree National Park

Table 2. Habitat classification and survey results at each LCTH call-broadcast survey point

Point Title	Vegetation Alliance	Vegetation Association	LCTH detected	CRTH detected
Lcth02NE	*Larrea tridentata- Encelia farinosa Shrubland* Alliance	*Yucca schidigera- Krameria grayi-Ephedra californica* Association		
Lcth02NM	*Larrea tridentata- Encelia farinosa Shrubland* Alliance	*Yucca schidigera- Ephedra californica - Cylindropuntia biglovii* Association	2/12/2014 9:38am (1)	
Lcth02NW	*Larrea tridentata- Encelia farinosa Shrubland* Alliance	*Ambrosia salsola* Association		
Lcth02SE	*Larrea tridentata - Encelia farinosa Shrubland* Alliance	*Ephedra californica - Cylindropuntia biglovii- Ambrosia salsola* Association	3/20/2014 11:18am (2)	
Lcth02SM	*Encelia farinosa* Shrubland Alliance	*Yucca schidigera-Ephedra californica* Association		
Lcth02SW	*Encelia farinosa* Shrubland Alliance	*Yucca schidigera -Ephedra californica* Association		
Lcth06NE	*Larrea tridentata - Encelia farinosa* Shrubland Alliance	*Ephedra californica* Association		
Lcth06NM	*Larrea tridentata - Encelia farinosa* Shrubland Alliance	*Ephedra californica* Association		
Lcth06NW	*Larrea tridentata - Encelia farinosa* Shrubland Alliance	*Ephedra californica* Association		
LCTH06SE	*Chilopsis linearis* Woodland Alliance	*Larrea tridentata - Encelia farinosa* Association		
Lcth06SM	*Larrea tridentata - Encelia farinosa* Shrubland Alliance	*Atriplex canescens* Association		
Lcth06SW	*Encelia farinosa* Shrubland Alliance	*Tamarix aphylla* Association		
Lcth07NE	*Larrea tridentata - Encelia farinosa* Shrubland Alliance	*Psorothamnus arborescens* Association		
Lcth07NM	*Larrea tridentata - Encelia farinosa* Shrubland Alliance	*Ambrosia dumosa- Ephedra californica -Psorothamnus arborescens - Ambrosia salsola* Association		
Lcth07NW	*Larrea tridentata - Encelia farinosa* Shrubland Alliance	*Ambrosia dumosa - Ephedra californica* Association		
Lcth07SE	*Larrea tridentata - Ambrosia dumosa* Shrubland Alliance	*Ericameria paniculata* (in wash) Association		
Lcth07SM	*Chilopsis linearis* Woodland Alliance (in wash). *Larrea tridentata - Encelia farinosa* Shrubland Alliance (not in wash)	*Ericameria paniculata* (in wash) Association		

Lcth07SW	*Larrea tridentata - Encelia farinosa* Shrubland Alliance	*Ambrosia dumosa- Psorothamnus arborescens* Association		
Lcth08NE	*Ericameria paniculata* Shrubland Alliance	*Ambrosia salsola* Association		
Lcth08NM	*Ericameria paniculata* Shrubland Alliance	*Ambrosia salsola* Association		
Lcth08NW	*Larrea tridentata - Ambrosia dumosa* Shrubland Alliance	*Encelia farinosa* Association		
Lcth08SE	*Ericameria paniculata - Ambrosia salsola* Shrubland Alliance (in wash), LATR AMDU outside of wash	*Psorothamnus arborescens* Association (outside of wash)		
Lcth08SM	*Larrea tridentata* Shrubland Alliance	*Encelia farinosa* Association		
Lcth08SW	*Larrea tridentata - Encelia farinosa* Shrubland Alliance (not in wash), *Chilopsis linearis* (WASH)	*Ambrosia dumosa- Petalonyx thurberii* Association (not in wash), *Ericameria paniculata - Ambrosia salsola* Association (in wash)		
Lcth10NE	*Larrea tridentata -Ambrosia dumosa* Shrubland Alliance	*Atriplex polycarpa* Association		
Lcth10NM	*Prosopis glandulosa - Atriplex* spp. Alliance	*Larrea tridentata - Ambrosia dumosa* Association		
Lcth10NW	*Larrea tridentata* Shrubland Alliance	*Atriplex polycarpa* Association		
Lcth10SE	*Larrea tridentata* Shrubland Alliance	*Psorothamnus arborescens* Association		
Lcth10SM	*Larrea tridentata - Ambrosia dumosa* Shrubland Alliance	*Psorothamnus arborescens* Association		
Lcth10SW	*Larrea tridentata -Ambrosia dumosa* Shrubland Alliance	*Krameria grayi- Psorothamnus arborescens* Association		
Lcth12NE	*Atriplex* Shrubland Alliance	*Larrea tridentata - Tamarix aphylla* Association		
Lcth12NM	*Atriplex* Shrubland Alliance	*Larrea tridentata* Association		
Lcth12NW	*Prosopis glandulosa- Atriplex polycarpa* Alliance	*Tamarix aphylla - Atriplex* spp. Association		
Lcth12SE	*Larrea tridentata* Alliance	*Parkinsonia florida* Association		
Lcth12SM	*Larrea tridentata* Shrubland Alliance	none		
Lcth12SW	*Larrea tridentata* Shrubland Alliance	none		
Lcth13NE	*Larrea tridentata-Ambrosia dumosa* Alliance	none		
Lcth13NM	*Larrea tridentata-Ambrosia dumosa* Alliance	*Croton californica* Association		

Lcth13NW	*Larrea tridentata* Shrubland Alliance	*Ambrosia dumosa* Association		
Lcth13SE	*Larrea tridentata* Shrubland Alliance	*Ambrosia dumosa* Association		
Lcth13SM	*Larrea tridentata* Shrubland Alliance	*Ambrosia dumosa* Association		
Lcth13SW	*Larrea tridentata-Ambrosia dumosa* Shrubland Alliance	*Croton californica* Association		
Lcth15NE	*Larrea tridentata* Shrubland Alliance	*Atriplex canescens* Association		
Lcth15NM	*Larrea tridentata* Shrubland Alliance	*Atriplex canescens* Association		
Lcth15NW	*Larrea tridentata* Shrubland Alliance	*Atriplex canescens* Association		
Lcth15SE	*Larrea tridentata* Shrubland Alliance	*Atriplex canescens* Association		
Lcth15SM	*Larrea tridentata* Shrubland Alliance	*Atriplex canescens* Association		
Lcth15SW	Non-Vegetated <2% Absolute Vegetation	*Larrea tridentata* Association		
Lcth16NE	*Larrea tridentata-Ambrosia dumosa* Shrubland Alliance	*Ambrosia salsola* Association		
Lcth16NM	*Larrea tridentata-Ambrosia dumosa* Shrubland Alliance	*Encelia farinosa-Psorothamnus schottii* Association		
Lcth16NW	*Larrea tridentata-Ambrosia dumosa* Shrubland Alliance	*Encelia farinosa-Psorothamnus schottii* Association		
Lcth16SE	*Larrea tridentata-Ambrosia dumosa* Shrubland Alliance	*Ambrosia salsola-Psorothamnus schottii* Association		
Lcth16SM	*Larrea tridentata-Ambrosia dumosa* Shrubland Alliance	*Psorothamnus schottii - Krameria grayi* Association		
Lcth16SW	*Larrea tridentata* Shrubland Alliance	*Ambrosia dumosa- Krameria grayi-Cylindropuntia ramossisima- Ferocactus cylindraceus* Association		
Lcth17NE	*Larrea tridentata* Shrubland Alliance	*Ambrosia dumosa -Encelia farinosa- Krameria grayi-Cylindropuntia ramossisima-Ferocactus cylindraceus* Association		
Lcth17NM	*Larrea tridentata-Ambrosia dumosa* Shrubland Association	*Ambrosia salsola-Psorothamnus schottii* Association		
Lcth17NW	*Larrea tridentata-Ambrosia dumosa* Shrubland Association	*Ambrosia dumosa-Psorothamnus schottii-Ambrosia salsola-Cylindropuntia ramossisima-Petalonyx thurberii* Association		

Lcth17SE	*Psorothamnus spinosus* Shrubland Alliance	*Psorothamnus schottii-Ambrosia salsola* Association		
Lcth17SM	*Psorothamnus spinosus* Shrubland Alliance	*Atriplex polycarpa-Ambrosia salsola* Association		
Lcth17SW	*Larrea tridentata-Ambrosia dumosa* Shrubland Association	*Ambrosia salsola - Atriplex polycarpa* Association		
Lcth18NE	*Atriplex canescens* Shrubland Alliance	*Larrea tridentata-Atriplex polycarpa* Association		
Lcth18NM	*Larrea tridentata* Shrubland Alliance	*Atriplex canescens* Association		
Lcth18NW	*Larrea tridentata* Shrubland Alliance	*Atriplex canescens* Association		
Lcth18SE	Non-Vegetated <2% Absolute Vegetation	*Atriplex polycarpa* Association		
Lcth18SM	*Atriplex polycarpa* Shrubland Alliance	*Larrea tridentata-Atriplex canescens* Association		
Lcth18SW	*Atriplex polycarpa* Shrubland Alliance	*Larrea tridentata-Atriplex canescens* Association		
Lcth22NE	*Atriplex canescens* Shrubland Alliance	*Larrea tridentata* Association		
Lcth22NM	*Larrea tridentata-Ambrosia dumosa* Shrubland Association	*Psorothamnus schottii - Encelia farinosa* Association		
Lcth22NW	*Larrea tridentata - Encelia farinosa* Shrubland Alliance	*Psorothamnus schottii* Association		
Lcth22SE	*Atriplex canescens/polycarpa* Shrubland Alliance	*Larrea tridentata* Association		
Lcth22SM	*Prosopsis glandulosa* Woodland Alliance	*Atriplex spp. Association*		
Lcth22SW	*Prosopsis glandulosa* Woodland Alliance	*Atriplex* spp. Association		
Lcth23NE	*Atriplex canescens* Shrubland Alliance	*Larrea tridentata- Ambrosia dumosa* Association		
Lcth23NM	*Larrea tridentata — Ambrosia dumosa* Shrubland Alliance	*Atriplex -Petalonyx thurberii* Association		
Lcth23NW	*Larrea tridentata* Shrubland Alliance	*Psorothamnus emoryii-Petalonyx thurberii* Association		
Lcth23SE	*Larrea tridentata* Shrubland Alliance	*Atriplex canescens* Association		
lcth23SM	*Atriplex polycarpa* Shrubland Alliance	*Tamarix aphylla - Atriplex canescens* Association		
Lcth23SW	*Tamarix aphylla* Alliance	*Larrea tridentata- Atriplex polycarpa- Ephedra californica* Association		
Lcth25EM	*Olneya tesota- Psorothamnus schottii* Alliance	*Larrea tridentata- Ambrosia dumosa* Association		
Lcth25NE	*Larrea tridentata* Shrubland Alliance	*Bebbia juncea* Association		

Lcth25NW	*Parkinsonia florida-Olneya tesota* Woodland Alliance	*Psorothamnus schottii-Ambrosia salsola* Association		
Lcth25SE	*Olneya tesota- Psorothamnus schottii* Alliance	*Larrea tridentata- Ambrosia dumosa* Association		
Lcth25SW	*Parkinsonia florida-Olneya tesota* Woodland Alliance	*Psorothamnus schottii-Ambrosia salsola* Association		
Lcth25WM	*Parkinsonia florida-Olneya tesota* Woodland Alliance	*Psorothamnus schottii-Ambrosia salsola* Association		
Lcth27EM	*Parkinsonia florida-Olneya tesota* Woodland Alliance	*Larrea tridentata- Ambrosia dumosa- Ambrosia salsola-Bebbia juncea* Association		
Lcth27NE	*Parkinsonia florida-Olneya tesota* Woodland Alliance	*Larrea tridentata- Ambrosia salsola* Association		
Lcth27NW	*Olneya tesota- Fouquieria splendens* Alliance	*Larrea tridentata- Ambrosia dumosa- Ambrosia salsola* Association		
Lcth27SE	*Parkinsonia florida- Olneya tesota* Alliance	*Psorothamnus schottii-Ambrosia salsola* Association		
Lcth27SW	*Parkinsonia florida-Olneya tesota* Woodland Alliance	*Larrea tridentata- Ambrosia dumosa- Encelia farinosa* Association		
Lcth27WM	*Parkinsonia florida-Olneya tesota* Woodland Alliance	*Larrea tridentata- Ambrosia dumosa* Association		
Lcth28NE	*Parkinsonia florida* Woodland Alliance	*Larrea tridentata- Atriplex polycarpa* Association		
Lcth28NM	*Larrea tridentata* Shrubland Alliance	*Parkinsonia florida- Atriplex hymenolytra- Psorothamnus schottii-Ambrosia salsola* Association		
Lcth28NW	*Parkinsonia florida* Woodland Alliance	*Larrea tridentata-Psorothamnus schottii-Ambrosia salsola* Association		1/28/2014 9:50am (1)
Lcth28SE	*Parkinsonia florida- Olneya tesota* Woodland Alliance	*Washingtonia filifera- Prosopis glandulosa- Atriplex polycarpa* Association		
Lcth28SM	*Larrea tridentata* Shrubland Alliance	*Atriplex polycarpa-Psorothamnus schottii* Association		
Lcth28SW	*Parkinsonia florida- Olneya tesota* Woodland Alliance	*Larrea tridentata- Ambrosia dumosa- Psorothamnus arborescens* Association		

Table 3. Environmental variables selected to construct the LCTH draft habitat suitability model.

Variables	Variable descriptions
Average precipitation	Average total precipitation from December-March during years 1971-2000
Ruggedness	Sappington ruggedness analysis of a 18 x 18 neighborhood of 10m cells
Elevation	Elevation: Median elevation above mean sea level for a 18 x 18 neighborhood of 10m cells
Maximum temperature	Average maximum temperature occurring July-August during years 1971 - 2000
Landcover	Landcover: Warm desert active and stabilized dune (within a 180m x 180m neighborhood)
Landcover	Landcover: Mojave mid-elevation mixed desert scrub (within a 180m x 180m neighborhood)
Landcover	Landcover: California central valley and southern coastal grassland (within a 180m x 180m neighborhood)
Landcover	Landcover: Bedrock cliff, outcrop, and badland (within a 510m x 510m neighborhood)
Landcover	Landcover: Sonora-Mojave creosote bush-white bursage desert scrub (within a 510m x 510m neighborhood)
Landcover	Landcover: Desert saltbush scrub (within a 510m x 510m neighborhood)
Edaphic	Edaphic: Count of 30m cells within a 510m x 150m neighborhood that are classified as rock outcrops
Model performance	
# records (known occurrences)	130
# partitions (equal to variables used)	11
Partition selected	2
P-Value	0.898
HSI value	0.70 (70%)
Area of modeled suitable habitat (ha)	134,482

Results of 2013-2014 protocol surveys for Crissal Thrasher (*Toxostoma crissale*) within the Coachella Valley

Introduction

Crissal Thrasher (*Toxostoma crissale,* CRTH) are widely distributed across arid regions of southwestern United States, south-central Mexico, and northeast Baja California. Preferred habitat consists of patches of dense vegetation such as riparian scrub thickets and dry wash woodlands (Shuford and Gardali 2008). Within California they are most abundant along the Colorado River and have been historically associated with mesquite (*Prosopis* species) stands although they can commonly be found in dry wash woodlands dominated by ironwood, palo verde, saltbush and saltcedar (Rosenberg et al. 1991, Laudenslayer 1992, Fletcher 2009, Cody 1999). CRTH are currently considered a Priority 3 Bird Species of Special Concern (Shuford and Gardali 2008) due to habitat loss and degradation and invasion of alien species.

CRTH are regarded as cryptic due to their foraging behavior on the ground beneath dense shrubs and trees (Laudenslayer 1992, Fletcher 2009). They primarily consume beetles and will also subsidize their diet with caterpillars, maggots, grasshoppers, and ants throughout the year (Rosenberg et al. 1991). Water is often present at sites where they are found, although its presence is not thought to be a critical habitat component (Dobkin and Granholm 1990, Shuford and Gardali 2008). This species is a year-round resident in California and has been found to breed from February to late July (Cody 1999). There are recent occurrence records from eBird (www.eBird.org) and Christmas Bird Counts (www.audubon.org/christmas-bird-count) documenting CRTH in the eastern Coachella Valley Multiple Species Habitat Conservation Plan (CVMSHCP) area in the Dos Palmas and Coachella Valley Stormwater Channel Delta Conservation Areas. No recent occurrence records have been documented west of the Indio Hills, in Willow Hole and Thousand Palms Conservation Areas that currently have mesquite habitat. One recent record of three CRTH has been confirmed south of the East Indio Hills Conservation Area at the Del Lago Golf Course.

Objectives

These surveys were carried out to establish baseline occurrence records as part of the CVMSHCP monitoring plan by the UC Riverside Center for Conservation Biology. Surveys for the CRTH were conducted following the guidelines and objectives outline by the CVMSHCP and carried out using the March 2014 protocol developed by the Coachella Valley Conservation Commission's Biological Working Group (BWG). With this baseline effort, the primary objectives were to assess the presence and distribution of Crissal Thrasher within the Plan's Conservation Areas, and to collect information about potential habitat attributes. These data will help determine habitat suitability for this species in order to facilitate the development of hypotheses and models designed in aiding sustainable conservation.

Methods

Site Selection

Prior to the 2013-2014 survey season there had not been a baseline monitoring effort for this species that adequately surveyed habitat within the core Dos Palmas and Coachella Valley Stormwater Channel and Delta Conservation Areas. The 2014 survey effort focused on these two main areas, with 30 survey sites within each, for a total of 60 survey sites. These two areas represent very different habitat types. Dos Palmas Conservation Area is dominated by California Fan Palms (*Washingtonia filifera)* and Honey Mesquite (*Prosopis glandulosa*), with surrounding salt scrub and dry wash woodlands. The CV Stormwater Channel and Delta Conservation Area is dominated by riparian vegetation and saltscrub, interspersed with natural and agricultural palm oases and dense thickets. Dos Palmas sites 1-15 encompass San Andreas Palms and mesquite areas on the western end of Dos Palmas Conservation Area, while Dos Palmas sites 16-30 focus on the larger palm oasis and the mesquite areas occurring to the east (Fig. 6). CV Stormwater Delta sites 31-40 focus on the salt scrub and agricultural palm oases from the Stormwater Channel and Buchanan Street Drain. Sites 41-50 focus on the levees of the Stormwater Channel from Buchanan Street Drain to the Lincoln Street Drain, and 51-60 focus on the riparian areas around the Johnson Street Drain south to the Delta (Fig. 7). All sites were visited during the first round of surveys, however sites 31-35 along Buchanan Street Drain were deemed unsuitable for CRTH due to a recent wildfire resulting in the loss of all mesquite habitat. The remaining vegetation consisted of a band of tamarisk (*Tamarix ramosissima*) east of the burned area near Highway 86, as well as a stand of fan palms (*Washingtonia filifera*) and date palms (*Phoenix dactylifera*) at the end of Buchanan Street. Sites 31-35 were not revisited during the second or third rounds of surveys.

Data Collection

Call-broadcast surveys were done at 60 sites set 250m apart in the two Conservation Areas deemed as Core Habitat for CRTH: Dos Palmas Conservation Area (Fig. 6) and CV Stormwater Channel and Delta Conservation Area (Fig. 7). To maximize detection probability and document change in herbaceous and invasive cover, points were visited three times during the sampling period (Conway and Simon 2003). The first round of surveys was completed over 8 days between 28 April 2014 and 23 May 2014. The second round was completed in 7 days, beginning 22 May 2014 and ending 5 June 2014. The third round was completed in 4 days between 9 June and 13 June 2014. Call-broadcast surveys have been shown to be most effective when sustained winds are no greater than Beaufort Scale 4 (20-28 km/hr), and when there is no rainfall (Conway and Simon 2008). The first survey period was extended over the longest timeframe owing to windy conditions preventing surveys of the more eastern sites for several days, during which time focused surveys were instead conducted for rare plant species. Survey for CRTH were always prioritized over other species-specific monitoring efforts when weather was within the boundaries defined by the protocol.

A field recording of a singing male CRTH (obtained from Stokes Field Guide to Bird Songs) was used for the call-broadcast surveys. The recording was looped to create a 60 second sound file on an mp3 player, which was then broadcast through an amplified field speaker at peak volume. At each broadcast point two observers surveyed simultaneously beginning with a passive detection period of two minutes where they scanned vegetation and the surrounding landscape for birds, followed by the 60 second song broadcast. After each broadcast, a three minute detection period followed where observers scanned with binoculars and listened for a vocal response. If no response was detected, observers repeated the 1 minute playback / 3 minute detection period twice. If CRTH were detected then data was collected detailing the response time, direction and distance, type/duration of vocals, and behaviors of the CRTH and call-broadcasts were stopped.

We employed the CNPS/CDFG Combined Vegetation Rapid Assessment Relevé protocol (Buck-Diaz and Evan 2011) in addition to species-focused methods to document habitat attributes such as vegetation communities, slope and substrate, and measure the presence and extent of invasive plant species. Variables recorded at each point include adjacent land uses (suburban, agriculture, natural open space) and degrees of anthropogenic alteration (as outlined in the CNPS/CDFW protocol). Surveys also documented varying densities of invasive species and attempted to quantify the change in levels of herbaceous cover and invasive plant species infestations. All incidental bird sightings were also recorded (Appendix B).

Results

A total of ten Crissal Thrashers were detected between both Conservation Areas during the 2013-2014 monitoring efforts (Table 4). Six CRTH were detected at the Dos Palmas Conservation Area, one of which was detected during focused surveys for Le Conte's Thrashers on 28 January 2014, in a Dry Wash Woodland Alliance. Four detections occurred in the CV Stormwater Channel Delta Conservation Area.

Dos Palmas Conservation Area Detections

The first CRTH detected during the focused surveys for Crissal Thrasher was on 8 May 2014 at site CRTH17, which is surrounded by a *Washingtonia filifera – Prosopis glandulosa* woodland alliance (Fig. 6, Table 5). The individual vocally responded to the call-broadcast and briefly appeared during the second call. It flew from a fan palm down behind a stand of mesquite and disappeared from view ~75m away from the broadcast point center. The site was upon a gravel access road with medium disturbance from daily vehicle activity. It was also slightly NW in aspect, and the substrate was classified as 5% water, 20% gravel, and 75% fines, following the protocol. Another CRTH individual was detected at this same site during the second round of surveys, 2 June 2014. At 8:55am, after the first call-broadcast, a CRTH flew from the same area where it was spotted during the first round of surveys towards fan palms along the access road where the observers were stationed. The individual disappeared behind a fan palm and was not seen again. Because the birds are not banded, it is unknown whether this sighting was a unique individual or the same individual that was first detected at this site a month previous.

On 15 May, a CRTH was detected at 11:20am at site CRTH26, a *Prosopis glandulosa* woodland alliance with associations of *Larrea tridentata* and *Pluchea sericea* (Fig. 6, Tables 4 and 5). This site was on top of a berm which surrounded a dry degraded holding pond with nearby mesquite, scattered palo verde and fan palms. A vehicle trail cut through the site. The substrate was classified as 15% stone, 30% cobble, 35% gravel, and 20% fines. After the second call-broadcast one Crissal thrasher flew out from behind a mesquite and perched briefly in a palo verde ~70m from the observers before flying west and disappearing beyond a stand of fan palms. The individual was interested in the call-broadcast but did not make an attempt to call back or approach. On an adjacent site (CRTH25), during the second round of surveys, another CRTH was sighted 3 June, a little after 9:00am. It appeared after the first call-broadcast, perched briefly and then flew to the ground. It did not reappear during the second attempt at call-broadcasts. The site had a slight SE aspect with substrate composed of 35% stone, 30% cobble, 30% gravel, and 5% fines. The site had a *Parkinsonia florida* woodland alliance with an *Acacia greggii-Ambrosia salsola* shrubland association. On the same day a CRTH was spotted at site CRTH27 in a *Prosopis glandulosa* vegetation alliance with an *Atriplex polycarpa* association (Fig. 6). At 9:47am, after the first call-broadcast, the individual appeared briefly to perch on a tall snag and then flew down to disappear behind a stand of mesquite. The individual did not reappear or vocally respond after the second call-broadcast. No third call-broadcast was attempted.

Coachella Valley Stormwater Channel and Delta Conservation Area Detections

On 21 May 2014, the first Crissal Thrasher was detected at 9:45am along the CV stormwater channel between sites CRTH46 and CRTH47 (Fig. 7). The individual was first spotted flying from a tamarix stand to a patch of mesquite ~100m NE of the northern channel berm in an area with a drainage canal at the edge of a fallow field. Because the individual was opportunistically spotted, the observers played a call-broadcast to verify the identity of the individual. The individual responded by flying closer to the observers at which time it was confirmed as being a CRTH. All sites upon the berm were flat, and consisted of substrate that was greater than 97% fines.

Upon reaching site CRTH46 the observers played the call-broadcast and spotted a CRTH ~125m E of the broadcast point (Table 4). It is assumed that the individual was the same CRTH sighted previously, however it did not approach in response to the call-broadcast. The site had a *Tamarix* spp. semi-natural shrubland alliance with a *Suaeda moquinii - Atriplex lentiformis* association (Table 5). After moving on to site CRTH45 at 10:24am, the observers spotted a CRTH near fan palms on the opposite (SW) side of the stormwater channel. The individual vocally responded to the call-broadcast but did not approach. The observers noted that the individual was almost directly across from the area where the first CRTH sighting took place in between sites CRTH46 and CRTH47, thus it may have been the same individual. No individual was heard or spotted at site CRTH44. Site CRTH43 was reached at 11:04am, whereby another CRTH appeared during the second call-broadcast. The individual was first spotted as it landed at the top of a tamarisk located directly adjacent to the call-broadcast point. After landing it almost immediately flew to the berm substrate where it ran across the berm ~15m in front of the observers to investigate the source of the call-broadcast before flying off. The behavior of the bird, specifically its surprise and curiosity in regards to the call-broadcast, suggested that it was a new CRTH individual and not the individual spotted prior.

One final CRTH was detected on 10 June 2014 near the Whitewater delta along the stormwater channel at site CRTH57 (Fig. 7). The call-broadcast point was located on the NE side of the channel, ~100 NW of where Johnson Street drain intersects the stormwater channel in a *Tamarix* spp. semi-natural shrubland alliance with an *Allenrolfea occidentalis* association. Upon arrival at the site at 10:00am, a thrasher-like call was heard coming from the vicinity of the dense vegetation in the channel, however there was no response to the call-broadcasts. During the final detection period after the third call-broadcast a CRTH was spotted flying across the channel towards the observer. It landed in a nearby tamarisk to investigate the source of the call-broadcast and approached the observer by flying from tree to tree.

Table 4. Count of Crissal Thrashers detected during the three rounds of 2013-2014 surveys

Location	April 28 - May 23 2014	May 22- June 5 2014	June 9 – June 13 2014
CRTH17	1	1	
CRTH25		1	
CRTH26	1		
CRTH27		1	
CRTH43	1		
CRTH45	1		
CRTH46	1		
CRTH57			1
Total	**5**	**3**	**1**

Discussion

The 2013-2014 year was the third year of an extreme drought in southern California. Although the drought apparently impacted the effectiveness of focused surveys for Le Conte's Thrasher, focused surveys for Crissal Thrashers were more successful, with three times the number of detections. The Core Habitat areas for CRTH (Dos Palmas Conservation Area and CV Stormwater Channel and Delta Conservation Area) have perennial water sources, thus the drought impact to individuals occupying those habitats may not be as severe. No change in herbaceous cover was documented between the three rounds of surveys indicating a lack of late spring precipitation. Disturbance and anthropogenic change were documented all sites where CRTH were detected. The spread of saltcedar (*Tamarix ramosissima*) and its replacement of native riparian vegetation has been indicated as a leading factor in this species decline near the Salton Sea (Patten et al. 2003), although CRTH has been reported as using saltcedar habitat in the lower Colorado River (Hunter et al. 1988). Saltcedar was present, and mesquite lacking, at all sites where CRTH were detected in the CV Stormwater Channel and Delta Conservation Area (Table 4), which may indicate a willingness for this species to utilize saltcedar habitat when more preferred habitat is unavailable. An additional cause of CRTH declines across its range is attributed to loss and degradation of mesquite from anthropogenic lowering of the water table and agricultural expansion (Unitt 2004, Shuford and Gardali 2008). More data is needed before we can assess how the different levels of disturbance and invasive species composition effect the distribution and reproductive success of thrashers in the Coachella Valley.

Although habitat for CRTH may have perennial sources of water, the surrounding habitat may be depressed as a result of drought conditions thereby limiting the full extent of potential foraging habitat available to thrashers, especially to breeding pairs. It is highly recommended that the sites covered in the

2013-2014 monitoring effort are re-surveyed during the spring following a wet year. This would allow ample time for populations, and the surrounding landscape, to recover from drought conditions so that researchers can better acquire an adequate estimate of the distribution and abundance of CRTH in the Coachella Valley.

During the Le Conte's Thrasher focused surveys, one Crissal Thrasher was detected in a Dry Wash Woodland in the western area of Dos Palmas (LCTH sites 28 and 30; see the 2013-2014 survey results for Le Conte's Thrasher, this report). These sites could be integrated into future CRTH surveys to cover the dry wash woodlands in the core area, and both the LCTH and CRTH calls could be played during those surveys to better increase the efficiency of monitoring these species for the objectives outlined in the Plan.

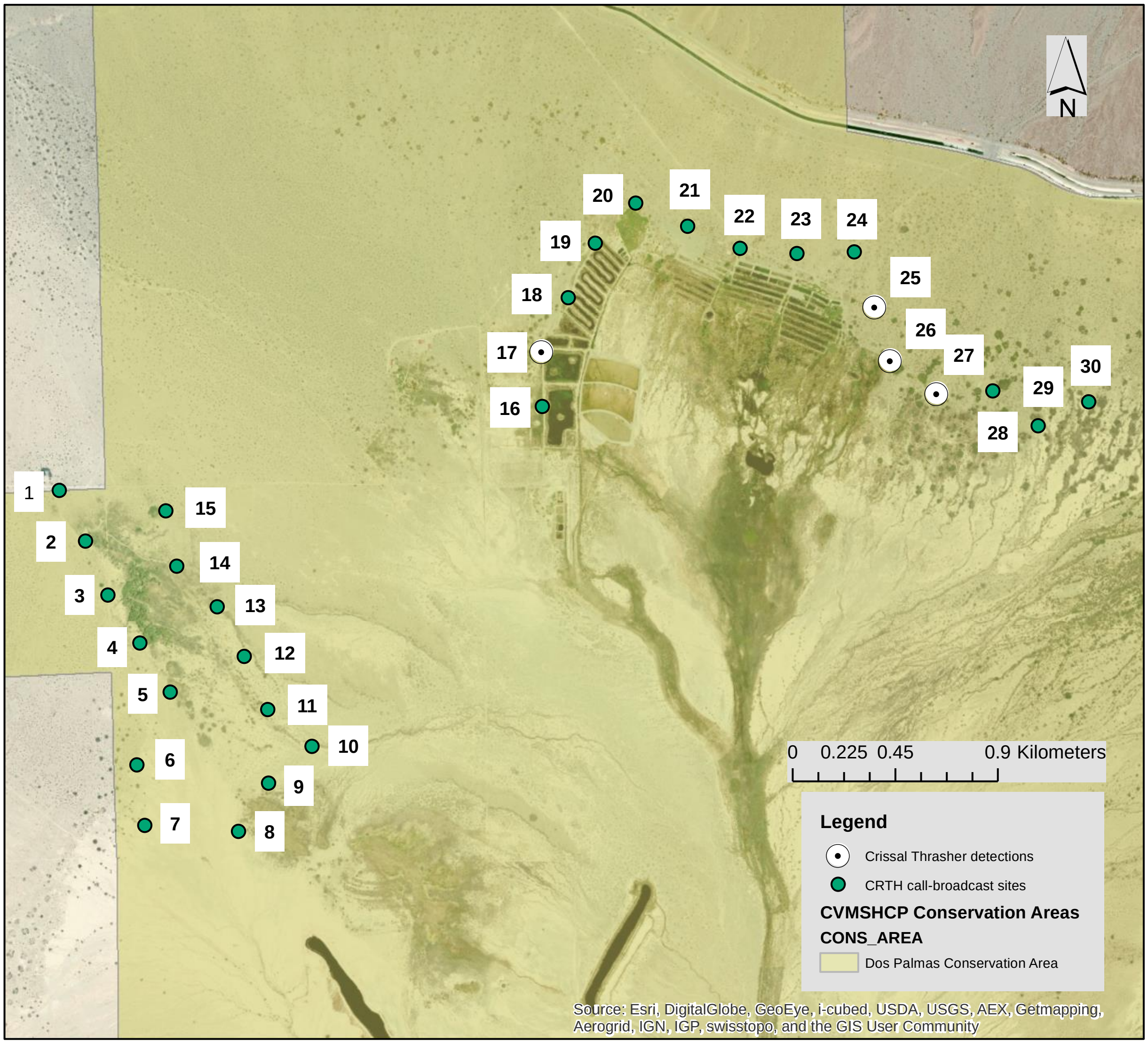

Figure 6. Distribution of CRTH sites and detections in the Dos Palmas Conservation Area

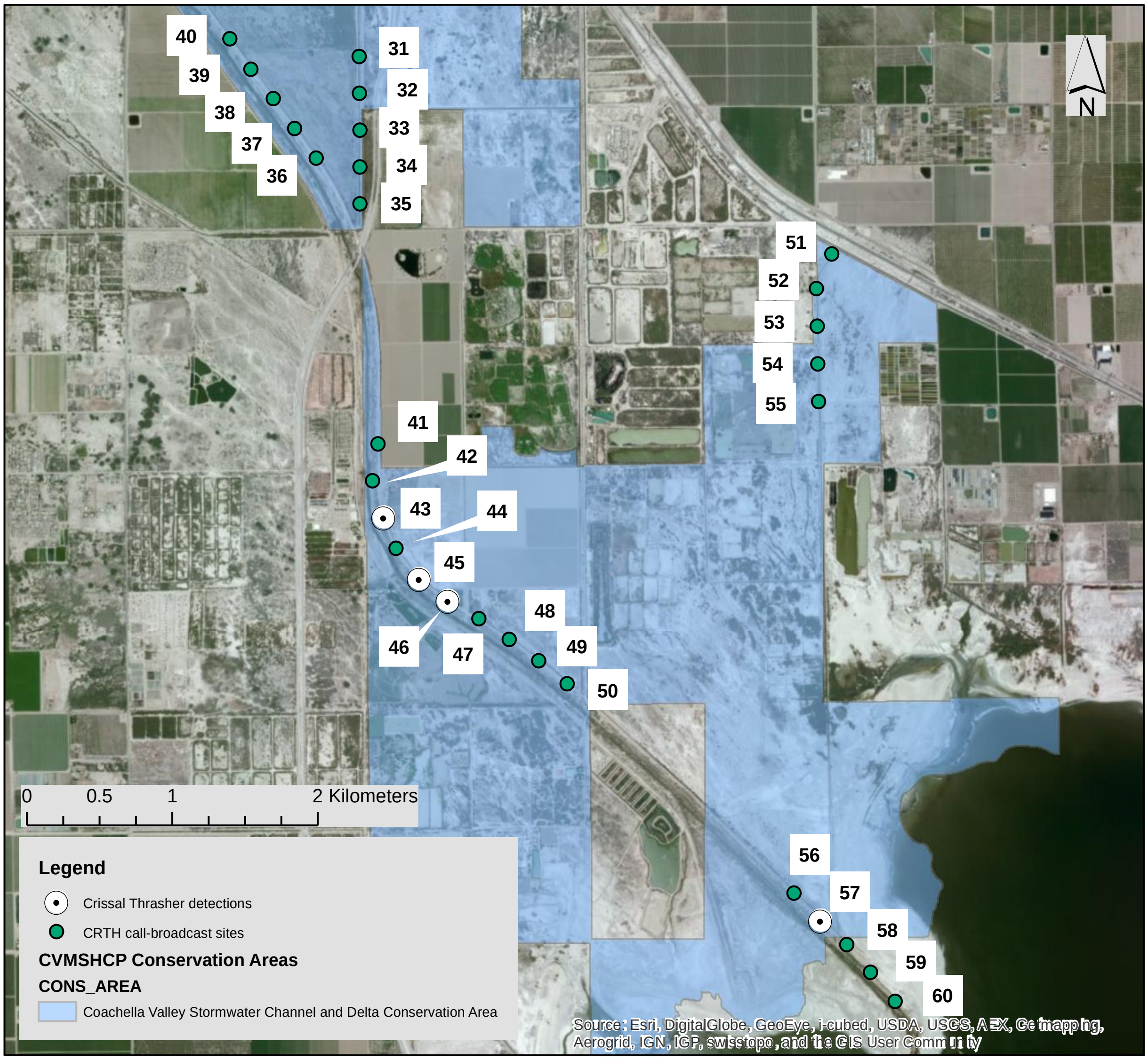

Figure 7. Distribution of CRTH sites and detections in the Coachella Valley Stormwater Channel and Delta Conservation Area

Table 5. Preliminary habitat classification and survey results at each CRTH call-broadcast survey point. (Vegetation alliances and associations are subject to change upon completion of the vegetation map for this region)

Point Title	Vegetation Alliance	Vegetation Association	CRTH detected
CRTH01	*Atriplex polycarpa - Isocoma acradenia* Alliance	*Prosopis glandulosa/ Encelia farinosa* Association	
CRTH02	*Washingtonia filifera* Woodland Alliance	*Isocoma acradenia - Atriplex polycarpa -Suaeda moquinii* Association	
CRTH03	*Washingtonia filifera* Woodland Alliance	*Atriplex canescens - Atriplex polycarpa* Association	
CRTH04	*Washingtonia filifera* Woodland Alliance	*Atriplex canescens* Association	
CRTH05	*Prosopis glandulosa* Woodland Alliance	*Pluchea sericea* Association	
CRTH06	*Prosopis glandulosa* Woodland Alliance	*Atriplex canescens* Association	
CRTH07	*Prosopis glandulosa* / *Atriplex canescens* Alliance	*Atriplex hymenelytra - Lycium andersonii* Association	
CRTH08	*Allenrolfea occidentalis* Shrubland Alliance	*Washingtonia filifera /Atriplex hymenelytra - Atriplex canescens* Association	
CRTH09	*Prosopis glandulosa* / *Allenrolfea occidentalis* Alliance	*Washingtonia filifera- Tamarix ramosissima / Isocoma acradenia* Association	
CRTH10	*Allenrolfea occidentalis* Shrubland Alliance	*Prosopis glandulosa* Association	
CRTH11	*Allenrolfea occidentalis* Shrubland Alliance	*Prosopis glandulosa* Association	
CRTH12	*Washingtonia filifera* Woodland Alliance	*Allenrolfea occidentalis* Association	
CRTH13	*Washingtonia filifera* Woodland Alliance	*Atriplex canescens - Pluchea sericea* Association	
CRTH14	*Pluchea sericea* Shrubland Alliance	*Suaeda moquinii* Association	
CRTH15	*Prosopis glandulosa* Woodland Alliance	*Atriplex canescens* Association	
CRTH16	*Prosopis glandulosa* Woodland Alliance	*Phragmites australis - Distichlis spicata* Association	
CRTH17	*Washingtonia filifera - Prosopis glandulosa* Woodland Alliance	*Allenrolfea occidentalis* Association	5/8/2014 (1); 6/2/2014 8:55am (1)

CRTH18	*Washingtonia filifera* Woodland Alliance	*Prosopis glandulosa / Phragmites australis* Association	
CRTH19	*Washingtonia filifera* Woodland Alliance	*Prosopis glandulosa - Pluchea sericea / Phragmites australis* Association	
CRTH20	*Washingtonia filifera* Woodland Alliance	*Parkinsonia florida / Isocoma acradenia* Association	
CRTH21	*Prosopis glandulosa - Parkinsonia florida* Woodland Alliance	*Larrea tridentata - Encelia farinosa* Association	
CRTH22	*Parkinsonia florida* Woodland Alliance	*Washingtonia filifera - Prosopis glandulosa / Larrea tridentata* Association	
CRTH23	*Parkinsonia florida* Woodland Alliance	*Larrea tridentata - Ambrosia salsola - Atriplex hymenelytra* Association	
CRTH24	*Parkinsonia florida* Woodland Alliance	*Atriplex hymenelytra - Encelia farinosa* Association	
CRTH25	*Parkinsonia florida* Woodland Alliance	*Acacia greggii - Ambrosia salsola* Association	6/3/2014 9:00am (1)
CRTH26	*Prosopis glandulosa* Woodland Alliance	*Larrea tridentata - Pluchea sericea* Association	5/15/2014 11:20am (1)
CRTH27	*Prosopis glandulosa* Woodland Alliance (*Parkinsonia florida* beyond the plot)	*Atriplex polycarpa* Association	6/3/2014 9:47am (1)
CRTH28	*Prosopis glandulosa* Woodland Alliance	*Larrea tridentata - Psorothamnus schottii - Atriplex hymenelytra* Association	
CRTH29	*Prosopis glandulosa* Woodland Alliance	*Atriplex canescens - Atriplex polycarpa* Association	
CRTH30	*Prosopis glandulosa* Woodland Alliance	*Atriplex hymenelytra* Association	
CRTH31	Non-Vegetated <2% Absolute Vegetation	*Tamarix ramosissima* Association	
CRTH32	Non-Vegetated <2% Absolute Vegetation	*Tamarix ramosissima* Association	
CRTH33	*Phoenix dactylifera* Alliance	*Washingtonia filifera - Tamarix ramosissima / Atriplex lentiformis* Association	
CRTH34	*Phoenix dactylifera* Alliance	*Tamarix ramosissima / Atriplex lentiformis - Pluchea sericea* Association	
CRTH35	*Phoenix dactylifera* Alliance	*Pluchea sericea* Association	

CRTH36	*Atriplex lentiformis* Shrubland Alliance	*Tamarix ramosissima / Suaeda moquinii - Pluchea sericea* Association	
CRTH37	*Tamarix* spp. Semi-natural Shrubland Stands	*Atriplex lentiformis - Pluchea sericea* Association	
CRTH38	*Pluchea sericea - Atriplex lentiformis* Shrubland Alliance	*Tamarix* spp. Association	
CRTH39	*Pluchea sericea - Atriplex lentiformis* Shrubland Alliance	*Tamarix* spp. Association	
CRTH40	*Tamarix* spp. Semi-natural Shrubland Stands	*Suaeda moquinii* Association	
CRTH41	Non-Vegetated <2% Absolute Vegetation	*Suaeda moquinii* Association	
CRTH42	*Suaeda moquinii* Shrubland Alliance	*Tamarix ramosissima / Atriplex lentiformis - Pluchea sericea* Association	
CRTH43	*Suaeda moquinii* Shrubland Alliance	*Tamarix ramosissima / Pluchea sericea* Association	5/21/2014 11:14am (1)
CRTH44	*Suaeda moquinii* Shrubland Alliance	*Tamarix ramosissima / Atriplex lentiformis - Pluchea sericea* Association	
CRTH45	*Tamarix* spp. Semi-natural Shrubland Stands	*Suaeda moquinii* Association	5/21/2014 10:24am (1)
CRTH46	*Tamarix* spp. Semi-natural Shrubland Stands	*Suaeda moquinii - Atriplex lentiformis* Association	5/21/2014 9:55am (1)
CRTH47	*Tamarix* spp. Semi-natural Shrubland Stands	*Allenrolfea occidentalis* Association	
CRTH48	*Tamarix* spp. Semi-natural Shrubland Stands	*Allenrolfea occidentalis - Atriplex lentiformis* Association	
CRTH49	*Allenrolfea occidentalis - Atriplex lentiformis* Shrubland Association	*Tamarix ramosissima / Suaeda moquinii - Atriplex canescens* Association	
CRTH50	*Allenrolfea occidentalis - Atriplex lentiformis* Shrubland Association	*Tamarix ramosissima / Suaeda moquinii* Association	
CRTH51	*Allenrolfea occidentalis* Shrubland Association	*Tamarix ramosissima* Association	
CRTH52	*Tamarix* spp. Semi-natural Shrubland Stands	*Prosopis glandulosa - Allenrolfea occidentalis* Association	
CRTH53	*Allenrolfea occidentalis* Shrubland Association	*Prosopis glandulosa - Pluchea sericea* Association	
CRTH54	*Allenrolfea occidentalis* Shrubland Association	*Tamarix ramosissima* Association	

CRTH55	*Tamarix* spp. Semi-natural Shrubland Stands	*Pluchea sericea* - *Allenrolfea occidentalis* Association	
CRTH56	*Tamarix* spp. Semi-natural Shrubland Stands	*Suaeda moquinii* Association	
CRTH57	*Tamarix* spp. Semi-natural Shrubland Stands	*Allenrolfea occidentalis* Association	6/10/2014 10:00am (1)
CRTH58	Non-Vegetated <2% Absolute Vegetation	*Tamarix ramosissima* / *Allenrolfea occidentalis* Association	
CRTH59	*Tamarix* spp. Semi-natural Shrubland Stands	*Allenrolfea occidentalis* Association	
CRTH60	*Allenrolfea occidentalis* Shrubland Alliance	*Tamarix ramosissima* Association	

Results of 2013-2014 protocol surveys for Orocopia sage (*Salvia greatae*) and Mecca aster (*Xylorhiza cognata*) within the Coachella Valley

Introduction

Orocopia sage (*Salvia greatae*, SAGR) is a perennial evergreen shrub endemic to California, found in the mountainous desert areas of southeastern Riverside and northern Imperial Counties. It is found primarily upon alluvial fans and washes in the Orocopia and Chocolate Mountains at elevations between 30-450m (although CNPS reports it as occurring below sea level to 825m) is associated with Sonoran and Mojavean desert scrub communities (Wilken and Wetherwax 2013, CNPS 2014). SAGR is categorized as California Rare Plant Rank 1B.3 (threatened or endangered in California and elsewhere, with < 20% of occurrences threatened / low degree and immediacy of threat or no current threats known; CNPS 2014). Mecca aster (*Xylorhiza cognata*, XYCO) is a perennial herb endemic to the Indio and Mecca Hills in Riverside County, California. It is commonly found on steep canyon slopes and faces and in adjacent washes at elevations between 20-300m, and is associated with Sonoran desert scrub (Keil 2013, CNPS 2014). XYCO is categorized as California Rare Plant Rank 1B.2 (threatened or endangered in California and elsewhere, with 20-80% of occurrences threatened / moderate degree and immediacy of threat; CNPS 2014).

In 2002, a master database of historic occurrence records was compiled for all five plant species covered under the Coachella Valley Multiple Species Habitat Conservation Plan (CVMSHCP) (Allen et al. 2005). Data were mined querying various herbaria and museums and required considerable effort to remove duplicate points and identify points that were precise enough for geo-referencing. A research team then attempted to visit historic occurrence locations occurring on public land for each species and document the existing populations through 500m^2 vegetation relevés. For Orocopia sage, of the 10 unique records occurring on public lands individuals were observed at seven locations (70% occupancy rate). Populations varied, but averaged over 200 individuals per hectare at each location (Allen et al. 2005). The research team noted that SAGR was present and fairly numerous over large areas within its range, and recommendations supported that additional populations may exist at upper elevation sites in the Orocopia Mountains. Of the 13 unique Mecca aster records occurring on public lands, individuals were observed at 12 locations (92% occupancy rate). In addition, researchers located two new locations where this plant species was occurring. Population sizes at all occupied locations averaged approximately 80 plants per location. The majority of records for XYCO were collected in the Mecca Hills area; there was only one record of XYCO occurring on public land in the Indio Hills area.

Objectives

Surveys for Orocopia sage and Mecca aster were carried out as part of the Coachella Valley Multiple Species Habitat Conservation Monitoring Plan by the UC Riverside Center for Conservation Biology. Surveys were conducted following the guidelines and objectives outlined by the MSHCP and carried out using the February 2014 protocol developed by the Coachella Valley Conservation Commission's Biological Working Group (BWG). The primary objectives for this monitoring effort were to assess the current presence, distribution, and demographics for populations of both species, and document habitat attributes, identify potential stressors (such as fire, invasive species, off-road vehicles, trampling, altered ecosystem processes due to flood control measures, and climate change impacts) that may affect persistence of either species.

Both SAGR and XYCO occur in habitats prone to periodic flooding (alluvial fans and canyons, respectively). Portions of the Salt Creek alluvial fan, where SAGR occurs, have been altered to control flood events and protect the old railroad and the Coachella Canal. To assess the impacts of flooding, sites were surveyed both within areas of active flooding and adjacent areas that are more protected (e.g. where flooding is controlled). Information about the presence of the target species were integrated into habitat suitability models. These models will help facilitate the expansion of future monitoring and adaptive management efforts, and may increase our understanding of the current and anticipated distribution of these species, particularly with regards to climate change.

Methods

Habitat Suitability Models

Following the Allen et al. (2005) procedure, occurrence records were collected for Orocopia sage and Mecca aster from the Consortium of California Herbaria and California Natural Diversity Database (CNDDB) in 2013. Additional records for Mecca aster were provided by the Bureau of Land Management. After investigating the source and description of each record, records that were found to be duplicates or considered invalid due to lack of precision were deleted. The remaining SAGR (n = 55) and XYCO (n = 73) points were then integrated into habitat suitability models (see the LeConte's Thrasher survey results section for more detail on the habitat suitability modelling process; Table 6a lists the variables used to construct each species' draft habitat model). The habitat suitability models are iterative tools that allow us to better understand the extent of suitable habitat and the potential distribution of each species. As additional information pertaining to each species is gained over time, the respective model for that species can, and should, be refined.

Site Selection

For each species, 20 sites were chosen by 1) identifying groups of occurrence records existing within the conservation areas (SAGR = 15 sites, XYCO = 17 sites), and 2) within modelled areas of potentially suitable habitat where the species has not been previously documented (SAGR = 5 sites, XYCO = 3 sites). Each site consisted of four 10m x 100m (1000m^2) relevé transects.

Data Collection

Surveys for XYCO were conducted at 20 sites, beginning 21 March and ending 30 May 2014. Surveys for SAGR were conducted at 14 sites, beginning 23 April and ending 11 June 2014. Surveys for Le Conte's Thrasher and Crissal Thrasher were conducted during this same timeframe by the monitoring team; due to inclement weather which expanded the survey timeframe for the thrasher species, and due to the perennial nature of XYCO and SAGR (i.e. persistent over several years), the decision was made to focus on surveys for both thrasher species with the knowledge that surveys for XYCO and SAGR would be delayed or potentially be incomplete. This decision was made after several surveys had already been completed for both vegetation species and threats were assessed as being low for both species in the areas where they were surveyed.

All XYCO sites selected for the 2013-2014 monitoring efforts were visited, however 6 of the sites selected for SAGR did not get visited (4 of which were sites where modeled suitable habitat existed but no known SAGR occurrences). The decision not to visit all 20 SAGR sites was a result of multiple factors, including 1) approaching end of the field season/fiscal year, 2) unseasonably hot weather, 3) finding no SAGR at the historic lower elevation sites and 4) realizing that the bulk of the population appeared to occur in the higher elevation, highly rugged interior areas of the Orocopia Mountains (not on the 20 pre-identified survey sites) and that accessing those areas safely will require surveys during cooler weather months. Surveys of SAGR sites with documented historic records were prioritized over the reconnaissance of the modelled habitat sites due to the intensive nature of the surveys and the need to re-visit sites with known occurrence points to document persistence and address the protocol objectives.

The CNPS-CDFW Combined Vegetation Rapid Assessment and Relevé protocol (Buck-Diaz and Evens 2011) was additionally employed when visiting each site to document habitat attributes such as vegetation communities, slope and substrate, disturbance and measure the presence and extent of invasive plant species. To quantify soil particle size distribution and type, surveyors collected one quart bags of soil on each transect. If the target species occurred within the transect a sample was collected at the base of the plant (presence sample), otherwise the sample was collected at random within the transect (absence sample); soils were analyzed with a standard shaker table and sieves. The number of XYCO and SAGR individuals were counted, and the percentage of those individuals in different life stages (seedling vs. reproductive individuals) and their densities were documented. Incidental occurrences of populations in between survey sites were also counted and GPS locations were taken to include in the refined habitat suitability model. Data collection for the SAGR surveys incorporated the involvement of several citizen scientist volunteers who were paired with a researcher trained to conduct the protocol. In total, 23 XYCO and 2 SAGR voucher specimens were collected and submitted to the UC Riverside Herbarium. Once verified, voucher data will be added to the Consortium of California Herbaria and the California Natural Diversity Database.

Results

Salvia greatae

A total of 892 SAGR were documented at 9 of the 14 survey sites (64% occupation rate) and incidental locations during the monitoring efforts (Appendix C). 15 records were collected at previously undocumented locations, the GPS points of which were used to construct the refined habitat suitability models for the species. Often, especially at the sites along the Bradshaw Trail, SAGR populations were continuous in density, therefore the historic occurrence points may have been marking the location of the entire population. The additional points obtained by the researchers during the survey efforts now document the extent of the population more fully. In other cases, several historic occurrence records were visited and found to have no SAGR individuals (Fig. 8). Such was the case for sites 6 and 7 along the Bradshaw Trail, sites 9, 11, and 13 near Dos Palmas, and site 19 near the Hidden Springs Oasis in Mecca

Wilderness. At site 5, SAGR was only located on the east side of the Bradshaw Trail (90+ individuals near the transect, including 5 that were considered juveniles); no individuals occurred on the west side. Site 18 (north of the Coachella Canal) was modeled as potentially suitable habitat for SAGR, however no individuals were found occurring there during this survey period. Most SAGR populations surveyed appeared to be similar in size, and therefore likely similar in age. Only one site (site 5) had five individuals that appeared smaller in size than the surrounding SAGR shrubs; there were no apparent size differences noted at any other site. The majority of SAGR individuals occurred on undisturbed alluvial fans and terraces, sometimes on desert pavement substrates. SAGR were found to occur within washes on only a few transects. No significant difference was found for soil particle size distribution or soil type between the sites where SAGR was present or where it was absent (Table 6). Sites 12, 14-17 (modelled habitat), and 20 were not visited during this survey period.

Xylorhiza cognata

A total of 2,994 XYCO were documented at 16 of the 20 survey sites (80% occupation rate) and incidental locations during the monitoring efforts (Appendix D). In addition to the survey sites, 42 new occurrence records were collected as incidental points in between sites for use in the habitat suitability model construction. Some historic records were located on roads or in large washes, both being unsuitable habitat for this species. In those instances there may have been georeferencing error, or perhaps the GPS points were recorded from a vehicle on the roadway. Many of the historic records were found to mark canyon mouths; no XYCO were present at the GPS points but were confirmed present further within the canyon.

As was found with previous surveys for this species, the majority of occurrences were located in the Mecca Hills in the Box Canyon and Painted Canyon areas (Fig. 9). XYCO were found at three sites in the Indio Hills (site 16-18). At site 16, one individual was confirmed near the historic record and an additional undocumented population (15 individuals) was located in between transects. Sites 17 and 18 were located in the Indio Hills Palms property. No XYCO were found at the historic record location, however 300+ individuals were found at other locations on the site. XYCO were found only at the historic record location at site 18 (7 individuals). Two sites (sites 19 and 20) were chosen as reconnaissance points where potentially suitable habitat was identified in the model, however surveys at these sites did not result in confirmation of XYCO occurrences. A historic occurrence record exists for site 10 (northern Box Canyon Road), however a survey of this site in 2003 did turn up any XYCO occurrences (according to CNDDB metadata for the historic record). We were also unable to locate any XYCO at this site during our survey efforts.

Baseline demographic data were taken for populations occurring at each site; these data may be used for future surveys to determine population trends. Of the 2,277 live XYCO individuals counted within the transects, 90% were adults and 10% were juveniles (< 20cm tall, and having a limited number of stems). Of the adults, 4% were actively blooming. Many individuals were post-bloom and already in seed during the survey period, however those individuals were not included in the flowering count. Dead individuals were counted separately and represented an additional 8% of the population. No significant difference was found for soil particle size distribution or soil type between the sites where XYCO was present or where it was absent (Table 6).

Habitat Suitability Models

Occurrence records collected for SAGR (n = 27) and XYCO (n = 69) during the 2013-2014 survey efforts were used to refine the habitat suitability models made for each species (Table 7). The models are only as accurate as the records that are used to construct them; the numerous historic occurrence points that were visited and found to be erroneous were therefore removed and only points that were gathered by the research team were used. An exception was made for the SAGR model due to the low number of occurrence records gathered (a minimum of 40 records is optimal for habitat suitability modeling). Occurrences of SAGR at higher elevations in the Orocopia Mountains have been confirmed (Allen et al. 2005, Andy Sanders, pers comm), therefore 4 additional occurrence records from that area, obtained from the CNDDB database, were included in the model construction process.

The area of suitable habitat for SAGR was reduced by 43% in the refined model (Table 7, Fig. 10), resulting in a model that is likely a better representation of the distribution of potential habitat for this species. Habitat near the northern shore of the Salton Sea that was modeled as suitable in the draft model was absent in the refined model (Fig. 9). Sites 9, 11, and 13 occurred in this area and no SAGR were found during the survey efforts. A greater extent of SAGR habitat in the Chocolate Mountains was also modeled as suitable in the refined model. Despite confirmed occurrences for SAGR at higher elevations in the Orocopia Mountains, neither model iteration displayed suitable habitat there.

The refined XYCO model had an area of suitable habitat that was reduced by 31% compared to the draft model (Table 7, Fig. 11). Modeled suitable habitat in the vicinity of site 10 that was present in the draft model was absent in the refined model; no XYCO were found at that location in 2003 or in 2014 despite there being a historic occurrence record. The refined XYCO map was generally shifted away from the base of slopes and concentrated in canyons. The refined model displayed a smaller area of suitable habitat near sites 17 and 18 in the Indio Hills, locations where XYCO was confirmed to occur.

Discussion

Surveys for both SAGR and XYCO were intensive and resulted in several discoveries of new populations, as well as identification of historic records where no individuals were found. The majority of unoccupied records were attributed to misidentifications, or that the record marked the mouth of a canyon (in the case of XYCO) where a population of individuals occurred rather that the exact location of the population itself. These survey efforts have provided a better understanding of the current distribution of both species since both occupied and unoccupied sites were documented. Through the establishment of these baseline survey efforts, re-surveys of these sites may help discern shifts in species range, and patterns of population dynamics in the future.

Three sites (9, 11, and 13) in the Dos Palmas area south of the Coachella Canal were surveyed for SAGR, however no SAGR were found despite there being historic records of their occurrence. The Coachella Canal was completed in the late 1940's, most of which was unlined. In 2006, a parallel concrete-lined canal was implemented along a 35 mile stretch near the Dos Palmas Area of Critical Environmental

Concern. Records for SAGR at these sites obtained from the Consortium of California Herbaria database are dated from 1905 and 1933. One CNDDB record is from 1981, however that location was re-surveyed in 1986 and no SAGR individuals were found. It may be possible that SAGR historically occurred south of the Coachella Canal near the Dos Palmas area, but post-construction seepage from the unlined canal may have altered the habitat, making it unsuitable for this species.

Despite using confirmed occurrence records to improve the habitat suitability models, the refined model for each respective species was not a perfect representation of the known distribution of that species' range. The models are hypotheses of where potential habitat may occur for the species based on abiotic associations of that species. However, there are other factors that may constrain species distributions (e.g. biotic interactions, soil pH) that may not be adequately addressed with the model parameters currently available. Models for these species should be refined after every survey effort, and areas where suitable habitat was not highlighted by the model but where focal species are known to occur should be sampled further in future surveys to increase our understanding of their ecology. For example, although accessibility may be an issue, an effort should be made to survey higher elevation sites in the Orocopia Mountains to determine the extent of SAGR distribution and demographics.

Disturbance and threats, including fire, invasive species, trampling, and off-highway vehicle (OHV) activity, were documented at each site. XYCO generally occurred on canyon slopes and walls, often in narrow slot canyons that are only accessible on foot, therefore very few populations were threatened by anthropogenic actions. One XYCO transect in Box Canyon at site 5 had OHV tracks that came very close to a XYCO individual that occurred in a wash at the base of a canyon wall. Another transect at site 8 had evidence of high foot traffic levels and one XYCO individual appeared to have been trampled. 95 XYCO individuals were counted within and near the transect, the majority of which occurred on the cliff faces within the canyon and were not threatened by trampling. Many sites were in close proximity to OHV, hiking, or camping activity however these activities did not generally appear to interfere with XYCO habitat. SAGR occurred close to the Bradshaw Trail and other established OHV trails in the Orocopia Mountains area, however there was little evidence of vehicle activity off of the established trails that might impact SAGR individuals. Invasive species (most often *Schismus barbatus*, but also *Bromus* sp.) were present at the majority of the sites visited, however herbaceous cover was usually below 1% and therefore not considered a threat to either species' persistence.

Sites with known occurrence locations should continue to be revisited with every future survey effort, and the environmental variables documented should be reanalyzed for change. If target species are found to be absent at any of the reconnaissance sites those sites still must be re-visited at least one more time in a subsequent survey year before documenting absence (CDFG 2009).

Table 6. Comparison of soil particle size distribution and type in each transect at (a) sites where *Xylorhiza cognata* was present or absent, and (b) sites where *Salvia greatae* was present or absent.

Species	Particle Size (mm)						
Xylorhiza cognata	**0.0555**	**0.0394**	**0.0278**	**0.0197**	**0.0139**	**.0098 or less**	**Soil type**
Absent	30.4%	6.6%	8.9%	10.3%	9.9%	33.9%	clay loam
Present	27.5%	6.7%	8.9%	10.6%	11.0%	35.3%	clay loam
Salvia greatae							
Absent	43.8%	6.3%	6.8%	7.1%	6.9%	29.0%	sandy clay loam
Present	46.9%	7.7%	8.0%	7.2%	5.8%	24.4%	sandy clay loam

Table 7. Environmental variables selected to construct the (a) draft habitat suitability models used for site selection, and (b) refined habitat suitability models based on survey findings for *Salvia greatae* (SAGR) and *Xylorhiza cognata* (XYCO).

	(a)		(b)	
Variable descriptions	SAGR	XYCO	SAGR	XYCO
Available water content		X		X
Percent sand contents of soil	X			
Percent silt contents of soil	X			
Average total precipitation from December-March during years 1971-2000	X			
Sappington ruggedness analysis of a 18 x 18 10m neighborhood	X	X	X	X
Mean value from a Sappington ruggedness analysis		X		
Median slope value	X			X
Average max. temperature occurring July-August during years 1971 - 2000	X	X		X
Landcover: Bedrock cliff, outcrop, and badland (within a 510m x 510m neighborhood)		X	X	
Landcover: Bedrock cliff, outcrop, and badland (within a 180m x 180m neighborhood)		X		
Landcover: Warm desert pavement (within a 510m x 510m neighborhood)			X	
Landcover: Warm desert wash (within a 510m x 510m neighborhood)			X	
Edaphic: Badlands		X		X
Edaphic: Carsitas cobbly sand		X		X
Edaphic: Myoma-Carsitas-Carrizo			X	
Model Performance				
# records (known occurrences)	55	73	27	69
# partitions (equal to variables used)	6	8	5	6
Partition selected	1	1	1	1
P-Value	0.785	0.716	0.683	0.680
HSI value	0.7	0.7	0.6	0.7
Area of modeled suitable habitat (ha)	25,262	9,292	14,593	6,470

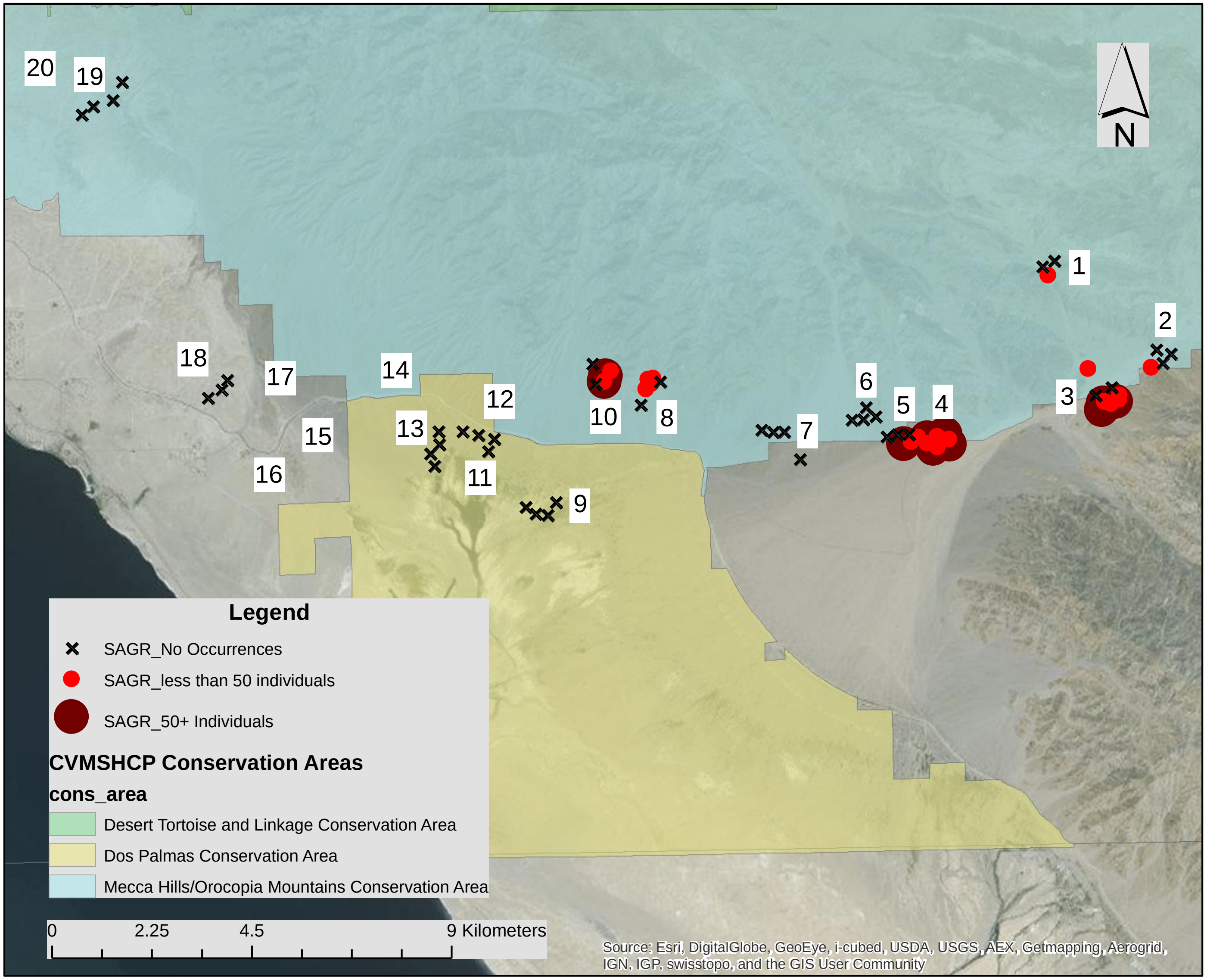

Figure 8. *Salvia greatae* occurrence points and densities per site

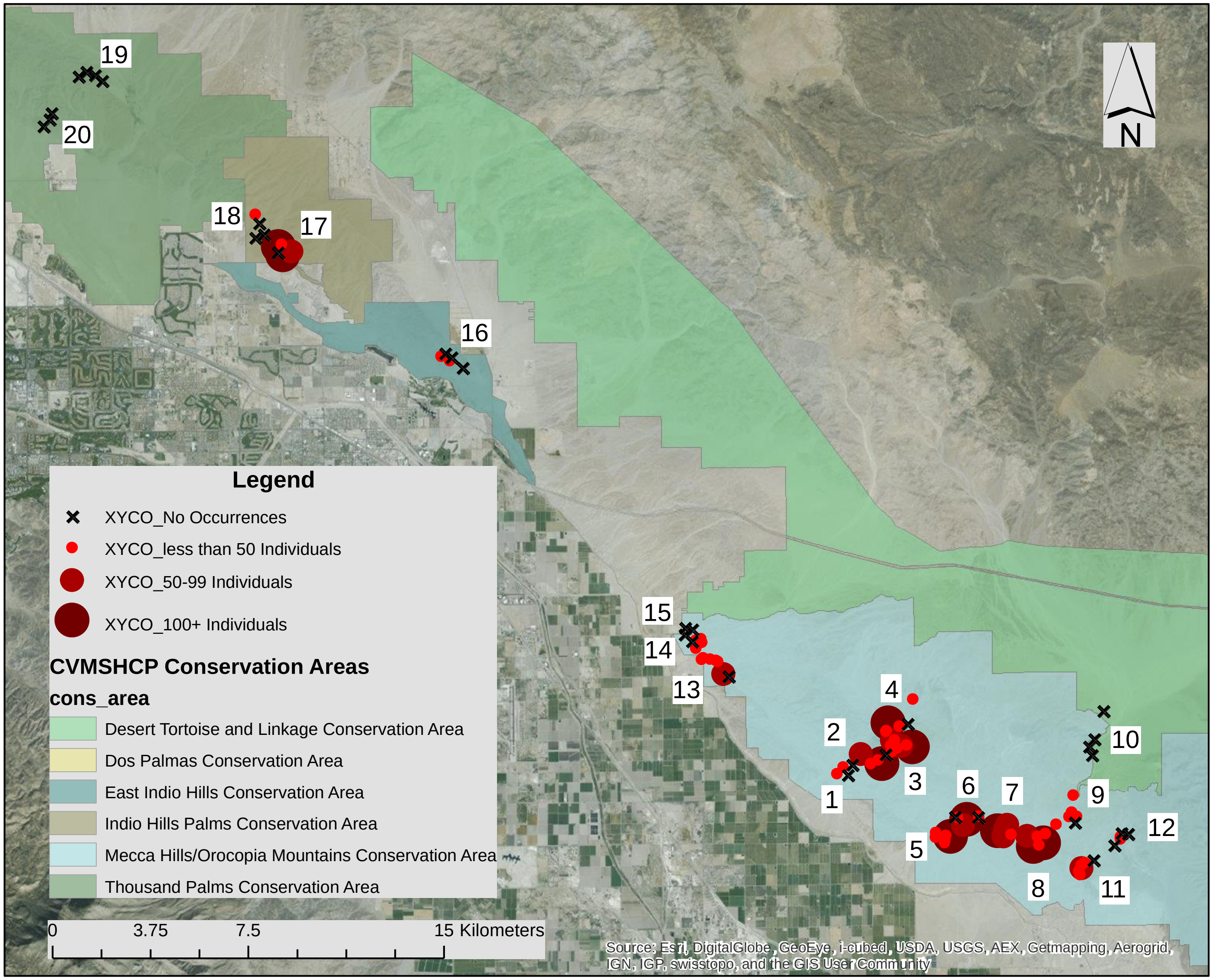

Figure 9. *Xylorhiza cognata* occurrence locations and densities per site

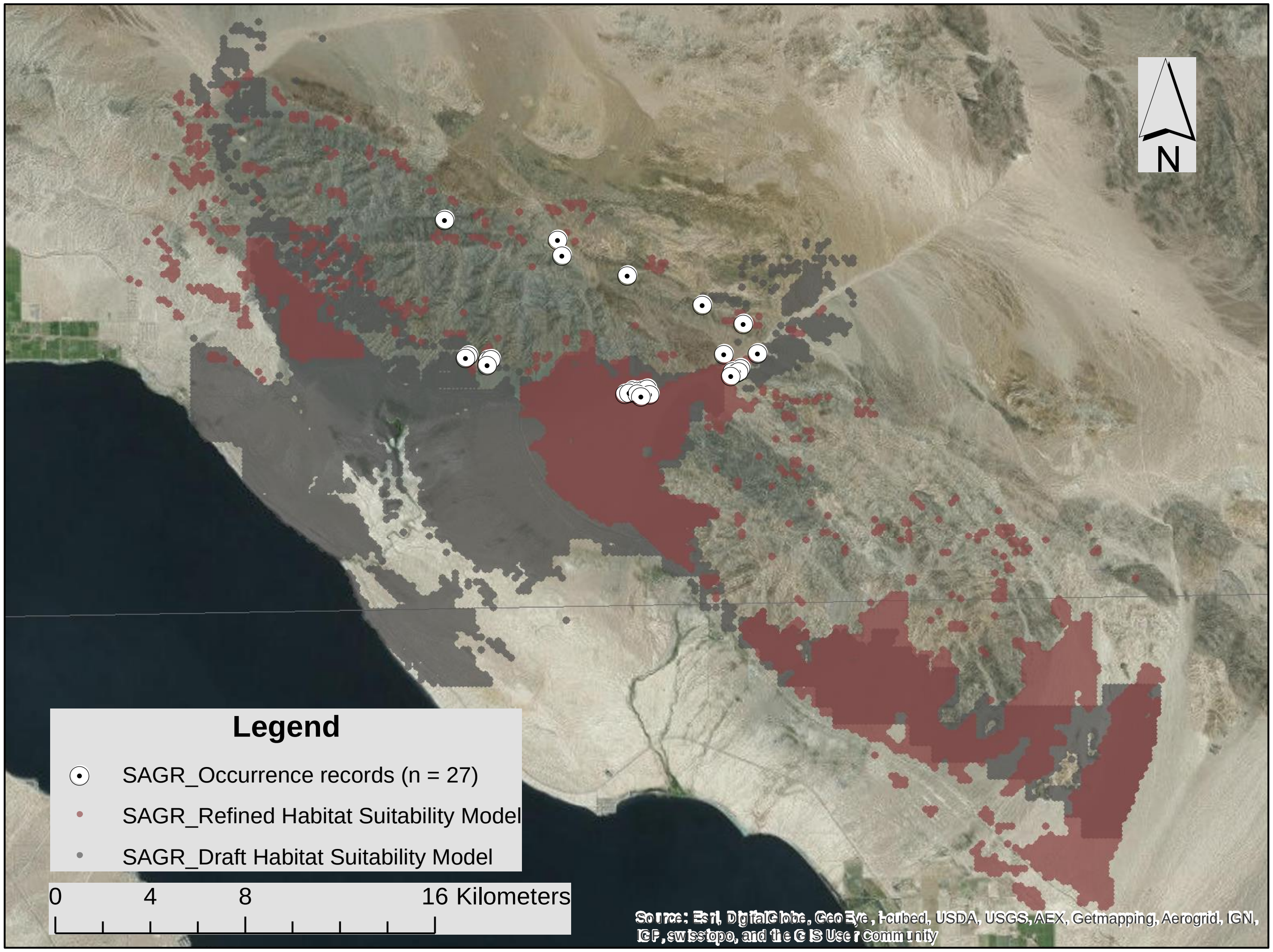

Figure 10. SAGR habitat suitability models and current occurrence points in the Orocopia Mountains. The refined model is layered on top of the draft model (dark gray)

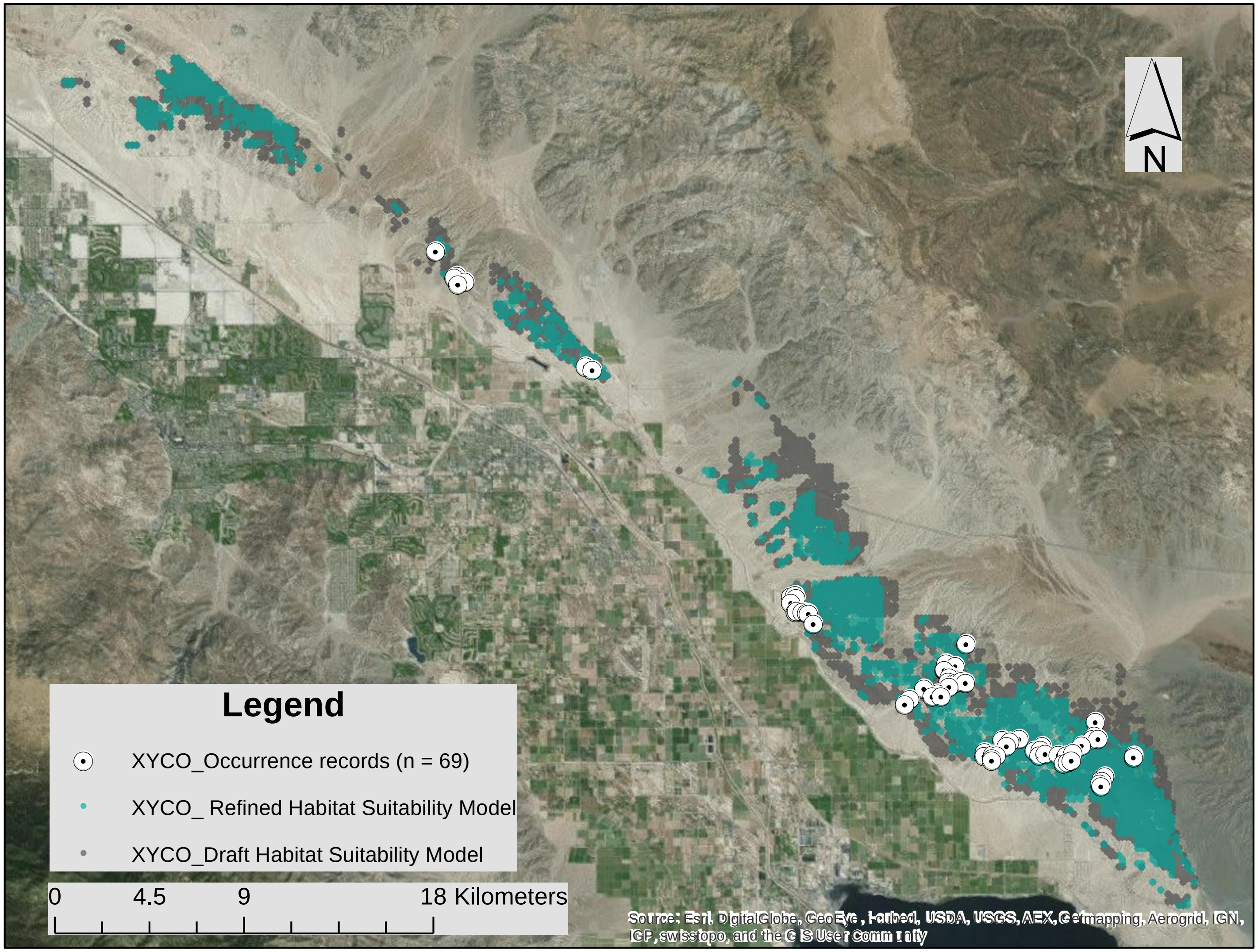

Figure 11. XYCO habitat suitability models and current occurrence points in the Indio and Mecca Hills. The refined model is layered on top of the draft model (dark gray)

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Appendix A. Incidental bird sightings documented at each visit to the call-broadcast points during the Le Conte’s Thrasher surveys

Plot name	Date	Time	UTM Easting	UTM Northing	Datum	American Goldfinch	American Kestrel	Anna's Hummingbird	Ash-throated Flycatcher	Barn Owl	Barn swallow	Black-tailed Gnatcatcher	Blue-gray Gnatcatcher	Bewick's Wren	Black-throated Sparrow	Brewer's Blackbird	Brewer's Sparrow
Lcth02NM	1/3/2014	9:50	526760	3755857	WGS84							1					1
Lcth02NM	2/12/2014	9:38	526760	3755857	WGS84									1			
Lcth02SE	1/3/2014	14:12	527036	3754724	WGS84									1			
Lcth02SE	2/12/2014	11:25	527036	3754724	WGS84									1			
Lcth06SE	12/16/2013	9:53	539883	3761297	WGS84							1					
Lcth07SM	1/28/2014	3:13	541051	3759836	WGS84							2					
Lcth07SM	2/25/2014	9:06	541051	3759836	WGS84							1					
Lcth08NE	2/18/2014	8:44	543267	3759471	WGS84											3	
Lcth08NM	12/20/2013	10:15	542812	3759260	WGS84							1					
Lcth08NM	2/18/2014	9:23	542812	3759260	WGS84							1					
Lcth08NW	2/18/2014	10:02	542312	3759248	WGS84										1		
Lcth08SE	12/20/2013	12:49	543509	3758505	WGS84							1					
Lcth08SE	4/3/2014	11:25	543509	3758505	WGS84										2		
Lcth10SE	3/19/2014	10:19	544941	3751037	WGS84						5						
Lcth10SW	3/19/2014	11:14	544213	3751708	WGS84						1						
Lcth12NE	2/21/2014	10:06	549562	3750102	WGS84							1					
Lcth12NW	2/21/2014	8:45	548636	3750476	WGS84				1								1
Lcth12SE	1/8/2014	10:57	549122	3749179	WGS84				1								
Lcth12SE	2/21/2014	11:11	549122	3749179	WGS84							1					
Lcth12SM	1/8/2014	11:36	548662	3749379	WGS84												2
Lcth12SM	1/23/2014	13:13	548662	3749379	WGS84							1					
Lcth12SW	1/8/2014	12:15	548201	3749576	WGS84							1					
Lcth13NM	2/24/2014	8:43	551726	3751125	WGS84						1						
Lcth13NW	1/23/2014	10:55	551242	3750997	WGS84							1					
Lcth13NW	2/24/2014	9:23	551242	3750997	WGS84							1					
Lcth15NM	1/16/2014	9:49	561827	3739874	WGS84				1								
Lcth15SE	2/20/2014	8:50	561571	3738962	WGS84		1										
Lcth16SE	4/4/2014	10:20	563659	3747952	WGS84							2					

Appendix A. LeConte’s Thrasher incidental sightings (American Goldfinch – Brewer’s Sparrow)

Plot name	Date	Time	UTM Easting	UTM Northing	Datum	American Goldfinch	American Kestrel	Anna's Hummingbird	Ash-throated Flycatcher	Barn Owl	Barn swallow	Black-tailed Gnatcatcher	Blue-gray Gnatcatcher	Bewick's Wren	Black-throated Sparrow	Brewer's Blackbird	Brewer's Sparrow
Lcth18NM	1/21/2014	9:47	564163	3738712	WGS84				1								
Lcth18NW	3/3/2014	10:36	563812	3739060	WGS84		1										
Lcth18SW	12/13/2013	10:14	563120	3738341	WGS84							1					
Lcth22NE	12/11/2013	11:28	572589	3736310	WGS84							1					
Lcth22NE	1/22/2014	10:00	572589	3736310	WGS84			1				1					
Lcth22NE	3/4/2014	10:48	572589	3736310	WGS84								1				
Lcth22SM	12/11/2013	9:50	571627	3735552	WGS84							1					
Lcth22SM	3/4/2014	9:23	571627	3735552	WGS84								1				
Lcth22SW	12/11/2013	9:12	571134	3735648	WGS84							1					
Lcth22SW	3/4/2014	8:45	571134	3735648	WGS84								1				
Lcth23NE	12/10/2013	8:50	577321	3734674	WGS84							1					
Lcth23NM	12/10/2013	9:28	576934	3734953	WGS84							1					
Lcth23NW	2/19/2014	9:56	576507	3735245	WGS84							2					
Lcth23SE	2/19/2014	12:17	576799	3733821	WGS84							1					
Lcth23SM	12/10/2013	12:34	576408	3734100	WGS84									1			
Lcth23SM	1/24/2014	10:18	576408	3734100	WGS84		1										
Lcth23SW	2/19/2014	11:05	575974	3734389	WGS84							1					
Lcth25NE	2/26/2014	12:10	594950	3715393	WGS84							2					
Lcth25NW	2/26/2014	9:24	594128	3715995	WGS84				1				1				
Lcth25SW	2/26/2014	10:27	593357	3715366	WGS84							2					
Lcth27NE	1/15/2014	2:18	603528	3722323	WGS84							1					
Lcth27NE	2/7/2014	11:19	603528	3722323	WGS84		1										
Lcth27NE	3/5/2014	10:40	603528	3722323	WGS84	1						2					
Lcth27NW	1/15/2014	3:01	603067	3723208	WGS84							1					
Lcth27SE	1/15/2014	1:15	602666	3721823	WGS84							1					
Lcth27SE	3/5/2014	9:36	602666	3721823	WGS84				1								
Lcth27SW	2/7/2014	9:19	602202	3722709	WGS84							1					
Lcth27SW	3/5/2014	12:16	602202	3722709	WGS84							1					
Lcth28NE	1/10/2014	11:40	608178	3708445	WGS84		1										
Lcth28NE	2/5/2014	11:18	608178	3708445	WGS84							3					

Appendix A. LeConte's Thrasher incidental sightings (American Goldfinch – Brewer's Sparrow)

Plot name	Date	Time	UTM Easting	UTM Northing	Datum	American Goldfinch	American Kestrel	Anna's Hummingbird	Ash-throated Flycatcher	Barn Owl	Barn swallow	Black-tailed Gnatcatcher	Blue-gray Gnatcatcher	Bewick's Wren	Black-throated Sparrow	Brewer's Blackbird	Brewer's Sparrow
Lcth28NM	2/5/2014	10:47	607697	3708583	WGS84							2					
Lcth28NM	2/27/2014	11:10	607697	3708583	WGS84								1				
Lcth28NW	2/27/2014	11:43	607213	3708705	WGS84							1					
Lcth28SE	1/10/2014	12:45	607743	3707547	WGS84					1							
Lcth28SE	2/5/2014	12:20	607743	3707547	WGS84		1					5					
Lcth28SM	2/5/2014	13:00	607262	3707685	WGS84							2					
Lcth28SM	2/27/2014	9:16	607262	3707685	WGS84								1				
Lcth28SW	1/10/2014	1:48	606778	3707809	WGS84							2					
Lcth28SW	2/5/2014	13:30	606778	3707809	WGS84							1					
Lcth28SW	2/27/2014	12:48	606778	3707809	WGS84							3					

Plot name	Date	Time	UTM Easting	UTM Northing	Datum	Brown-headed Cowbird	Burrowing Owl	Cactus Wren	California Towhee	California Thrasher	Canadian Goose	Common Raven	Costa's Hummingbird	Crissal Thrasher	Ferruginous Hawk	Gambel's Quail	Golden Eagle
Lcth02NE	2/12/2014	10:26	527230	3755688	WGS84			1				2					
Lcth02NE	3/20/2014	10:26	527230	3755688	WGS84			1									
Lcth02NM	1/3/2014	9:50	526760	3755857	WGS84							2	1				
Lcth02NM	2/12/2014	9:38	526760	3755857	WGS84					2							
Lcth02NM	3/20/2014	9:47	526760	3755857	WGS84								1			1	
Lcth02NW	2/12/2014	8:52	526376	3756176	WGS84							1					
Lcth02NW	3/20/2014	8:56	526376	3756176	WGS84			1	1			7	1				
Lcth02SE	1/3/2014	14:12	527036	3754724	WGS84							1	2				
Lcth02SE	3/20/2014	11:18	527036	3754724	WGS84			1									
Lcth02SM	2/12/2014	11:50	526569	3754938	WGS84							1					
Lcth02SM	3/20/2014	12:08	526569	3754938	WGS84			1				2	1			1	
Lcth02SW	1/3/2014	13:03	526098	3755108	WGS84							1					
Lcth02SW	2/12/2014	12:15	526098	3755108	WGS84				1			4					

Appendix A. LeConte's Thrasher incidental sightings (American Goldfinch – Golden Eagle)

Plot name	Date	Time	UTM Easting	UTM Northing	Datum	Brown-headed Cowbird	Burrowing Owl	Cactus Wren	California Towhee	California Thrasher	Canadian Goose	Common Raven	Costa's Hummingbird	Crissal Thrasher	Ferruginous Hawk	Gambel's Quail	Golden Eagle
Lcth02SW	3/20/2014	12:41	526098	3755108	WGS84							2					
Lcth06NE	12/16/2013	8:49	540206	3762254	WGS84								1				
Lcth06NE	1/28/2014	10:30	540206	3762254	WGS84							1					
Lcth06NE	2/18/2014	2:50	540206	3762254	WGS84							1					
Lcth06NM	12/16/2013	8:05	539844	3762596	WGS84								1				
Lcth06NM	1/28/2014	NR	539844	3762596	WGS84							3					
Lcth06NW	12/16/2013	7:18	539373	3762765	WGS84							1	1				
Lcth06NW	2/18/2014	1:37	539373	3762765	WGS84								1				
LCTH06SE	12/16/2013	9:53	539883	3761297	WGS84							1	1				
LCTH06SE	2/18/2014	3:34	539883	3761297	WGS84								1				
Lcth06SM	12/16/2013	10:48	539483	3761667	WGS84								1				
Lcth06SM	1/28/2014	9:05	539483	3761667	WGS84								1				
Lcth06SM	2/18/2014	4:05	539483	3761667	WGS84								1				
Lcth06SW	12/16/2013	11:30	539010	3761834	WGS84							1					
Lcth06SW	1/28/2014	8:22	539010	3761834	WGS84							1					
Lcth06SW	2/18/2014	4:32	539010	3761834	WGS84							1					
Lcth07NE	12/16/2013	3:23	541760	3760658	WGS84							1					
Lcth07NE	1/28/2014	1:05	541760	3760658	WGS84							2	1				
Lcth07NE	2/25/2014	11:31	541760	3760658	WGS84							1	1				
Lcth07NM	12/16/2013	2:55	541278	3760812	WGS84							1					
Lcth07NM	1/28/2014	1:36	541278	3760812	WGS84								1				
Lcth07NM	2/25/2014	11:08	541278	3760812	WGS84								1				
Lcth07NW	12/16/2013	2:22	540802	3760964	WGS84							1	1				
Lcth07NW	2/25/2014	10:12	540802	3760964	WGS84							1					
Lcth07SE	1/28/2014	3:43	541530	3759687	WGS84							1					
Lcth07SM	2/25/2014	9:06	541051	3759836	WGS84							3	1				
Lcth07SW	12/16/2013	1:39	540572	3759987	WGS84								1				
Lcth07SW	1/28/2014	2:53	540572	3759987	WGS84							1					
Lcth07SW	2/25/2014	9:30	540572	3759987	WGS84							1					

Appendix A. LeConte's Thrasher incidental sightings (Brown-headed Cowbird – Golden Eagle)

Plot name	Date	Time	UTM Easting	UTM Northing	Datum	Brown-headed Cowbird	Burrowing Owl	Cactus Wren	California Towhee	California Thrasher	Canadian Goose	Common Raven	Costa's Hummingbird	Crissal Thrasher	Ferruginous Hawk	Gambel's Quail	Golden Eagle
Lcth08NE	12/20/2013	9:04	543267	3759471	WGS84	1	1					1	1			2	
Lcth08NE	2/18/2014	8:44	543267	3759471	WGS84	1				1							
Lcth08NM	12/20/2013	10:15	542812	3759260	WGS84							1					
Lcth08NM	2/18/2014	9:23	542812	3759260	WGS84							3					
Lcth08NW	2/18/2014	10:02	542312	3759248	WGS84							1					
Lcth08NW	4/3/2014	1:18	542312	3759248	WGS84							1	1				
Lcth08SE	12/20/2013	12:49	543509	3758505	WGS84							1					
Lcth08SE	2/18/2014	12:07	543509	3758505	WGS84							1					
Lcth08SE	4/3/2014	11:25	543509	3758505	WGS84							1				1	
Lcth08SM	12/20/2013	12:15	543057	3758293	WGS84								1				
Lcth08SM	2/18/2014	11:28	543057	3758293	WGS84					2			1				
Lcth08SM	4/3/2014	11:57	543057	3758293	WGS84		1					2					
Lcth08SW	2/18/2014	10:48	542400	3758254	WGS84							1			1		
Lcth10NM	12/17/2013	9:19	544726	3752439	WGS84								1				
Lcth10NM	2/12/2014	15:45	544726	3752439	WGS84							1					
Lcth10NW	3/19/2014	8:30	544296	3752697	WGS84							1	1				
Lcth10NW	2/12/2014	16:13	544296	3752697	WGS84							1					
Lcth10SE	12/17/2013	10:30	544941	3751037	WGS84							1					
Lcth10SE	3/19/2014	10:19	544941	3751037	WGS84							2					
Lcth10SM	3/19/2014	10:49	544634	3751436	WGS84							1					
Lcth10SW	12/17/2013	11:30	544213	3751708	WGS84							1					
Lcth10SW	2/12/2014	13:53	544213	3751708	WGS84							2					
Lcth12NE	1/8/2014	9:46	549562	3750102	WGS84											1	
Lcth12NE	1/23/2014	14:37	549562	3750102	WGS84								1				
Lcth12NM	1/23/2014	15:08	549095	3750277	WGS84							1					
Lcth12NM	2/21/2014	9:26	549095	3750277	WGS84							1					
Lcth12NW	1/8/2014	8:13	548636	3750476	WGS84							1	1				
Lcth12NW	2/21/2014	8:45	548636	3750476	WGS84								1				
Lcth12SE	1/23/2014	13:41	549122	3749179	WGS84							1					
Lcth12SE	2/21/2014	11:11	549122	3749179	WGS84							1					
Lcth12SM	1/23/2014	13:13	548662	3749379	WGS84							2					

Appendix A. LeConte's Thrasher incidental sightings (Brown-headed Cowbird – Golden Eagle)

Plot name	Date	Time	UTM Easting	UTM Northing	Datum	Brown-headed Cowbird	Burrowing Owl	Cactus Wren	California Towhee	California Thrasher	Canadian Goose	Common Raven	Costa's Hummingbird	Crissal Thrasher	Ferruginous Hawk	Gambel's Quail	Golden Eagle
Lcth12SW	1/8/2014	12:15	548201	3749576	WGS84							1					
Lcth12SW	1/23/2014	12:42	548201	3749576	WGS84							2					
Lcth12SW	2/21/2014	12:24	548201	3749576	WGS84							1					
Lcth13NE	1/8/2014	16:26	552207	3751265	WGS84							1					
Lcth13NE	2/24/2014	12:12	552207	3751265	WGS84							1					
Lcth13NM	1/8/2014	13:39	551726	3751125	WGS84							1					
Lcth13NM	1/23/2014	11:24	551726	3751125	WGS84							1					
Lcth13NW	1/8/2014	14:06	551242	3750997	WGS84							1					
Lcth13NW	1/23/2014	10:55	551242	3750997	WGS84							2	2				
Lcth13NW	2/24/2014	9:23	551242	3750997	WGS84							1	1				
Lcth13SE	1/8/2014	15:49	551895	3750238	WGS84							3					
Lcth13SE	1/23/2014	9:16	551895	3750238	WGS84							2					
Lcth13SE	2/24/2014	11:33	551895	3750238	WGS84							1					
Lcth13SM	1/8/2014	15:19	551397	3750183	WGS84							1					
Lcth13SM	1/23/2014	9:47	551397	3750183	WGS84							2					
Lcth13SM	2/24/2014	10:59	551397	3750183	WGS84							1					
Lcth13SW	1/23/2014	10:18	550912	3750057	WGS84							1					
Lcth13SW	2/24/2014	10:21	550912	3750057	WGS84							2					
Lcth15NE	12/6/2013	14:25	562245	3739586	WGS84							3					
Lcth15NE	2/20/2014	9:30	562245	3739586	WGS84							3					
Lcth15NM	12/6/2013	15:01	561827	3739874	WGS84							1					
Lcth15NM	2/20/2014	10:05	561827	3739874	WGS84							1					
Lcth15NW	12/6/2013	NR	561475	3740227	WGS84		1					3					
Lcth15NW	2/20/2014	10:33	561475	3740227	WGS84							2					
Lcth15SE	12/6/2013	NR	561571	3738962	WGS84							6					
Lcth15SM	12/6/2013	12:52	561148	3739229	WGS84						5						
Lcth15SM	2/20/2014	11:44	561148	3739229	WGS84							1					
Lcth16NE	2/14/2014	1:09	564354	3748625	WGS84							2					
Lcth16NE	4/4/2014	11:15	564354	3748625	WGS84							2					
Lcth16NM	2/14/2014	12:45	563871	3748490	WGS84							2					
Lcth16NM	4/4/2014	11:44	563871	3748490	WGS84							5					

Appendix A. LeConte's Thrasher incidental sightings (Brown-headed Cowbird – Golden Eagle)

Plot name	Date	Time	UTM Easting	UTM Northing	Datum	Brown-headed Cowbird	Burrowing Owl	Cactus Wren	California Towhee	California Thrasher	Canadian Goose	Common Raven	Costa's Hummingbird	Crissal Thrasher	Ferruginous Hawk	Gambel's Quail	Golden Eagle
Lcth16NW	2/14/2014	10:55	563423	3748275	WGS84							10	1			1	
Lcth16NW	4/4/2014	12:20	563423	3748275	WGS84							1					
Lcth16SE	2/14/2014	9:07	563659	3747952	WGS84							1					
Lcth16SE	4/4/2014	10:20	563659	3747952	WGS84							2					
Lcth16SM	2/14/2014	9:40	563203	3747741	WGS84		1					2					
Lcth16SM	4/4/2014	1:05	563203	3747741	WGS84							8					
Lcth16SW	4/4/2014	2:09	562743	3747545	WGS84							3					
Lcth17NE	1/9/2014	14:10	563917	3747141	WGS84								1				
Lcth17NE	2/13/2014	11:43	563917	3747141	WGS84							2					
Lcth17NM	2/13/2014	11:21	563429	3747260	WGS84							9					
Lcth17NM	4/4/2014	16:18	563429	3747260	WGS84							2					
Lcth17NW	1/9/2014	13:02	563000	3747515	WGS84							14					1
Lcth17SE	1/9/2014	10:32	563489	3746239	WGS84							1					
Lcth17SE	2/13/2014	9:15	563489	3746239	WGS84							2				1	
Lcth17SE	4/4/2014	15:47	563489	3746239	WGS84							3					
Lcth17SM	1/9/2014	11:20	563003	3746357	WGS84							1					
Lcth17SM	2/13/2014	9:44	563003	3746357	WGS84							1					
Lcth17SW	1/9/2014	12:00	562575	3746614	WGS84							1					
Lcth17SW	4/4/2014	14:56	562575	3746614	WGS84							2					
Lcth18NM	12/13/2013	11:49	564163	3738712	WGS84								1				
Lcth18NM	1/21/2014	9:47	564163	3738712	WGS84							1					
Lcth18NM	3/3/2014	11:06	564163	3738712	WGS84							1					
Lcth18NE	3/3/2014	11:33	564491	3738314	WGS84							1					
Lcth18NW	12/13/2013	11:10	563812	3739060	WGS84							2					
Lcth18NW	1/21/2014	10:18	563812	3739060	WGS84							4	1				
Lcth18NW	3/3/2014	10:36	563812	3739060	WGS84							7					
Lcth18SE	12/13/2013	9:04	563788	3737604	WGS84							1					
Lcth18SE	1/21/2014	12:07	563788	3737604	WGS84							2					
Lcth18SE	3/3/2014	8:44	563788	3737604	WGS84							1					
Lcth18SM	1/21/2014	11:42	563473	3737990	WGS84							20					
Lcth18SM	3/3/2014	9:20	563473	3737990	WGS84							2					

Appendix A. LeConte's Thrasher incidental sightings (Brown-headed Cowbird – Golden Eagle)

Plot name	Date	Time	UTM Easting	UTM Northing	Datum	Brown-headed Cowbird	Burrowing Owl	Cactus Wren	California Towhee	California Thrasher	Canadian Goose	Common Raven	Costa's Hummingbird	Crissal Thrasher	Ferruginous Hawk	Gambel's Quail	Golden Eagle
Lcth18SW	1/21/2014	11:08	563120	3738341	WGS84							1					
Lcth18SW	3/3/2014	9:47	563120	3738341	WGS84							3					
Lcth22NE	12/11/2013	11:28	572589	3736310	WGS84		1					2					
Lcth22NE	1/22/2014	10:00	572589	3736310	WGS84							2	1				
Lcth22NM	3/4/2014	11:22	572090	3736354	WGS84							1					
Lcth22SE	12/11/2013	10:37	572118	3735424	WGS84							2					
Lcth22SE	3/4/2014	10:00	572118	3735424	WGS84								1				
Lcth22SM	1/22/2014	11:22	571627	3735552	WGS84								1				
Lcth22SM	3/4/2014	9:23	571627	3735552	WGS84								1				
Lcth22SW	12/11/2013	9:12	571134	3735648	WGS84								1				
Lcth22SW	3/4/2014	8:45	571134	3735648	WGS84								1				
Lcth23NE	2/19/2014	8:50	577321	3734674	WGS84							1					
Lcth23NW	12/10/2013	10:15	576507	3735245	WGS84							2					
Lcth23NW	1/24/2014	11:45	576507	3735245	WGS84							2	1				
Lcth23NW	2/19/2014	9:56	576507	3735245	WGS84							2	1				
Lcth23SE	12/10/2013	8:05	576799	3733821	WGS84							1					
Lcth23SE	1/24/2014	9:48	576799	3733821	WGS84							1					
Lcth23SM	12/10/2013	12:34	576408	3734100	WGS84							2					
Lcth23SM	1/24/2014	10:18	576408	3734100	WGS84								1				
Lcth23SW	1/24/2014	10:47	575974	3734389	WGS84								2				
Lcth23SW	2/19/2014	11:05	575974	3734389	WGS84							2	1				
Lcth25EM	2/7/2014	14:24	594519	3715119	WGS84								1			1	
Lcth25EM	2/26/2014	11:34	594519	3715119	WGS84							3					
Lcth25NE	2/7/2014	13:49	594950	3715393	WGS84								1				
Lcth25NE	2/26/2014	12:10	594950	3715393	WGS84							1	1				
Lcth25NW	2/26/2014	9:24	594128	3715995	WGS84								1				
Lcth25SE	2/26/2014	11:05	594160	3714769	WGS84							1	1				
Lcth25SW	1/15/2014	9:50	593357	3715366	WGS84											1	
Lcth25SW	2/7/2014	15:30	593357	3715366	WGS84								1				

Appendix A. LeConte's Thrasher incidental sightings (Brown-headed Cowbird – Golden Eagle)

Plot name	Date	Time	UTM Easting	UTM Northing	Datum	Brown-headed Cowbird	Burrowing Owl	Cactus Wren	California Towhee	California Thrasher	Canadian Goose	Common Raven	Costa's Hummingbird	Crissal Thrasher	Ferruginous Hawk	Gambel's Quail	Golden Eagle
Lcth25SW	2/26/2014	10:27	593357	3715366	WGS84	1						1	1				
Lcth25WM	2/7/2014	15:55	593715	3715715	WGS84								1				
Lcth25WM	2/26/2014	9:58	593715	3715715	WGS84							1					
Lcth27EM	3/5/2014	10:06	603119	3722037	WGS84							1	1				
Lcth27NE	2/7/2014	11:19	603528	3722323	WGS84								1				
Lcth27NE	3/5/2014	10:40	603528	3722323	WGS84							1					
Lcth27NW	3/5/2014	11:26	603067	3723208	WGS84							1					
Lcth27SE	1/15/2014	1:15	602666	3721823	WGS84								1			1	
Lcth27SE	2/7/2014	12:32	602666	3721823	WGS84								1				
Lcth27SE	3/5/2014	9:36	602666	3721823	WGS84								1				
Lcth27SW	1/15/2014	3:55	602202	3722709	WGS84								1				
Lcth27SW	2/7/2014	9:19	602202	3722709	WGS84			1									
Lcth27SW	3/5/2014	12:16	602202	3722709	WGS84							2					
Lcth27WM	2/7/2014	10:00	602655	3722921	WGS84			1									
Lcth27WM	3/5/2014	11:53	602655	3722921	WGS84								1				
Lcth28NE	1/10/2014	11:40	608178	3708445	WGS84							1				1	
Lcth28NE	2/5/2014	11:18	608178	3708445	WGS84							1				1	
Lcth28NE	2/27/2014	10:30	608178	3708445	WGS84							2					
Lcth28NM	1/10/2014	11:00	607697	3708583	WGS84							1					
Lcth28NM	2/5/2014	10:47	607697	3708583	WGS84							1	1				
Lcth28NM	2/27/2014	11:10	607697	3708583	WGS84			1									
Lcth28NW	1/10/2014	9:50	607213	3708705	WGS84									1			
Lcth28NW	2/5/2014	10:05	607213	3708705	WGS84							1					
Lcth28NW	2/27/2014	11:43	607213	3708705	WGS84							2					
Lcth28SE	2/27/2014	9:50	607743	3707547	WGS84								1			1	
Lcth28SM	1/10/2014	1:20	607262	3707685	WGS84							1					
Lcth28SM	2/5/2014	13:00	607262	3707685	WGS84							2					
Lcth28SM	2/27/2014	9:16	607262	3707685	WGS84							1					
Lcth28SW	1/10/2014	1:48	606778	3707809	WGS84							2					
Lcth28SW	2/5/2014	13:30	606778	3707809	WGS84							1					

Appendix A. LeConte's Thrasher incidental sightings (Brown-headed Cowbird – Golden Eagle)

Plot name	Date	Time	UTM Easting	UTM Northing	Datum	Greater Roadrunner	Great-tailed Grackle	House Finch	House Wren	Lazuli Bunting	Le Contes Thrasher	Loggerhead Shrike	Mourning Dove	Northern Flicker	Northern Mockingbird	Orange-crowned Warbler	Osprey
Lcth02NM	2/12/2014	9:38	526760	3755857	WGS84			2			1						
Lcth02NM	3/20/2014	9:47	526760	3755857	WGS84			1					1				
Lcth02SE	1/3/2014	14:12	527036	3754724	WGS84			1									
Lcth02SE	3/20/2014	11:18	527036	3754724	WGS84						2						
Lcth02SM	1/3/2014	12:15	526569	3754938	WGS84			2				1					
Lcth02SM	2/12/2014	11:50	526569	3754938	WGS84			1									
Lcth02SM	3/20/2014	12:08	526569	3754938	WGS84			1									
Lcth02SW	1/3/2014	13:03	526098	3755108	WGS84			1									
Lcth06NM	12/16/2013	8:05	539844	3762596	WGS84			2									
LCTH06SE	2/18/2014	3:34	539883	3761297	WGS84			2									
Lcth06SM	1/28/2014	9:05	539483	3761667	WGS84			1									
Lcth06SM	2/18/2014	4:05	539483	3761667	WGS84			2									
Lcth06SW	1/28/2014	8:22	539010	3761834	WGS84								1				
Lcth06SW	2/18/2014	4:32	539010	3761834	WGS84			1									
Lcth07NE	2/25/2014	11:31	541760	3760658	WGS84			2									
Lcth07SE	12/16/2013	12:45	541530	3759687	WGS84			1									
Lcth07SE	1/28/2014	3:43	541530	3759687	WGS84			1									
Lcth07SM	2/25/2014	9:06	541051	3759836	WGS84			1					1				
Lcth07SW	2/25/2014	9:30	540572	3759987	WGS84			1									
Lcth08NE	12/20/2013	9:04	543267	3759471	WGS84				1								
Lcth08NE	2/18/2014	8:44	543267	3759471	WGS84	1	1						2		2		
Lcth08SE	4/3/2014	11:25	543509	3758505	WGS84		1										
Lcth08SM	12/20/2013	12:15	543057	3758293	WGS84												
Lcth08SM	2/18/2014	11:28	543057	3758293	WGS84												
Lcth08SM	4/3/2014	11:57	543057	3758293	WGS84			2							2		
Lcth08SW	12/20/2013	NR	542400	3758254	WGS84												
Lcth08SW	2/18/2014	10:48	542400	3758254	WGS84												
Lcth08SW	4/3/2014	12:35	542400	3758254	WGS84			1									
Lcth10NE	12/17/2013	9:49	545014	3752031	WGS84			1									
Lcth10NM	3/19/2014	9:05	544726	3752439	WGS84							1					
Lcth10SM	12/17/2013	11:08	544634	3751436	WGS84			1									

Appendix A. LeConte's Thrasher incidental sightings (Greater Roadrunner - Osprey)

Plot name	Date	Time	UTM Easting	UTM Northing	Datum	Greater Roadrunner	Great-tailed Grackle	House Finch	House Wren	Lazuli Bunting	Le Contes Thrasher	Loggerhead Shrike	Mourning Dove	Northern Flicker	Northern Mockingbird	Orange-crowned Warbler	Osprey
Lcth12NM	2/21/2014	9:26	549095	3750277	WGS84	1											
Lcth12NW	1/8/2014	8:13	548636	3750476	WGS84							1					
Lcth12SE	1/23/2014	13:41	549122	3749179	WGS84			2									
Lcth12SM	1/8/2014	11:36	548662	3749379	WGS84			2									
Lcth12SW	1/23/2014	12:42	548201	3749576	WGS84										1		
Lcth13NE	1/8/2014	16:26	552207	3751265	WGS84			1									
Lcth13NM	2/24/2014	8:43	551726	3751125	WGS84			1						1			
Lcth13NW	1/8/2014	14:06	551242	3750997	WGS84								1				
Lcth13SE	1/23/2014	9:16	551895	3750238	WGS84			1									
Lcth13SM	1/23/2014	9:47	551397	3750183	WGS84			1									
Lcth13SW	2/24/2014	10:21	550912	3750057	WGS84			1					1				
Lcth15NE	12/6/2013	14:25	562245	3739586	WGS84			2									
Lcth15NE	1/16/2024	9:11	562245	3739586	WGS84			1									
Lcth15NM	2/20/2014	10:05	561827	3739874	WGS84							1					
Lcth15NW	2/20/2014	10:33	561475	3740227	WGS84										1		
Lcth15SE	1/16/2014	11:57	561571	3738962	WGS84			1									
Lcth15SM	12/6/2013	12:52	561148	3739229	WGS84			2									
Lcth15SM	2/20/2014	11:44	561148	3739229	WGS84			1									
Lcth15SM	1/16/2014	11:34	561148	3739229	WGS84			5									
Lcth15SW	2/20/2014	11:15	560752	3739536	WGS84			1									
Lcth16NE	4/4/2014	11:15	564354	3748625	WGS84							1					
Lcth16NW	12/19/2013	12:05	563423	3748275	WGS84			1									
Lcth16NW	2/14/2014	10:55	563423	3748275	WGS84								2				
Lcth16SE	4/4/2014	10:20	563659	3747952	WGS84								1				
Lcth16SW	4/4/2014	2:09	562743	3747545	WGS84								1				
Lcth17SE	2/13/2014	9:15	563489	3746239	WGS84			1				2					
Lcth17SM	1/9/2014	11:20	563003	3746357	WGS84			2									
Lcth17SM	2/13/2014	9:44	563003	3746357	WGS84							2					
Lcth18NM	12/13/2013	11:49	564163	3738712	WGS84			3									
Lcth18NM	3/3/2014	11:06	564163	3738712	WGS84							2					
Lcth18NE	12/13/2013	12:55	564491	3738314	WGS84			1									

Appendix A. LeConte’s Thrasher incidental sightings (Greater Roadrunner - Osprey)

Plot name	Date	Time	UTM Easting	UTM Northing	Datum	Greater Roadrunner	Great-tailed Grackle	House Finch	House Wren	Lazuli Bunting	Le Contes Thrasher	Loggerhead Shrike	Mourning Dove	Northern Flicker	Northern Mockingbird	Orange-crowned Warbler	Osprey
Lcth22NM	12/11/2013	12:20	572090	3736354	WGS84			3									
Lcth22NW	1/22/2014	8:54	571573	3736444	WGS84			1									
Lcth22SE	12/11/2013	10:37	572118	3735424	WGS84			2									
Lcth22SE	1/22/2014	10:57	572118	3735424	WGS84			1									
Lcth22SE	3/4/2014	10:00	572118	3735424	WGS84										1		
Lcth22SM	12/11/2013	9:50	571627	3735552	WGS84			1									
Lcth22SM	3/4/2014	9:23	571627	3735552	WGS84								1		3		
Lcth22SW	12/11/2013	9:12	571134	3735648	WGS84			1									
Lcth22SW	1/22/2014	11:52	571134	3735648	WGS84			1									
Lcth22SW	3/4/2014	8:45	571134	3735648	WGS84										2		
Lcth23NE	12/10/2013	8:50	577321	3734674	WGS84							1					
Lcth23NE	1/24/2014	12:40	577321	3734674	WGS84			5				1					
Lcth23NE	2/19/2014	8:50	577321	3734674	WGS84			6				2					
Lcth23NM	1/24/2014	12:13	576934	3734953	WGS84			1									
Lcth23NM	2/19/2014	9:22	576934	3734953	WGS84			1									
Lcth23NW	1/24/2014	11:45	576507	3735245	WGS84			1									
Lcth23NW	2/19/2014	9:56	576507	3735245	WGS84			1				1					
Lcth23SE	1/24/2014	9:48	576799	3733821	WGS84			1									
Lcth23SW	2/19/2014	11:05	575974	3734389	WGS84			1									
Lcth25EM	2/26/2014	11:34	594519	3715119	WGS84							1					
Lcth25NW	1/15/2014	8:30	594128	3715995	WGS84			1				1				1	
Lcth25NW	2/7/2014	16:35	594128	3715995	WGS84			2		6							
Lcth25NW	2/26/2014	9:24	594128	3715995	WGS84								1				
Lcth25SE	2/7/2014	14:48	594160	3714769	WGS84									1			
Lcth25SE	2/26/2014	11:05	594160	3714769	WGS84							1					
Lcth25SW	1/15/2014	9:50	593357	3715366	WGS84										1		
Lcth25WM	2/7/2014	15:55	593715	3715715	WGS84			1									
Lcth27EM	3/5/2014	10:06	603119	3722037	WGS84								1				
Lcth27NE	2/7/2014	11:19	603528	3722323	WGS84			1					20				
Lcth27NW	2/7/2014	NR	603067	3723208	WGS84			1									

Appendix A. LeConte's Thrasher incidental sightings (Greater Roadrunner - Osprey)

Plot name	Date	Time	UTM Easting	UTM Northing	Datum	Greater Roadrunner	Great-tailed Grackle	House Finch	House Wren	Lazuli Bunting	Le Contes Thrasher	Loggerhead Shrike	Mourning Dove	Northern Flicker	Northern Mockingbird	Orange-crowned Warbler	Osprey
Lcth28NE	1/10/2014	11:40	608178	3708445	WGS84							1					
Lcth28NE	2/27/2014	10:30	608178	3708445	WGS84								1	1			
Lcth28NM	2/5/2014	10:47	607697	3708583	WGS84			3									
Lcth28NW	1/10/2014	9:50	607213	3708705	WGS84												1
Lcth28SE	2/5/2014	12:20	607743	3707547	WGS84										2		
Lcth28SE	2/27/2014	9:50	607743	3707547	WGS84			1					1				
Lcth28SM	2/27/2014	9:16	607262	3707685	WGS84								1				

Plot name	Date	Time	UTM Easting	UTM Northing	Datum	Phainopepla	Red-tailed Hawk	Rock Dove	Rock Wren	Sage Sparrow	Sage Thrasher	Say's Phoebe	Song Sparrow	Turkey Vulture	Verdin	Western Meadowlark	White-crowned Sparrow
Lcth02NE	2/12/2014	10:26	527230	3755688	WGS84						1						
Lcth02NE	3/20/2014	10:26	527230	3755688	WGS84											1	
Lcth02NM	1/3/2014	9:50	526760	3755857	WGS84							1			1		1
Lcth02NM	2/12/2014	9:38	526760	3755857	WGS84												1
Lcth02NW	1/3/2014	8:51	526376	3756176	WGS84						1						
Lcth02NW	2/12/2014	8:52	526376	3756176	WGS84						1	1					
Lcth02NW	3/20/2014	8:56	526376	3756176	WGS84							1					1
Lcth02SE	3/20/2014	11:18	527036	3754724	WGS84											1	
Lcth02SM	1/3/2014	12:15	526569	3754938	WGS84							1					
Lcth02SM	3/20/2014	12:08	526569	3754938	WGS84						2						
Lcth02SW	1/3/2014	13:03	526098	3755108	WGS84											1	
Lcth02SW	2/12/2014	12:15	526098	3755108	WGS84							1					
Lcth02SW	3/20/2014	12:41	526098	3755108	WGS84											1	
Lcth06NM	12/16/2013	8:05	539844	3762596	WGS84							2					
Lcth06NW	12/16/2013	7:18	539373	3762765	WGS84										1		

Appendix A. LeConte's Thrasher incidental sightings (Greater Roadrunner – White-crowned Sparrow)

Plot name	Date	Time	UTM Easting	UTM Northing	Datum	Phainopepla	Red-tailed Hawk	Rock Dove	Rock Wren	Sage Sparrow	Sage Thrasher	Say's Phoebe	Song Sparrow	Turkey Vulture	Verdin	Western Meadowlark	White-crowned Sparrow
Lcth06NW	1/28/2014	11:10	539373	3762765	WGS84										1		
Lcth06SM	1/28/2014	9:05	539483	3761667	WGS84											1	
Lcth06SW	12/16/2013	11:30	539010	3761834	WGS84					1		2					
Lcth06SW	1/28/2014	8:22	539010	3761834	WGS84				1								
Lcth07NM	1/28/2014	1:36	541278	3760812	WGS84										1		
Lcth07NM	2/25/2014	11:08	541278	3760812	WGS84							1					
Lcth07SM	1/28/2014	3:13	541051	3759836	WGS84										1		
Lcth07SW	1/28/2014	2:53	540572	3759987	WGS84					1							
Lcth08NE	12/20/2013	9:04	543267	3759471	WGS84											1	3
Lcth08NE	2/18/2014	8:44	543267	3759471	WGS84						1						
Lcth08NE	4/3/2014	2:21	543267	3759471	WGS84										1		
Lcth08NM	12/20/2013	10:15	542812	3759260	WGS84										1		1
Lcth08NW	2/18/2014	10:02	542312	3759248	WGS84												2
Lcth08SE	12/20/2013	12:49	543509	3758505	WGS84					1					1		
Lcth08SM	12/20/2013	12:15	543057	3758293	WGS84					1							
Lcth08SM	4/3/2014	11:57	543057	3758293	WGS84							1					
Lcth10NE	3/19/2014	9:40	545014	3752031	WGS84							1					
Lcth10NM	12/17/2013	9:19	544726	3752439	WGS84							1					
Lcth10NW	12/17/2013	8:44	544296	3752697	WGS84							1					
Lcth10NW	3/19/2014	8:30	544296	3752697	WGS84											2	
Lcth12NE	1/8/2014	9:46	549562	3750102	WGS84	1				2					1		
Lcth12NE	1/23/2014	14:37	549562	3750102	WGS84	1											
Lcth12NE	2/21/2014	10:06	549562	3750102	WGS84							1					
Lcth12NM	1/8/2014	8:57	549095	3750277	WGS84					1							
Lcth12NM	1/23/2014	15:08	549095	3750277	WGS84					1							
Lcth12NW	1/8/2014	8:13	548636	3750476	WGS84					1					2		
Lcth12NW	2/21/2014	8:45	548636	3750476	WGS84										1		
Lcth12SW	1/23/2014	12:42	548201	3749576	WGS84										1		
Lcth13NM	2/24/2014	8:43	551726	3751125	WGS84		1					1					
Lcth13NW	1/23/2014	10:55	551242	3750997	WGS84										1		
Lcth13NW	2/24/2014	9:23	551242	3750997	WGS84										1		

Appendix A. LeConte's Thrasher incidental sightings (Phainopepla – White-crowned Sparrow)

Plot name	Date	Time	UTM Easting	UTM Northing	Datum	Phainopepla	Red-tailed Hawk	Rock Dove	Rock Wren	Sage Sparrow	Sage Thrasher	Say's Phoebe	Song Sparrow	Turkey Vulture	Verdin	Western Meadowlark	White-crowned Sparrow
Lcth13SE	1/23/2014	9:16	551895	3750238	WGS84							1					
Lcth13SW	2/24/2014	10:21	550912	3750057	WGS84							1					
Lcth15NE	12/6/2013	14:25	562245	3739586	WGS84							1					
Lcth15NE	2/20/2014	9:30	562245	3739586	WGS84		1					1					
Lcth15NM	1/16/2014	9:49	561827	3739874	WGS84					1							
Lcth15NW	12/6/2013	NR	561475	3740227	WGS84							2					
Lcth15SE	12/6/2013	NR	561571	3738962	WGS84		2										
Lcth15SE	2/20/2014	8:50	561571	3738962	WGS84							2					
Lcth16SE	2/14/2014	9:07	563659	3747952	WGS84		1					1					
Lcth16SE	4/4/2014	10:20	563659	3747952	WGS84							1					
Lcth16SM	2/14/2014	9:40	563203	3747741	WGS84									4			
Lcth16SW	2/14/2014	10:11	562743	3747545	WGS84							1					
Lcth17NE	1/9/2014	14:10	563917	3747141	WGS84							1					
Lcth17NM	1/9/2014	13:35	563429	3747260	WGS84										1		
Lcth17NM	2/13/2014	11:21	563429	3747260	WGS84		1										
Lcth17SE	2/13/2014	9:15	563489	3746239	WGS84							1					
Lcth17SM	2/13/2014	9:44	563003	3746357	WGS84							1					
Lcth18NM	1/21/2014	9:47	564163	3738712	WGS84							1					
Lcth18NM	3/3/2014	11:06	564163	3738712	WGS84		1										
Lcth18NE	1/21/2014	9:11	564491	3738314	WGS84							2					
Lcth18NE	3/3/2014	11:33	564491	3738314	WGS84							2					
Lcth18NW	12/13/2013	11:10	563812	3739060	WGS84		1										
Lcth18NW	1/21/2014	10:18	563812	3739060	WGS84							1					
Lcth18NW	3/3/2014	10:36	563812	3739060	WGS84							2					
Lcth18SE	3/3/2014	8:44	563788	3737604	WGS84							1					
Lcth18SM	12/13/2013	9:38	563473	3737990	WGS84											1	
Lcth18SW	1/21/2014	11:08	563120	3738341	WGS84							1					
Lcth18SW	3/3/2014	9:47	563120	3738341	WGS84							1					
Lcth22NE	12/11/2013	11:28	572589	3736310	WGS84					1							
Lcth22NE	1/22/2014	10:00	572589	3736310	WGS84										1		
Lcth22NE	3/4/2014	10:48	572589	3736310	WGS84										1		

Appendix A. LeConte's Thrasher incidental sightings (Phainopepla – White-crowned Sparrow)

Plot name	Date	Time	UTM Easting	UTM Northing	Datum	Phainopepla	Red-tailed Hawk	Rock Dove	Rock Wren	Sage Sparrow	Sage Thrasher	Say's Phoebe	Song Sparrow	Turkey Vulture	Verdin	Western Meadowlark	White-crowned Sparrow
Lcth22NW	1/22/2014	8:54	571573	3736444	WGS84							1					
Lcth22NW	3/4/2014	NR	571573	3736444	WGS84							1					
Lcth22SE	12/11/2013	10:37	572118	3735424	WGS84							2					
Lcth22SE	1/22/2014	10:57	572118	3735424	WGS84							1			1		
Lcth22SE	3/4/2014	10:00	572118	3735424	WGS84										2		
Lcth22SM	12/11/2013	9:50	571627	3735552	WGS84					1		1			2		
Lcth22SM	1/22/2014	11:22	571627	3735552	WGS84							2			1		
Lcth22SM	3/4/2014	9:23	571627	3735552	WGS84										1		
Lcth22SW	12/11/2013	9:12	571134	3735648	WGS84										1		
Lcth22SW	1/22/2014	11:52	571134	3735648	WGS84							1			1		
Lcth22SW	3/4/2014	8:45	571134	3735648	WGS84						1	1			1		2
Lcth23NE	12/10/2013	8:50	577321	3734674	WGS84		1								3		
Lcth23NE	2/19/2014	8:50	577321	3734674	WGS84									6			
Lcth23NM	12/10/2013	9:28	576934	3734953	WGS84		2								2		
Lcth23NM	2/19/2014	9:22	576934	3734953	WGS84		1							16			
Lcth23NW	12/10/2013	10:15	576507	3735245	WGS84					2					2		
Lcth23NW	1/24/2014	11:45	576507	3735245	WGS84					1		1					
Lcth23NW	2/19/2014	9:56	576507	3735245	WGS84									19			
Lcth23SE	12/10/2013	8:05	576799	3733821	WGS84							1			2		
Lcth23SM	12/10/2013	12:34	576408	3734100	WGS84							1					
Lcth23SM	2/19/2014	11:38	576408	3734100	WGS84		1					1			2		
Lcth23SW	2/19/2014	11:05	575974	3734389	WGS84		1					1					
Lcth25EM	1/15/2014	11:19	594519	3715119	WGS84							1					
Lcth25EM	2/7/2014	14:24	594519	3715119	WGS84							1					
Lcth25EM	2/26/2014	11:34	594519	3715119	WGS84							1					
Lcth25NE	1/15/2014	12:02	594950	3715393	WGS84		3					1					
Lcth25NE	2/7/2014	13:49	594950	3715393	WGS84							1					
Lcth25NW	1/15/2014	8:30	594128	3715995	WGS84										2		
Lcth25NW	2/7/2014	16:35	594128	3715995	WGS84										1		
Lcth25NW	2/26/2014	9:24	594128	3715995	WGS84										2		
Lcth25SE	1/15/2014	10:45	594160	3714769	WGS84					1							

Appendix A. LeConte's Thrasher incidental sightings (Phainopepla – White-crowned Sparrow)

Plot name	Date	Time	UTM Easting	UTM Northing	Datum	Phainopepla	Red-tailed Hawk	Rock Dove	Rock Wren	Sage Sparrow	Sage Thrasher	Say's Phoebe	Song Sparrow	Turkey Vulture	Verdin	Western Meadowlark	White-crowned Sparrow
Lcth25SE	2/7/2014	14:48	594160	3714769	WGS84							1					
Lcth25SE	2/26/2014	11:05	594160	3714769	WGS84							1		3			
Lcth25SW	1/15/2014	9:50	593357	3715366	WGS84							2					
Lcth25SW	2/7/2014	15:30	593357	3715366	WGS84							1					
Lcth25SW	2/26/2014	10:27	593357	3715366	WGS84		1					1					
Lcth25WM	1/15/2014	9:15	593715	3715715	WGS84		1										
Lcth25WM	2/26/2014	9:58	593715	3715715	WGS84										1		
Lcth27EM	1/15/2014	1:50	603119	3722037	WGS84	1									1		
Lcth27EM	2/7/2014	11:50	603119	3722037	WGS84	2						1					
Lcth27EM	3/5/2014	10:06	603119	3722037	WGS84	4						1			1		
Lcth27NE	1/15/2014	2:18	603528	3722323	WGS84	1									1		
Lcth27NE	2/7/2014	11:19	603528	3722323	WGS84	2									1		
Lcth27NE	3/5/2014	10:40	603528	3722323	WGS84							1			2		
Lcth27NW	1/15/2014	3:01	603067	3723208	WGS84	1	1	1									
Lcth27NW	2/7/2014	NR	603067	3723208	WGS84	2											
Lcth27NW	3/5/2014	11:26	603067	3723208	WGS84	2											
Lcth27SE	1/15/2014	1:15	602666	3721823	WGS84	1									1		
Lcth27SE	2/7/2014	12:32	602666	3721823	WGS84	2											
Lcth27SE	3/5/2014	9:36	602666	3721823	WGS84	5									1		
Lcth27SW	1/15/2014	3:55	602202	3722709	WGS84	1											
Lcth27SW	2/7/2014	9:19	602202	3722709	WGS84	5					2				2		
Lcth27SW	3/5/2014	12:16	602202	3722709	WGS84	2									1		
Lcth27WM	2/7/2014	10:00	602655	3722921	WGS84	1									1		
Lcth27WM	3/5/2014	11:53	602655	3722921	WGS84	1									2		
Lcth28NE	2/5/2014	11:18	608178	3708445	WGS84	2						1					
Lcth28NM	2/5/2014	10:47	607697	3708583	WGS84										2		
Lcth28NM	2/27/2014	11:10	607697	3708583	WGS84	1								1			
Lcth28NW	1/10/2014	9:50	607213	3708705	WGS84										1		
Lcth28NW	2/27/2014	11:43	607213	3708705	WGS84	1									1		
Lcth28SE	1/10/2014	12:45	607743	3707547	WGS84	1											
Lcth28SE	2/5/2014	12:20	607743	3707547	WGS84	1											1
Lcth28SE	2/27/2014	9:50	607743	3707547	WGS84	2									1		

Appendix A. LeConte's Thrasher incidental sightings (Phainopepla – White-crowned Sparrow)

Plot name	Date	Time	UTM Easting	UTM Northing	Datum	Phainopepla	Red-tailed Hawk	Rock Dove	Rock Wren	Sage Sparrow	Sage Thrasher	Say's Phoebe	Song Sparrow	Turkey Vulture	Verdin	Western Meadowlark	White-crowned Sparrow
Lcth28SM	2/5/2014	13:00	607262	3707685	WGS84							1					
Lcth28SM	2/27/2014	9:16	607262	3707685	WGS84								1				
Lcth28SW	2/27/2014	12:48	606778	3707809	WGS84									1	1		

Plot name	Date	Time	UTM Easting	UTM Northing	Datum	Yellow-rumped Warbler	Duck-unidentified	Raptor- unidentified	Seagull- unidentified	Swallow- unidentified	Warbler- unidentified	Woodpecker- unidentified
Lcth02NW	3/20/2014	8:56	526376	3756176	WGS84							1
Lcth06SW	2/18/2014	4:32	539010	3761834	WGS84			1				
Lcth07NE	1/28/2014	1:05	541760	3760658	WGS84	1						
Lcth08NE	12/20/2013	9:04	543267	3759471	WGS84	1						
Lcth08NE	4/3/2014	2:21	543267	3759471	WGS84	1						
Lcth08SE	12/20/2013	12:49	543509	3758505	WGS84	1						
Lcth08SE	4/3/2014	11:25	543509	3758505	WGS84					1		
Lcth10NM	3/19/2014	9:05	544726	3752439	WGS84					1		
Lcth13NM	2/24/2014	8:43	551726	3751125	WGS84				1	1		
Lcth13NW	2/24/2014	9:23	551242	3750997	WGS84					1		
Lcth15SE	2/20/2014	8:50	561571	3738962	WGS84					3		
Lcth15SM	12/6/2013	12:52	561148	3739229	WGS84		1					
Lcth15SW	2/20/2014	11:15	560752	3739536	WGS84					2		
Lcth16NW	4/4/2014	12:20	563423	3748275	WGS84					2		
Lcth18NM	3/3/2014	11:06	564163	3738712	WGS84					1		
Lcth18NE	3/3/2014	11:33	564491	3738314	WGS84					1		
Lcth18SE	3/3/2014	8:44	563788	3737604	WGS84					30		
Lcth18SM	12/13/2013	9:38	563473	3737990	WGS84						1	

Appendix A. LeConte's Thrasher incidental sightings (Phainopepla – Woodpecker- unidentified)

Plot name	Date	Time	UTM Easting	UTM Northing	Datum	Yellow-rumped Warbler	Duck-unidentified	Raptor- unidentified	Seagull- unidentified	Swallow- unidentified	Warbler- unidentified	Woodpecker- unidentified
Lcth18SM	3/3/2014	9:20	563473	3737990	WGS84					30		
Lcth18SW	3/3/2014	9:47	563120	3738341	WGS84					20		
Lcth22SM	3/4/2014	9:23	571627	3735552	WGS84	1				10		
Lcth22SW	3/4/2014	8:45	571134	3735648	WGS84				1			
Lcth23NE	2/19/2014	8:50	577321	3734674	WGS84				1			
Lcth23NW	2/19/2014	9:56	576507	3735245	WGS84				1			
Lcth23SE	2/19/2014	12:17	576799	3733821	WGS84				1			
Lcth23SM	2/19/2014	11:38	576408	3734100	WGS84					1		
Lcth23SW	2/19/2014	11:05	575974	3734389	WGS84					10		
Lcth25EM	2/7/2014	14:24	594519	3715119	WGS84					6		
Lcth25SE	2/7/2014	14:48	594160	3714769	WGS84	3						
Lcth25SE	2/26/2014	11:05	594160	3714769	WGS84					2		
Lcth25SW	2/7/2014	15:30	593357	3715366	WGS84	3						
Lcth25SW	2/26/2014	10:27	593357	3715366	WGS84					2		
Lcth28SW	2/27/2014	12:48	606778	3707809	WGS84			1				

Appendix A. LeConte's Thrasher incidental sightings (Yellow-rumped Warbler – Woodpecker- unidentified)

Appendix B. Incidental bird sightings documented at each visit to the call-broadcast points during the Crissal Thrasher surveys

Plot name	Date	Time	UTM Easting	UTM Northing	Datum	Abert's Towhee	American Goldfinch	American Kestrel	American White Pelican	Ash-throated Flycatcher	Bank Swallow	Barn Swallow	Black Phoebe	Black-headed Grosbeak	Black-tailed Gnatcatcher	Blue Grosbeak	Blue-gray Gnatcatcher	Bewick's Wren
CRTH02	4/28/2014	9:51	606521	3707049	NAD83			1										
CRTH02	5/22/2014	9:52	606521	3707049	NAD83									2				
CRTH03	4/28/2014	10:30	606619	3706811	NAD83							1						
CRTH03	5/22/2014	10:17	606619	3706811	NAD83									1				
CRTH03	6/12/2014	10:26	606619	3706811	NAD83			1										
CRTH04	6/12/2014	10:10	606760	3706600	NAD83			1										
CRTH05	4/28/2014	11:30	606893	3706385	NAD83		1								1			
CRTH06	6/12/2014	9:35	606747	3706064	NAD83										1			
CRTH08	5/29/2014	9:07	607193	3705772	NAD83										1			
CRTH08	6/12/2014	9:19	607193	3705772	NAD83										1			
CRTH09	5/7/2014	NR	607324	3705984	NAD83										1			
CRTH09	5/29/2014	9:25	607324	3705984	NAD83										1			
CRTH09	6/12/2014	9:35	607324	3705984	NAD83										1			
CRTH10	6/12/2014	9:49	607515	3706146	NAD83										1			
CRTH11	5/7/2014	10:50	607321	3706308	NAD83										2			
CRTH12	5/7/2014	10:30	607218	3706542	NAD83			1										
CRTH15	5/7/2014	9:00	606874	3707182	NAD83									1				
CRTH17	5/8/2014	NR	608522	3707891	NAD83										2			
CRTH17	6/9/2014	8:20	608522	3707891	NAD83										1			
CRTH18	6/2/2014	9:06	608640	3708120	NAD83										1			
CRTH19	6/2/2014	9:19	608758	3708359	NAD83						1							
CRTH20	5/8/2014	11:50	608936	3708535	NAD83										2			
CRTH20	6/2/2014	9:42	608936	3708535	NAD83					1								
CRTH21	5/8/2014	12:35	609164	3708433	NAD83										1			
CRTH22	5/8/2014	12:50	609394	3708336	NAD83										1			
CRTH22	6/2/2014	10:15	609394	3708336	NAD83										4			
CRTH22	6/9/2014	9:35	609394	3708336	NAD83										4			
CRTH23	5/15/2014	9:42	609643	3708314	NAD83										2			
CRTH23	6/2/2014	10:33	609643	3708314	NAD83										2			

Plot name	Date	Time	UTM Easting	UTM Northing	Datum	Abert's Towhee	American Goldfinch	American Kestrel	American White Pelican	Ash-throated Flycatcher	Bank Swallow	Barn Swallow	Black Phoebe	Black-headed Grosbeak	Black-tailed Gnatcatcher	Blue Grosbeak	Blue-gray Gnatcatcher	Bewick's Wren
CRTH23	6/9/2014	9:50	609643	3708314	NAD83										1			
CRTH25	5/15/2014	10:30	609984	3708087	NAD83										1			
CRTH25	6/3/2014	9:00	609984	3708087	NAD83										1			
CRTH25	6/9/2014	NR	609984	3708087	NAD83										2			
CRTH26	5/15/2014	11:00	610052	3707851	NAD83									1	1		1	
CRTH26	6/3/2014	9:25	610052	3707851	NAD83					1					1			
CRTH26	6/9/2014	8:54	610052	3707851	NAD83	1									2			
CRTH27	5/15/2014	11:45	610256	3707706	NAD83										1			
CRTH27	6/9/2014	9:10	610256	3707706	NAD83										3			
CRTH28	5/15/2014	12:12	610503	3707709	NAD83										1		1	
CRTH28	6/3/2014	10:01	610503	3707709	NAD83										1			
CRTH28	6/9/2014	9:26	610503	3707709	NAD83										1			
CRTH29	6/9/2014	9:41	610702	3707556	NAD83			1							1			
CRTH30	5/15/2014	12:55	610923	3707662	NAD83										1			
CRTH31	5/14/2014	8:52	583975	3714317	NAD83							3	1		1			
CRTH32	5/14/2014	9:18	583976	3714067	NAD83					1	1							
CRTH33	5/14/2014	9:44	583980	3713818	NAD83	2		1										
CRTH35	5/14/2014	10:28	583980	3713318	NAD83	1												
CRTH36	5/14/2014	11:00	583678	3713627	NAD83	1									2			
CRTH37	5/14/2014	11:25	583530	3713829	NAD83										1			
CRTH37	5/27/2014	9:58	583530	3713829	NAD83										1			
CRTH38	5/14/2014	11:45	583383	3714032	NAD83	1									1			
CRTH38	6/13/2014	8:31	583383	3714032	NAD83										2			
CRTH39	5/14/2014	12:00	583229	3714231	NAD83										1			
CRTH39	5/27/2014	9:26	583229	3714231	NAD83			1	20		1				1			
CRTH40	5/14/2014	12:20	583085	3714438	NAD83	1												
CRTH40	5/27/2014	9:10	583085	3714438	NAD83			1	50									
CRTH40	6/13/2014	8:00	583085	3714438	NAD83										4			
CRTH41	6/5/2014	9:20	584104	3711688	NAD83	1									2			
CRTH42	5/21/2014	11:25	584066	3711437	NAD83			1								1		
CRTH42	6/5/2014	9:02	584066	3711437	NAD83										1			

Appendix B. Crissal Thrasher incidental sightings (Abert's Towhee – Bewick's Wren)

Plot name	Date	Time	UTM Easting	UTM Northing	Datum	Abert's Towhee	American Goldfinch	American Kestrel	American White Pelican	Ash-throated Flycatcher	Bank Swallow	Barn Swallow	Black Phoebe	Black-headed Grosbeak	Black-tailed Gnatcatcher	Blue Grosbeak	Blue-gray Gnatcatcher	Bewick's Wren
CRTH43	5/21/2014	11:04	584142	3711198	NAD83			1							3			
CRTH43	6/5/2014	8:44	584142	3711198	NAD83			1							1			
CRTH43	6/10/2014	9:02	584142	3711198	NAD83			1										
CRTH44	5/21/2014	10:45	584228	3710978	NAD83							1						
CRTH44	6/5/2014	NR	584228	3710978	NAD83										2			
CRTH44	6/10/2014	9:15	584228	3710978	NAD83										1			
CRTH45	5/21/2014	10:24	584385	3710782	NAD83										1			
CRTH46	5/21/2014	9:55	584584	3710632	NAD83										1			
CRTH46	6/5/2014	NR	584584	3710632	NAD83					1					1			
CRTH47	5/21/2014	9:25	584797	3710501	NAD83						1				2			
CRTH47	6/10/2014	9:59	584797	3710501	NAD83										2			
CRTH48	5/21/2014	8:55	585006	3710360	NAD83			1			1				1			
CRTH48	6/5/2014	NR	585006	3710360	NAD83										1			
CRTH49	5/21/2014	8:30	585209	3710215	NAD83						1				2			
CRTH49	6/5/2014	10:47	585209	3710215	NAD83	1									1			
CRTH51	5/19/2014	8:44	587224	3712977	NAD83			1	200									
CRTH52	5/19/2014	9:04	587120	3712743	NAD83			1							1			
CRTH52	5/27/2014	11:15	587120	3712743	NAD83				3						1			
CRTH52	6/13/2014	9:35	587120	3712743	NAD83			1	12						2			
CRTH53	5/19/2014	9:30	587124	3712487	NAD83			1							1			
CRTH53	5/27/2014	NR	587124	3712487	NAD83			1										
CRTH54	5/19/2014	9:49	587128	3712231	NAD83				50						1			
CRTH54	5/27/2014	NR	587128	3712231	NAD83										1			
CRTH55	5/19/2014	10:16	587134	3711975	NAD83				8						3			
CRTH55	5/27/2014	NR	587134	3711975	NAD83										1			
CRTH56	5/28/2014	NR	586965	3708638	NAD83										1			
CRTH56	6/10/2014	10:17	586965	3708638	NAD83										3			
CRTH57	5/23/2014	10:15	587145	3708461	NAD83				40	1					1			2
CRTH57	5/28/2014	10:04	587145	3708461	NAD83				25						1			1
CRTH57	6/10/2014	10:00	587145	3708461	NAD83										4			

Appendix B. Crissal Thrasher incidental sightings (Abert's Towhee – Bewick's Wren)

Plot name	Date	Time	UTM Easting	UTM Northing	Datum	Abert's Towhee	American Goldfinch	American Kestrel	American White Pelican	Ash-throated Flycatcher	Bank Swallow	Barn Swallow	Black Phoebe	Black-headed Grosbeak	Black-tailed Gnatcatcher	Blue Grosbeak	Blue-gray Gnatcatcher	Bewick's Wren
CRTH58	5/23/2014	10:00	587328	3708289	NAD83				50									
CRTH58	5/28/2014	9:56	587328	3708289	NAD83				70						1			
CRTH58	6/10/2014	9:45	587328	3708289	NAD83										4			
CRTH59	5/23/2014	9:48	587492	3708100	NAD83				5									
CRTH59	5/28/2014	9:35	587492	3708100	NAD83				3						1			
CRTH59	6/10/2014	9:30	587492	3708100	NAD83										1			
CRTH60	5/23/2014	9:35	587660	3707903	NAD83				200									
CRTH60	5/28/2014	9:23	587660	3707903	NAD83				10									
CRTH60	6/10/2014	9:11	587660	3707903	NAD83										2			1

Plot name	Date	Time	UTM Easting	UTM Northing	Datum	Brown Pelican	Brown-headed Cowbird	Brown-Crested Flycatcher	Bullock's Oriole	Cactus Wren	Cliff Swallow	Common Raven	Common Yellowthroat	Cooper's Hawk	Costa's Hummingbird	Crissal Thrasher	Double-crested Cormorant	Eurasian Collared Dove
CRTH01	4/28/2014	9:30	606406	3707272	NAD83							1						
CRTH01	5/22/2014	9:35	606406	3707272	NAD83							1						
CRTH02	4/28/2014	9:51	606521	3707049	NAD83					1		1						
CRTH02	5/22/2014	9:52	606521	3707049	NAD83							2						
CRTH03	4/28/2014	10:30	606619	3706811	NAD83							1						
CRTH03	5/22/2014	10:17	606619	3706811	NAD83										1			
CRTH03	6/12/2014	10:26	606619	3706811	NAD83							1						
CRTH04	5/22/2014	10:35	606760	3706600	NAD83										1			
CRTH04	6/12/2014	10:10	606760	3706600	NAD83							1						
CRTH05	6/12/2014	9:50	606893	3706385	NAD83							2						
CRTH06	5/7/2014	13:20	606747	3706064	NAD83							1						
CRTH06	6/12/2014	9:35	606747	3706064	NAD83							1						
CRTH07	5/7/2014	12:55	606781	3705798	NAD83							1						

Plot name	Date	Time	UTM Easting	UTM Northing	Datum	Brown Pelican	Brown-headed Cowbird	Brown-Crested Flycatcher	Bullock's Oriole	Cactus Wren	Cliff Swallow	Common Raven	Common Yellowthroat	Cooper's Hawk	Costa's Hummingbird	Crissal Thrasher	Double-crested Cormorant	Eurasian Collared Dove
CRTH07	5/22/2014	11:35	606781	3705798	NAD83							1						
CRTH07	6/12/2014	9:20	606781	3705798	NAD83							1						
CRTH08	6/12/2014	9:19	607193	3705772	NAD83							1						
CRTH09	5/7/2014	NR	607324	3705984	NAD83							1						
CRTH10	5/7/2014	11:27	607515	3706146	NAD83							1						
CRTH10	6/12/2014	9:49	607515	3706146	NAD83							1						
CRTH12	6/12/2014	10:16	607218	3706542	NAD83							2						
CRTH13	6/12/2014	10:25	607099	3706760	NAD83							1						
CRTH15	5/29/2014	10:50	606874	3707182	NAD83					1								
CRTH16	6/2/2014	8:36	608526	3707641	NAD83								2					
CRTH17	5/8/2014	NR	608522	3707891	NAD83											1		
CRTH17	6/2/2014	8:50	608522	3707891	NAD83								1			1		
CRTH18	5/8/2014	10:51	608640	3708120	NAD83							1						
CRTH18	6/9/2014	8:37	608640	3708120	NAD83							2						
CRTH19	6/2/2014	9:19	608758	3708359	NAD83							1						
CRTH19	6/9/2014	8:50	608758	3708359	NAD83							1						
CRTH20	6/2/2014	9:42	608936	3708535	NAD83							1						
CRTH21	6/2/2014	10:00	609164	3708433	NAD83							1						
CRTH22	5/8/2014	12:50	609394	3708336	NAD83							1						
CRTH22	6/2/2014	10:15	609394	3708336	NAD83								1					
CRTH24	5/15/2014	10:06	609895	3708321	NAD83							1						
CRTH24	6/3/2014	8:50	609895	3708321	NAD83					1								
CRTH25	5/15/2014	10:30	609984	3708087	NAD83							1						
CRTH25	6/3/2014	9:00	609984	3708087	NAD83											1		
CRTH25	6/9/2014	NR	609984	3708087	NAD83							1						
CRTH26	5/15/2014	11:00	610052	3707851	NAD83							1				1		
CRTH26	6/3/2014	9:25	610052	3707851	NAD83					1		1						
CRTH27	5/15/2014	11:45	610256	3707706	NAD83							2						
CRTH27	6/3/2014	9:43	610256	3707706	NAD83							1				1		
CRTH29	5/15/2014	12:35	610702	3707556	NAD83							1						
CRTH29	6/9/2014	9:41	610702	3707556	NAD83							1						

Appendix B. Crissal Thrasher incidental sightings (Brown Pelican – Eurasian Collared Dove)

Plot name	Date	Time	UTM Easting	UTM Northing	Datum	Brown Pelican	Brown-headed Cowbird	Brown-Crested Flycatcher	Bullock's Oriole	Cactus Wren	Cliff Swallow	Common Raven	Common Yellowthroat	Cooper's Hawk	Costa's Hummingbird	Crissal Thrasher	Double-crested Cormorant	Eurasian Collared Dove
CRTH30	6/3/2014	10:30	610923	3707662	NAD83					1		1						
CRTH30	6/9/2014	9:58	610923	3707662	NAD83					1								
CRTH31	5/14/2014	8:52	583975	3714317	NAD83						4							
CRTH32	5/14/2014	9:18	583976	3714067	NAD83		1										4	
CRTH35	5/14/2014	10:28	583980	3713318	NAD83						1						5	
CRTH36	5/14/2014	11:00	583678	3713627	NAD83						4		1					
CRTH36	5/27/2014	10:20	583678	3713627	NAD83						1							
CRTH36	6/13/2014	8:52	583678	3713627	NAD83												7	
CRTH37	5/14/2014	11:25	583530	3713829	NAD83						3							
CRTH37	5/27/2014	9:58	583530	3713829	NAD83		1				1		1					
CRTH38	5/27/2014	9:43	583383	3714032	NAD83						1		1					
CRTH39	6/13/2014	8:17	583229	3714231	NAD83												1	
CRTH40	5/14/2014	12:20	583085	3714438	NAD83						1	1						
CRTH40	5/27/2014	9:10	583085	3714438	NAD83								1				20	
CRTH42	5/21/2014	11:25	584066	3711437	NAD83				1									
CRTH43	5/21/2014	11:04	584142	3711198	NAD83											1		
CRTH43	6/5/2014	8:44	584142	3711198	NAD83													
CRTH43	6/10/2014	9:02	584142	3711198	NAD83												1	
CRTH45	5/21/2014	10:24	584385	3710782	NAD83									1		1		
CRTH45	6/5/2014	NR	584385	3710782	NAD83								1					
CRTH45	6/10/2014	9:29	584385	3710782	NAD83							1						
CRTH46	5/21/2014	9:55	584584	3710632	NAD83											1		
CRTH46	6/5/2014	NR	584584	3710632	NAD83							2	1					
CRTH47	5/21/2014	9:25	584797	3710501	NAD83		1					1						
CRTH47	6/5/2014	10:23	584797	3710501	NAD83							1	1					
CRTH48	5/21/2014	8:55	585006	3710360	NAD83							1						
CRTH48	6/5/2014	NR	585006	3710360	NAD83							1						
CRTH50	5/21/2014	8:00	585405	3710060	NAD83		1											
CRTH51	5/19/2014	8:44	587224	3712977	NAD83							1						
CRTH51	5/27/2014	11:00	587224	3712977	NAD83						5						1	
CRTH53	6/13/2014	9:47	587124	3712487	NAD83												2	

Appendix B. Crissal Thrasher incidental sightings (Brown Pelican – Eurasian Collared Dove)

Plot name	Date	Time	UTM Easting	UTM Northing	Datum	Brown Pelican	Brown-headed Cowbird	Brown-Crested Flycatcher	Bullock's Oriole	Cactus Wren	Cliff Swallow	Common Raven	Common Yellowthroat	Cooper's Hawk	Costa's Hummingbird	Crissal Thrasher	Double-crested Cormorant	Eurasian Collared Dove
CRTH54	6/13/2014	9:56	587128	3712231	NAD83												3	
CRTH55	5/19/2014	10:16	587134	3711975	NAD83												4	
CRTH55	5/27/2014	NR	587134	3711975	NAD83												20	
CRTH55	6/13/2014	10:13	587134	3711975	NAD83					1							6	
CRTH56	5/28/2014	NR	586965	3708638	NAD83			1										
CRTH56	6/10/2014	10:17	586965	3708638	NAD83								1				2	
CRTH57	5/23/2014	10:15	587145	3708461	NAD83			1									5	1
CRTH57	6/10/2014	10:00	587145	3708461	NAD83							1	1			1		
CRTH58	5/23/2014	10:00	587328	3708289	NAD83							1						1
CRTH58	5/28/2014	9:56	587328	3708289	NAD83												1	
CRTH58	6/10/2014	9:45	587328	3708289	NAD83								1					
CRTH59	5/28/2014	9:35	587492	3708100	NAD83												5	
CRTH59	6/10/2014	9:30	587492	3708100	NAD83		1											
CRTH60	5/23/2014	9:35	587660	3707903	NAD83		1						1				1	
CRTH60	5/28/2014	9:23	587660	3707903	NAD83	2	1										5	
CRTH60	6/10/2014	9:11	587660	3707903	NAD83		2											

Plot name	Date	Time	UTM Easting	UTM Northing	Datum	European Starling	Gambel's Quail	Great Blue Heron	Great Egret	Great-tailed Grackle	Green Heron	House Finch	Killdeer	Least Tern	Lesser Nighthawk	Loggerhead Shrike	Mallard	Marsh Wren
CRTH01	4/28/2014	9:30	606406	3707272	NAD83							2						
CRTH01	5/22/2014	9:35	606406	3707272	NAD83							2				1		
CRTH01	6/12/2014	11:00	606406	3707272	NAD83							1						
CRTH02	4/28/2014	9:51	606521	3707049	NAD83		1					1						
CRTH03	4/28/2014	10:30	606619	3706811	NAD83		2					3						
CRTH03	5/22/2014	10:17	606619	3706811	NAD83					1		1						
CRTH03	6/12/2014	10:26	606619	3706811	NAD83							2						

Appendix B. Crissal Thrasher incidental sightings (Brown Pelican – Marsh Wren)

Plot name	Date	Time	UTM Easting	UTM Northing	Datum	European Starling	Gambel's Quail	Great Blue Heron	Great Egret	Great-tailed Grackle	Green Heron	House Finch	Killdeer	Least Tern	Lesser Nighthawk	Loggerhead Shrike	Mallard	Marsh Wren
CRTH04	4/28/2014	11:00	606760	3706600	NAD83		2					2						
CRTH04	5/22/2014	10:35	606760	3706600	NAD83							3						
CRTH04	6/12/2014	10:10	606760	3706600	NAD83							2						
CRTH05	5/22/2014	10:50	606893	3706385	NAD83							1						
CRTH08	5/29/2014	9:07	607193	3705772	NAD83		2											
CRTH09	6/12/2014	9:35	607324	3705984	NAD83										1			
CRTH16	6/2/2014	8:36	608526	3707641	NAD83										1			
CRTH17	5/8/2014	NR	608522	3707891	NAD83		1											
CRTH17	6/9/2014	8:20	608522	3707891	NAD83		1								1			
CRTH18	5/8/2014	10:51	608640	3708120	NAD83		1											
CRTH19	6/9/2014	8:50	608758	3708359	NAD83		1											
CRTH20	6/9/2014	9:07	608936	3708535	NAD83		2											
CRTH21	5/8/2014	12:35	609164	3708433	NAD83		5					1						
CRTH21	6/2/2014	10:00	609164	3708433	NAD83		1											
CRTH22	6/2/2014	10:15	609394	3708336	NAD83		2											
CRTH23	5/15/2014	9:42	609643	3708314	NAD83			1		1			1					
CRTH24	5/15/2014	10:06	609895	3708321	NAD83										1	1		
CRTH25	5/15/2014	10:30	609984	3708087	NAD83							2						
CRTH25	6/3/2014	9:00	609984	3708087	NAD83							1						
CRTH25	6/9/2014	NR	609984	3708087	NAD83											1		
CRTH26	5/15/2014	11:00	610052	3707851	NAD83							2						
CRTH26	6/3/2014	9:25	610052	3707851	NAD83		1											
CRTH26	6/9/2014	8:54	610052	3707851	NAD83										1			
CRTH27	5/15/2014	11:45	610256	3707706	NAD83		1					1						
CRTH27	6/3/2014	9:43	610256	3707706	NAD83										1			
CRTH27	6/9/2014	9:10	610256	3707706	NAD83										1			
CRTH28	5/15/2014	12:12	610503	3707709	NAD83		1											
CRTH31	5/14/2014	8:52	583975	3714317	NAD83				2								1	
CRTH32	5/14/2014	9:18	583976	3714067	NAD83	4												
CRTH33	5/14/2014	9:44	583980	3713818	NAD83	3						1						
CRTH34	5/14/2014	10:05	583979	3713567	NAD83				3								1	

Appendix B. Crissal Thrasher incidental sightings (European Starling – Marsh Wren)

Plot name	Date	Time	UTM Easting	UTM Northing	Datum	European Starling	Gambel's Quail	Great Blue Heron	Great Egret	Great-tailed Grackle	Green Heron	House Finch	Killdeer	Least Tern	Lesser Nighthawk	Loggerhead Shrike	Mallard	Marsh Wren
CRTH36	5/27/2014	10:20	583678	3713627	NAD83		1											
CRTH37	5/14/2014	11:25	583530	3713829	NAD83	1												
CRTH37	5/27/2014	9:58	583530	3713829	NAD83			1										
CRTH37	6/13/2014	8:41	583530	3713829	NAD83		1											
CRTH38	6/13/2014	8:31	583383	3714032	NAD83							1						
CRTH39	5/14/2014	12:00	583229	3714231	NAD83		1					1						
CRTH39	5/27/2014	9:26	583229	3714231	NAD83				1									
CRTH40	5/14/2014	12:20	583085	3714438	NAD83		1											
CRTH41	5/21/2014	11:58	584104	3711688	NAD83					2								
CRTH41	6/5/2014	9:20	584104	3711688	NAD83					1					1			
CRTH41	6/10/2014	8:31	584104	3711688	NAD83					1								
CRTH42	5/21/2014	11:25	584066	3711437	NAD83					4				1				
CRTH42	6/5/2014	9:02	584066	3711437	NAD83					10								
CRTH42	6/10/2014	8:45	584066	3711437	NAD83					10								
CRTH43	5/21/2014	11:04	584142	3711198	NAD83					1								
CRTH43	6/5/2014	8:44	584142	3711198	NAD83					2								
CRTH43	6/10/2014	9:02	584142	3711198	NAD83		1			1								
CRTH44	5/21/2014	10:45	584228	3710978	NAD83					1		1						
CRTH44	6/5/2014	NR	584228	3710978	NAD83					1								
CRTH44	6/10/2014	9:15	584228	3710978	NAD83		1											
CRTH45	5/21/2014	10:24	584385	3710782	NAD83	1							1					
CRTH45	6/10/2014	9:29	584385	3710782	NAD83		1											
CRTH47	5/21/2014	9:25	584797	3710501	NAD83		1											
CRTH47	6/5/2014	10:23	584797	3710501	NAD83		1											
CRTH48	5/21/2014	8:55	585006	3710360	NAD83		1	1										
CRTH48	6/5/2014	NR	585006	3710360	NAD83						1							
CRTH48	6/10/2014	10:14	585006	3710360	NAD83		1											
CRTH49	5/21/2014	8:30	585209	3710215	NAD83	1	6	2										
CRTH49	6/5/2014	10:47	585209	3710215	NAD83						1							
CRTH49	6/10/2014	10:27	585209	3710215	NAD83		1											
CRTH50	5/21/2014	8:00	585405	3710060	NAD83	2	1	1	1									

Appendix B. Crissal Thrasher incidental sightings (European Starling – Marsh Wren)

Plot name	Date	Time	UTM Easting	UTM Northing	Datum	European Starling	Gambel's Quail	Great Blue Heron	Great Egret	Great-tailed Grackle	Green Heron	House Finch	Killdeer	Least Tern	Lesser Nighthawk	Loggerhead Shrike	Mallard	Marsh Wren
CRTH50	6/5/2014	11:01	585405	3710060	NAD83			1										
CRTH50	6/10/2014	10:40	585405	3710060	NAD83					3								
CRTH51	5/19/2014	8:44	587224	3712977	NAD83				2				1					
CRTH51	5/27/2014	11:00	587224	3712977	NAD83								1					
CRTH51	6/13/2014	9:26	587224	3712977	NAD83													
CRTH52	5/19/2014	9:04	587120	3712743	NAD83		3		2									
CRTH53	5/19/2014	9:30	587124	3712487	NAD83		1					1						
CRTH53	5/27/2014	NR	587124	3712487	NAD83		1					2						
CRTH54	5/19/2014	9:49	587128	3712231	NAD83				1									
CRTH54	5/27/2014	NR	587128	3712231	NAD83		10		1			1						
CRTH54	6/13/2014	9:56	587128	3712231	NAD83		1					1						
CRTH55	5/19/2014	10:16	587134	3711975	NAD83				2									
CRTH55	5/27/2014	NR	587134	3711975	NAD83		1		1									
CRTH55	6/13/2014	10:13	587134	3711975	NAD83		1											
CRTH56	5/23/2014	10:33	586965	3708638	NAD83		1											1
CRTH56	5/28/2014	NR	586965	3708638	NAD83			1							1			
CRTH57	5/28/2014	10:04	587145	3708461	NAD83		1											
CRTH58	5/23/2014	10:00	587328	3708289	NAD83				1		2							1
CRTH58	5/28/2014	9:56	587328	3708289	NAD83			1				1				1	1	
CRTH58	6/10/2014	9:45	587328	3708289	NAD83			1	1	1								
CRTH59	5/23/2014	9:48	587492	3708100	NAD83				1							1		1
CRTH59	5/28/2014	9:35	587492	3708100	NAD83			1	1									
CRTH59	6/10/2014	9:30	587492	3708100	NAD83		1	1										
CRTH60	5/23/2014	9:35	587660	3707903	NAD83			1							1			1
CRTH60	5/28/2014	9:23	587660	3707903	NAD83			3										
CRTH60	6/10/2014	9:11	587660	3707903	NAD83					2								

Appendix B. Crissal Thrasher incidental sightings (European Starling – Marsh Wren)

Plot name	Date	Time	UTM Easting	UTM Northing	Datum	Mourning Dove	Northern Mockingbird	Northern Rough-winged Swallow	Pacific-slope Flycatcher	Phainopepla	Red-tailed Hawk	Red-winged Blackbird	Say's Phoebe	Snowy Egret	Song Sparrow	Summer Tanager	Townsend's Warbler	Turkey Vulture
CRTH01	4/28/2014	9:30	606406	3707272	NAD83	3												
CRTH01	5/22/2014	9:35	606406	3707272	NAD83	1				2								
CRTH01	6/12/2014	11:00	606406	3707272	NAD83													1
CRTH02	5/22/2014	9:52	606521	3707049	NAD83	1												
CRTH03	4/28/2014	10:30	606619	3706811	NAD83	3												
CRTH03	5/22/2014	10:17	606619	3706811	NAD83	5												2
CRTH03	6/12/2014	10:26	606619	3706811	NAD83													1
CRTH04	4/28/2014	11:00	606760	3706600	NAD83	4	1											
CRTH04	5/22/2014	10:35	606760	3706600	NAD83	6							1					
CRTH04	6/12/2014	10:10	606760	3706600	NAD83	2												1
CRTH05	4/28/2014	11:30	606893	3706385	NAD83													1
CRTH05	5/22/2014	10:50	606893	3706385	NAD83	2				1								
CRTH05	6/12/2014	9:50	606893	3706385	NAD83	3												
CRTH06	5/7/2014	13:20	606747	3706064	NAD83					4								1
CRTH06	5/22/2014	11:14	606747	3706064	NAD83					1								
CRTH06	6/12/2014	9:35	606747	3706064	NAD83													1
CRTH07	5/22/2014	11:35	606781	3705798	NAD83					1								
CRTH08	5/29/2014	9:07	607193	3705772	NAD83	1												
CRTH08	6/12/2014	9:19	607193	3705772	NAD83	3												
CRTH09	5/7/2014	NR	607324	3705984	NAD83	3												
CRTH09	5/29/2014	9:25	607324	3705984	NAD83	1												
CRTH09	6/12/2014	9:35	607324	3705984	NAD83	12												
CRTH10	5/7/2014	11:27	607515	3706146	NAD83	1												
CRTH10	5/29/2014	9:38	607515	3706146	NAD83	2												
CRTH11	5/7/2014	10:50	607321	3706308	NAD83	1												
CRTH11	5/29/2014	9:53	607321	3706308	NAD83	2				1								
CRTH12	5/7/2014	10:30	607218	3706542	NAD83	1												1
CRTH12	5/29/2014	10:08	607218	3706542	NAD83	1												
CRTH13	5/29/2014	10:22	607099	3706760	NAD83	1												
CRTH13	6/12/2014	10:25	607099	3706760	NAD83	1												
CRTH14	5/7/2014	9:38	606921	3706939	NAD83	1												3

Appendix B. Crissal Thrasher incidental sightings (Mourning Dove – Turkey Vulture)

Plot name	Date	Time	UTM Easting	UTM Northing	Datum	Mourning Dove	Northern Mockingbird	Northern Rough-winged Swallow	Pacific-slope Flycatcher	Phainopepla	Red-tailed Hawk	Red-winged Blackbird	Say's Phoebe	Snowy Egret	Song Sparrow	Summer Tanager	Townsend's Warbler	Turkey Vulture
CRTH14	5/29/2014	10:36	606921	3706939	NAD83	2												
CRTH14	6/12/2014	10:43	606921	3706939	NAD83													1
CRTH15	5/7/2014	9:00	606874	3707182	NAD83	1											2	
CRTH15	5/29/2014	10:50	606874	3707182	NAD83	1												
CRTH16	5/8/2014	NR	608526	3707641	NAD83	11												
CRTH17	5/8/2014	NR	608522	3707891	NAD83					6								
CRTH17	6/2/2014	8:50	608522	3707891	NAD83	3												6
CRTH17	6/9/2014	8:20	608522	3707891	NAD83	2												3
CRTH18	5/8/2014	10:51	608640	3708120	NAD83		1										1	
CRTH18	6/2/2014	9:06	608640	3708120	NAD83	1												
CRTH18	6/9/2014	8:37	608640	3708120	NAD83	1												4
CRTH19	5/8/2014	NR	608758	3708359	NAD83					2								
CRTH19	6/2/2014	9:19	608758	3708359	NAD83	1					1							
CRTH19	6/9/2014	8:50	608758	3708359	NAD83	1												
CRTH20	5/8/2014	11:50	608936	3708535	NAD83	1												1
CRTH20	6/2/2014	9:42	608936	3708535	NAD83	1												
CRTH20	6/9/2014	9:07	608936	3708535	NAD83	1												
CRTH21	5/8/2014	12:35	609164	3708433	NAD83	1				1								1
CRTH21	6/2/2014	10:00	609164	3708433	NAD83	5												
CRTH21	6/9/2014	9:19	609164	3708433	NAD83	1												
CRTH22	5/8/2014	12:50	609394	3708336	NAD83	1			1									1
CRTH22	6/2/2014	10:15	609394	3708336	NAD83	1												
CRTH22	6/9/2014	9:35	609394	3708336	NAD83	2												
CRTH23	5/15/2014	9:42	609643	3708314	NAD83	3	2											
CRTH23	6/2/2014	10:33	609643	3708314	NAD83	2												
CRTH23	6/9/2014	9:50	609643	3708314	NAD83	1												
CRTH24	5/15/2014	10:06	609895	3708321	NAD83	1												
CRTH24	6/3/2014	8:50	609895	3708321	NAD83	2												
CRTH25	5/15/2014	10:30	609984	3708087	NAD83					1								
CRTH25	6/3/2014	9:00	609984	3708087	NAD83													1
CRTH26	5/15/2014	11:00	610052	3707851	NAD83	2												

Plot name	Date	Time	UTM Easting	UTM Northing	Datum	Mourning Dove	Northern Mockingbird	Northern Rough-winged Swallow	Pacific-slope Flycatcher	Phainopepla	Red-tailed Hawk	Red-winged Blackbird	Say's Phoebe	Snowy Egret	Song Sparrow	Summer Tanager	Townsend's Warbler	Turkey Vulture
CRTH26	6/3/2014	9:25	610052	3707851	NAD83								1					
CRTH27	5/15/2014	11:45	610256	3707706	NAD83	1												
CRTH28	5/15/2014	12:12	610503	3707709	NAD83	2												2
CRTH28	6/3/2014	10:01	610503	3707709	NAD83	1												
CRTH29	6/3/2014	10:16	610702	3707556	NAD83	1												
CRTH30	5/15/2014	12:55	610923	3707662	NAD83								1					1
CRTH30	6/3/2014	10:30	610923	3707662	NAD83	1												1
CRTH30	6/9/2014	9:58	610923	3707662	NAD83													2
CRTH31	5/14/2014	8:52	583975	3714317	NAD83	1							3					
CRTH32	5/14/2014	9:18	583976	3714067	NAD83	2												
CRTH33	5/14/2014	9:44	583980	3713818	NAD83	5								1				
CRTH34	5/14/2014	10:05	583979	3713567	NAD83	5								2				
CRTH35	5/14/2014	10:28	583980	3713318	NAD83			3										
CRTH36	5/14/2014	11:00	583678	3713627	NAD83	5									1			
CRTH36	5/27/2014	10:20	583678	3713627	NAD83	1												1
CRTH36	6/13/2014	8:52	583678	3713627	NAD83	1												
CRTH37	5/14/2014	11:25	583530	3713829	NAD83										3			
CRTH37	5/27/2014	9:58	583530	3713829	NAD83										1			
CRTH37	6/13/2014	8:41	583530	3713829	NAD83							1						
CRTH38	5/14/2014	11:45	583383	3714032	NAD83	1												
CRTH39	5/14/2014	12:00	583229	3714231	NAD83										1			
CRTH39	5/27/2014	9:26	583229	3714231	NAD83	1												
CRTH39	6/13/2014	8:17	583229	3714231	NAD83	1												
CRTH40	5/14/2014	12:20	583085	3714438	NAD83	2									1			
CRTH40	5/27/2014	9:10	583085	3714438	NAD83	1												
CRTH40	6/13/2014	8:00	583085	3714438	NAD83											1		
CRTH41	5/21/2014	11:58	584104	3711688	NAD83	1									1			
CRTH41	6/5/2014	9:20	584104	3711688	NAD83	1												
CRTH42	5/21/2014	11:25	584066	3711437	NAD83	1									1			
CRTH42	6/5/2014	9:02	584066	3711437	NAD83	4												
CRTH43	5/21/2014	11:04	584142	3711198	NAD83	1												

Appendix B. Crissal Thrasher incidental sightings (Mourning Dove – Turkey Vulture)

Plot name	Date	Time	UTM Easting	UTM Northing	Datum	Mourning Dove	Northern Mockingbird	Northern Rough-winged Swallow	Pacific-slope Flycatcher	Phainopepla	Red-tailed Hawk	Red-winged Blackbird	Say's Phoebe	Snowy Egret	Song Sparrow	Summer Tanager	Townsend's Warbler	Turkey Vulture
CRTH43	6/5/2014	8:44	584142	3711198	NAD83	5												
CRTH43	6/10/2014	9:02	584142	3711198	NAD83	1												
CRTH44	5/21/2014	10:45	584228	3710978	NAD83	4												
CRTH44	6/5/2014	NR	584228	3710978	NAD83	1						1						
CRTH45	6/5/2014	NR	584385	3710782	NAD83	4									1			
CRTH45	6/10/2014	9:29	584385	3710782	NAD83	1	1											
CRTH46	5/21/2014	9:55	584584	3710632	NAD83	1												
CRTH46	6/5/2014	NR	584584	3710632	NAD83	3		1							1			
CRTH46	6/10/2014	9:43	584584	3710632	NAD83	1												
CRTH47	5/21/2014	9:25	584797	3710501	NAD83	1							1					
CRTH47	6/10/2014	9:59	584797	3710501	NAD83	1												1
CRTH48	5/21/2014	8:55	585006	3710360	NAD83	1						1						
CRTH48	6/10/2014	10:14	585006	3710360	NAD83	1												
CRTH49	5/21/2014	8:30	585209	3710215	NAD83	3									1		1	
CRTH49	6/5/2014	10:47	585209	3710215	NAD83	1									1			
CRTH49	6/10/2014	10:27	585209	3710215	NAD83	1												
CRTH50	5/21/2014	8:00	585405	3710060	NAD83	5								2				
CRTH50	6/5/2014	11:01	585405	3710060	NAD83	1												
CRTH50	6/10/2014	10:40	585405	3710060	NAD83	3												
CRTH51	5/19/2014	8:44	587224	3712977	NAD83	3												
CRTH51	5/27/2014	11:00	587224	3712977	NAD83	2							1					1
CRTH52	5/19/2014	9:04	587120	3712743	NAD83	6												
CRTH52	5/27/2014	11:15	587120	3712743	NAD83	5												
CRTH52	6/13/2014	9:35	587120	3712743	NAD83	1												
CRTH53	5/19/2014	9:30	587124	3712487	NAD83	1							1					1
CRTH53	5/27/2014	NR	587124	3712487	NAD83	5												1
CRTH53	6/13/2014	9:47	587124	3712487	NAD83	2					1							1
CRTH54	5/19/2014	9:49	587128	3712231	NAD83	4		1					1				3	
CRTH54	5/27/2014	NR	587128	3712231	NAD83	3												1
CRTH54	6/13/2014	9:56	587128	3712231	NAD83	2					1							

Appendix B. Crissal Thrasher incidental sightings (Mourning Dove – Turkey Vulture)

Plot name	Date	Time	UTM Easting	UTM Northing	Datum	Mourning Dove	Northern Mockingbird	Northern Rough-winged Swallow	Pacific-slope Flycatcher	Phainopepla	Red-tailed Hawk	Red-winged Blackbird	Say's Phoebe	Snowy Egret	Song Sparrow	Summer Tanager	Townsend's Warbler	Turkey Vulture
CRTH55	5/19/2014	10:16	587134	3711975	NAD83	6		1										
CRTH55	5/27/2014	NR	587134	3711975	NAD83	6								1				
CRTH55	6/13/2014	10:13	587134	3711975	NAD83	1												
CRTH56	5/23/2014	10:33	586965	3708638	NAD83	2	1											
CRTH56	5/28/2014	NR	586965	3708638	NAD83	1	1											
CRTH56	6/10/2014	10:17	586965	3708638	NAD83	1												
CRTH57	5/23/2014	10:15	587145	3708461	NAD83	1	1											1
CRTH57	5/28/2014	10:04	587145	3708461	NAD83	1									1			
CRTH57	6/10/2014	10:00	587145	3708461	NAD83	2								1				
CRTH58	5/23/2014	10:00	587328	3708289	NAD83	1	1								1			
CRTH58	5/28/2014	9:56	587328	3708289	NAD83	1	1							1				
CRTH58	6/10/2014	9:45	587328	3708289	NAD83	2												
CRTH59	5/23/2014	9:48	587492	3708100	NAD83	1								1	1			
CRTH59	5/28/2014	9:35	587492	3708100	NAD83	6								1	1			
CRTH59	6/10/2014	9:30	587492	3708100	NAD83										1			1
CRTH60	5/23/2014	9:35	587660	3707903	NAD83	1												1
CRTH60	5/28/2014	9:23	587660	3707903	NAD83	5												
CRTH60	6/10/2014	9:11	587660	3707903	NAD83	3									1			

Plot name	Date	Time	UTM Easting	UTM Northing	Datum	Verdin	Warbling Vireo	Western Kingbird	Western Tanager	Western Wood Pewee	White-winged Dove	Wilson's Warbler	Yellow Warbler	Yellow-rumped Warbler
CRTH01	6/12/2014	11:00	606406	3707272	NAD83						1			
CRTH02	4/28/2014	9:51	606521	3707049	NAD83	1			3					
CRTH02	5/22/2014	9:52	606521	3707049	NAD83	1							1	
CRTH02	6/12/2014	10:45	606521	3707049	NAD83						6			

Appendix B. Crissal Thrasher incidental sightings (Mourning Dove – Yellow-rumped Warbler)

Plot name	Date	Time	UTM Easting	UTM Northing	Datum	Verdin	Warbling Vireo	Western Kingbird	Western Tanager	Western Wood Pewee	White-winged Dove	Wilson's Warbler	Yellow Warbler	Yellow-rumped Warbler
CRTH03	4/28/2014	10:30	606619	3706811	NAD83				2					1
CRTH03	5/22/2014	10:17	606619	3706811	NAD83				1					
CRTH03	6/12/2014	10:26	606619	3706811	NAD83						2			
CRTH04	6/12/2014	10:10	606760	3706600	NAD83	1					1			
CRTH05	4/28/2014	11:30	606893	3706385	NAD83	2								
CRTH05	5/22/2014	10:50	606893	3706385	NAD83						3			
CRTH07	5/7/2014	12:55	606781	3705798	NAD83			1						
CRTH08	5/7/2014	12:30	607193	3705772	NAD83				1					
CRTH09	5/7/2014	NR	607324	3705984	NAD83				1					
CRTH09	5/29/2014	9:25	607324	3705984	NAD83						1			
CRTH09	6/12/2014	9:35	607324	3705984	NAD83						1			
CRTH10	5/7/2014	11:27	607515	3706146	NAD83				1					
CRTH11	6/12/2014	10:03	607321	3706308	NAD83						1			
CRTH13	5/7/2014	10:10	607099	3706760	NAD83	1			2					
CRTH14	5/7/2014	9:38	606921	3706939	NAD83						1			
CRTH14	5/29/2014	10:36	606921	3706939	NAD83	1					2			
CRTH14	6/12/2014	10:43	606921	3706939	NAD83						1			
CRTH15	5/7/2014	9:00	606874	3707182	NAD83				2					
CRTH15	6/12/2014	10:56	606874	3707182	NAD83						1			
CRTH16	5/8/2014	NR	608526	3707641	NAD83							3		
CRTH16	6/2/2014	8:36	608526	3707641	NAD83						4			
CRTH16	6/9/2014	8:06	608526	3707641	NAD83						1			
CRTH17	5/8/2014	NR	608522	3707891	NAD83				1	2	1	2		
CRTH17	6/9/2014	8:20	608522	3707891	NAD83						1			
CRTH18	5/8/2014	10:51	608640	3708120	NAD83							1		
CRTH18	6/2/2014	9:06	608640	3708120	NAD83						1			
CRTH18	6/9/2014	8:37	608640	3708120	NAD83						2			
CRTH19	5/8/2014	NR	608758	3708359	NAD83				1					
CRTH19	6/2/2014	9:19	608758	3708359	NAD83					1				
CRTH19	6/9/2014	8:50	608758	3708359	NAD83						1			
CRTH20	5/8/2014	11:50	608936	3708535	NAD83	1						1		

Plot name	Date	Time	UTM Easting	UTM Northing	Datum	Verdin	Warbling Vireo	Western Kingbird	Western Tanager	Western Wood Pewee	White-winged Dove	Wilson's Warbler	Yellow Warbler	Yellow-rumped Warbler
CRTH20	6/2/2014	9:42	608936	3708535	NAD83	1								
CRTH20	6/9/2014	9:07	608936	3708535	NAD83						1			
CRTH21	5/8/2014	12:35	609164	3708433	NAD83	1								
CRTH21	6/2/2014	10:00	609164	3708433	NAD83	1								
CRTH22	5/8/2014	12:50	609394	3708336	NAD83	1								
CRTH22	6/2/2014	10:15	609394	3708336	NAD83	1								
CRTH22	6/9/2014	9:35	609394	3708336	NAD83						3			
CRTH23	5/15/2014	9:42	609643	3708314	NAD83									1
CRTH23	6/2/2014	10:33	609643	3708314	NAD83						2			
CRTH23	6/9/2014	9:50	609643	3708314	NAD83						1			
CRTH24	5/15/2014	10:06	609895	3708321	NAD83	1								
CRTH24	6/3/2014	8:50	609895	3708321	NAD83	1					1			
CRTH24	6/9/2014	8:22	609895	3708321	NAD83	5					2			
CRTH25	5/15/2014	10:30	609984	3708087	NAD83	2					4			
CRTH25	6/3/2014	9:00	609984	3708087	NAD83	2					2			
CRTH25	6/9/2014	NR	609984	3708087	NAD83	1					2			
CRTH26	5/15/2014	11:00	610052	3707851	NAD83	1					1			1
CRTH26	6/3/2014	9:25	610052	3707851	NAD83	1					1			
CRTH26	6/9/2014	8:54	610052	3707851	NAD83						5			
CRTH27	6/3/2014	9:43	610256	3707706	NAD83						4			
CRTH27	6/9/2014	9:10	610256	3707706	NAD83	1					1			
CRTH28	5/15/2014	12:12	610503	3707709	NAD83						2			
CRTH28	6/3/2014	10:01	610503	3707709	NAD83						2			
CRTH28	6/9/2014	9:26	610503	3707709	NAD83	1								
CRTH29	6/3/2014	10:16	610702	3707556	NAD83	1					5			
CRTH29	6/9/2014	9:41	610702	3707556	NAD83	1								
CRTH30	6/3/2014	10:30	610923	3707662	NAD83						3			
CRTH30	6/9/2014	9:58	610923	3707662	NAD83	1					1			
CRTH33	5/14/2014	9:44	583980	3713818	NAD83			1						
CRTH35	5/14/2014	10:28	583980	3713318	NAD83						1			
CRTH36	5/14/2014	11:00	583678	3713627	NAD83	1								

Appendix B. Crissal Thrasher incidental sightings (Verdin – Yellow-rumped Warbler)

Plot name	Date	Time	UTM Easting	UTM Northing	Datum	Verdin	Warbling Vireo	Western Kingbird	Western Tanager	Western Wood Pewee	White-winged Dove	Wilson's Warbler	Yellow Warbler	Yellow-rumped Warbler
CRTH37	5/14/2014	11:25	583530	3713829	NAD83	1								
CRTH37	6/13/2014	8:41	583530	3713829	NAD83	1					1			
CRTH38	5/14/2014	11:45	583383	3714032	NAD83	1								
CRTH38	6/13/2014	8:31	583383	3714032	NAD83						1			
CRTH39	5/14/2014	12:00	583229	3714231	NAD83	1								
CRTH39	6/13/2014	8:17	583229	3714231	NAD83	1					1			
CRTH40	5/14/2014	12:20	583085	3714438	NAD83	1								
CRTH40	5/27/2014	9:10	583085	3714438	NAD83						3			
CRTH40	6/13/2014	8:00	583085	3714438	NAD83	1					1			
CRTH42	5/21/2014	11:25	584066	3711437	NAD83								1	
CRTH42	6/10/2014	8:45	584066	3711437	NAD83						1			
CRTH43	5/21/2014	11:04	584142	3711198	NAD83	1								
CRTH43	6/5/2014	8:44	584142	3711198	NAD83						1			
CRTH44	5/21/2014	10:45	584228	3710978	NAD83	1							1	
CRTH44	6/5/2014	NR	584228	3710978	NAD83						1			
CRTH44	6/10/2014	9:15	584228	3710978	NAD83	1					1			
CRTH45	6/5/2014	NR	584385	3710782	NAD83	1								
CRTH46	5/21/2014	9:55	584584	3710632	NAD83	1							1	
CRTH46	6/10/2014	9:43	584584	3710632	NAD83						1			
CRTH47	5/21/2014	9:25	584797	3710501	NAD83								1	
CRTH47	6/5/2014	10:23	584797	3710501	NAD83	1								
CRTH48	5/21/2014	8:55	585006	3710360	NAD83	1							4	
CRTH48	6/10/2014	10:14	585006	3710360	NAD83			1			1			
CRTH49	5/21/2014	8:30	585209	3710215	NAD83						1			
CRTH49	6/10/2014	10:27	585209	3710215	NAD83	1								
CRTH50	6/5/2014	11:01	585405	3710060	NAD83	1								
CRTH50	6/10/2014	10:40	585405	3710060	NAD83			1			1			
CRTH51	5/19/2014	8:44	587224	3712977	NAD83	1								
CRTH51	6/13/2014	9:26	587224	3712977	NAD83						1			
CRTH52	5/19/2014	9:04	587120	3712743	NAD83	2								
CRTH52	5/27/2014	11:15	587120	3712743	NAD83	1								

Appendix B. Crissal Thrasher incidental sightings (Verdin – Yellow-rumped Warbler)

Plot name	Date	Time	UTM Easting	UTM Northing	Datum	Verdin	Warbling Vireo	Western Kingbird	Western Tanager	Western Wood Pewee	White-winged Dove	Wilson's Warbler	Yellow Warbler	Yellow-rumped Warbler
CRTH52	6/13/2014	9:35	587120	3712743	NAD83						1			
CRTH53	5/19/2014	9:30	587124	3712487	NAD83	1								
CRTH53	6/13/2014	9:47	587124	3712487	NAD83						2			
CRTH55	5/19/2014	10:16	587134	3711975	NAD83	1								
CRTH55	5/27/2014	NR	587134	3711975	NAD83	1								
CRTH55	6/13/2014	10:13	587134	3711975	NAD83						2			
CRTH56	5/23/2014	10:33	586965	3708638	NAD83						1			
CRTH56	5/28/2014	NR	586965	3708638	NAD83	1								
CRTH56	6/10/2014	10:17	586965	3708638	NAD83	2								
CRTH58	5/23/2014	10:00	587328	3708289	NAD83			1						
CRTH59	5/23/2014	9:48	587492	3708100	NAD83						1			
CRTH59	6/10/2014	9:30	587492	3708100	NAD83	1								
CRTH60	5/23/2014	9:35	587660	3707903	NAD83	1								

Appendix B. Crissal Thrasher incidental sightings (Verdin – Yellow-rumped Warbler)

Appendix C. Locations and population counts at *Salvia greatae* sites and incidental occurrences

Survey date	Site and transect	utm_x	utm_y	Total SAGR individuals	Notes
6/11/2014	SAGR1A	623264	3710249	26	Transect in wash, low numbers of SAGR outside of wash
6/11/2014	SAGR1B	622358	3712359	4	Transect in wash, SAGR occur in wash and outside of wash in same density
6/11/2014	SAGR1C	622222	3712563	0	No SAGR
6/11/2014	SAGR1D	622491	3712692	0	No SAGR
5/6/2014	SAGR2A	624683	3710282	3	2 SAGR on E facing slope adjacent to wash, 1 SAGR in wash
5/6/2014	SAGR2B	624931	3710387	0	No SAGR
5/6/2014	SAGR2C	625118	3710595	0	No SAGR
5/6/2014	SAGR2D	624794	3710690	0	No SAGR
5/6/2014	SAGR3A	623966	3709655	6	Near historic occurrence record; all SAGR occur a in wash
5/6/2014	SAGR3B	623777	3709458	42	SAGR occur on a rocky alluvial deposit
5/6/2014	SAGR3C	623563	3709323	78	SAGR occur on alluvial fan
5/6/2014	SAGR3D	623426	3709655	0	Historic occurrence record occurs in a wash; not suitable habitat
5/6/2014	SAGR4A	620038	3708777	78	SAGR occur on low disturbance alluvial fan and desert pavement
5/6/2014	SAGR4B	620141	3708543	85	SAGR continuous on desert pavement alluvial fan
5/6/2014	SAGR4C	619774	3708449	60	SAGR continuous on desert pavement alluvial fan
5/6/2014	SAGR4D	619639	3708690	90	SAGR continuous on alluvial fan with sections of desert pavement
6/4/2014	SAGR5A	619218	3708777	0	No SAGR
6/4/2014	SAGR5B	618721	3708727	0	No SAGR
6/4/2014	SAGR5C	618966	3708780	0	No SAGR
6/4/2014	SAGR5D	619109	3708558	90	5 juvenile SAGR found on an undisturbed alluvial plain
6/4/2014	SAGR6A	618189	3709117	0	Near historic occurrence record
6/4/2014	SAGR6B	617935	3709106	0	No SAGR
6/4/2014	SAGR6C	618467	3709182	0	No SAGR
6/4/2014	SAGR6D	618250	3709384	0	No SAGR
6/4/2014	SAGR7A	616409	3708833	0	No SAGR
6/4/2014	SAGR7B	616161	3708831	0	No SAGR
6/4/2014	SAGR7C	615902	3708876	0	No SAGR
6/4/2014	SAGR7D	616766	3708215	0	Near historic occurrence record

Survey date	Site and transect	utm_x	utm_y	Total SAGR individuals	Notes
6/11/2014	SAGR8A	613346	3710015	19	SAGR occur on a very rocky alluvial fan; near historic occurrence record
6/11/2014	SAGR8B	613614	3709964	0	SAGR occur on a very rocky alluvial fan
6/11/2014	SAGR8C	613302	3709791	7	SAGR stops appearing ~50m S downslope of transect start
6/11/2014	SAGR8D	613180	3709439	0	No SAGR
6/3/2014	SAGR9A	611271	3707246	0	No SAGR
6/3/2014	SAGR9B	611080	3706952	0	No SAGR
6/3/2014	SAGR9C	610812	3706982	0	No SAGR
6/3/2014	SAGR9D	610589	3707133	0	No SAGR
6/11/2014	SAGR10A	612161	3709912	0	near historic occurrence record; no SAGR present
6/11/2014	SAGR10B	612088	3710369	0	No SAGR
6/11/2014	SAGR10C	612508	3710198	8	SAGR on N facing talus slope, no SAGR in wash or on flats
6/11/2014	SAGR10D	612367	3709962	2	
5/2/2014	SAGR11A	609746	3708395	0	Near historic occurrence record
5/2/2014	SAGR11B	609875	3708670	0	No SAGR
5/2/2014	SAGR11C	609520	3708758	0	No SAGR
5/2/2014	SAGR11D	609167	3708840	0	No SAGR
5/2/2014	SAGR13A	608530	3708059	0	Palm oasis center is approximate location of historic occurrence record
5/2/2014	SAGR13B	608440	3708341	0	No SAGR
5/2/2014	SAGR13C	608641	3708549	0	No SAGR
5/2/2014	SAGR13D	608623	3708841	0	No SAGR
5/29/2014	SAGR18A	603430	3709597	0	No SAGR
4/23/2014	SAGR18B	603736	3709787	0	No SAGR
4/23/2014	SAGR18C	603869	3710002	0	No SAGR
4/23/2014	SAGR19A	601494	3716729	0	Historic occurrence record location is ~215 m from transect in a wash, No SAGR
4/23/2014	SAGR19B	601286	3716315	0	Near historic occurrence record
4/23/2014	SAGR19C	600841	3716173	0	No SAGR
4/23/2014	SAGR19D	600590	3715990	0	No SAGR
5/6/2014	SAGR_EXTRA2	623885	3709513	55	SAGR all occur on alluvial terrace
5/6/2014	SAGR_EXTRA3	623957	3709557	7	SAGR occur on a slope face

Survey date	Site and transect	utm_x	utm_y	Total SAGR individuals	Notes
5/6/2014	SAGR_EXTRA4	623627	3709511	1	SAGR individual in a wash
5/6/2014	SAGR_EXTRA5	623606	3709475	100	Near historic occurrence record; SAGR occurring on an alluvial face
5/6/2014	SAGR_EXTRA5	623786	3709835	0	Near historic occurrence record; point occurs in a wash; not suitable habitat
5/6/2014	SAGR_EXTRA6	620126	3708660	1	Population continuous but no SAGR estimate taken
5/6/2014	SAGR_EXTRA7	619874	3708482	1	Population continuous but no SAGR estimate taken
5/6/2014	SAGR_EXTRA8	619634	3708568	1	Population continuous but no SAGR estimate taken
5/6/2014	SAGR_EXTRA9	619858	3708725	1	Population continuous but no SAGR estimate taken
6/4/2014	SAGR_EXTRA10	619280	3708603	1	Population continuous but no SAGR estimate taken
6/4/2014	SAGR_EXTRA11	619430	3708707	1	Population continuous but no SAGR estimate taken
6/11/2014	SAGR_EXTRA12	613463	3710033	15	SAGR occur on a very rocky alluvial fan
6/11/2014	SAGR_EXTRA13	613427	3709915	10	
6/11/2014	SAGR_EXTRA14	612367	3709962	50	Dense SAGR population on steep (<30%) W facing slope/cliff face
6/11/2014	SAGR_EXTRA15	612395	3710090	50	Dense SAGR population on steep (<30%) W facing slope/cliff face

Appendix D. Locations and population counts at *Xylorhiza cognata* sites and incidental occurrences

Survey date	Site and transect	utm_x	utm_y	Total XYCO individuals	XYCO Flowering	XYCO Adult	XYCO Juvenile	XYCO Dead	Notes
3/21/2014	XYCO1A	590672	3719063	25	5	25	0	3	specimen #1 collected; XYCO located in a small NE-SW oriented slot canyon that branches off main wash
3/21/2014	XYCO1B	590908	3719323	3	0	3	0	0	specimen #2 collected; XYCO occur at mouth of NE-SW oriented slot canyon that branches off the main wash
3/21/2014	XYCO1C	591248	3719418	0	0	0	0	0	No XYCO
3/21/2014	XYCO1D	591077	3719018	0	0	0	0	0	No XYCO
3/31/2014	XYCO2A	591616	3719898	20	2	17	3	0	XYCO occur in a N-W branching slot canyon, and on a NW facing erosional rockslide
3/31/2014	XYCO2B	591546	3719663	5	0	4	1	0	XYCO located in a slot canyon/erosional slope that branches off of the canyon to the S
3/31/2014	XYCO2C	591897	3719530	22	0	21	1	0	XYCO occur on steep N facing cliff with erosion and rock slides
3/31/2014	XYCO2D	592392	3719448	117	2	97	20	9	specimen #5 collected; XYCO occurring on N & S facing sandstone cliff faces
4/9/2014	XYCO3A	592772	3719909	13	0	9	4	0	Near historic occurrence record; XYCO occur on rocky, E facing cliff face
4/9/2014	XYCO3B	593177	3720126	70	6	68	2	5	Near historic occurrence record; XYCO occurs on N facing cliff face in a slot canyon
4/9/2014	XYCO3C	593595	3720118	97	1	90	7	4	XYCO occur on a N facing cliff face
4/16/2014	XYCO3D	592524	3719816	0	0	0	0	0	No XYCO
4/16/2014	XYCO4A	592676	3721034	114	11	92	22	4	XYCO occur on N & S facing slopes
4/16/2014	XYCO4B	592540	3720697	41	4	39	2	2	XYCO occur on N facing cliff face
4/16/2014	XYCO4C	592739	3720146	34	5	34	0	6	XYCO occur on N facing cliff face
4/16/2014	XYCO4D	593366	3720995	0	0	0	0	0	No XYCO; Near historic occurrence record but *Pleurocoronis pluriseta* may have been misidentified as XYCO; XYCO occur ~100m away

Survey date	Site and transect	utm_x	utm_y	Total XYCO individuals	XYCO Flowering	XYCO Adult	XYCO Juvenile	XYCO Dead	Notes
4/10/2014	XYCO5A	594775	3716267	1	0	1	0	0	XYCO occur on N facing slope in narrow slot canyon; historic point is ~270m from XYCO occurrence
4/10/2014	XYCO5B	594806	3716495	21	1	17	4	1	Specimen #8 collected; XYCO occur on NE facing slope in a slot canyon at a historic point; Near historic occurrence record
4/10/2014	XYCO5C	595020	3716642	225	4	217	8	18	Specimen #9 collected; XYCO occur on all aspects of canyon walls and at historic point in slot canyon
4/10/2014	XYCO5D	594452	3716788	34	0	27	7	4	Specimen #10 collected; XYCO occur on all aspects on canyon walls in small canyon
4/14/2014	XYCO6A	595178	3717410	0	0	0	0	0	No XYCO; Near historic occurrence record
4/14/2014	XYCO6B	595505	3717077	86	5	54	32	4	Specimen #11 collected; flowering individuals located in wash, all others occur on W facing slopes in narrow slot canyon
4/14/2014	XYCO6C	595652	3717301	105	2	89	16	8	Specimen #12 collected; XYCO occur on N & W facing slopes in shallow slots branching S from main canyon
4/14/2014	XYCO6D	596066	3717395	0	0	0	0	0	No XYCO; Near historic occurrence record
4/15/2014	XYCO7A	596731	3716932	101	4	84	17	6	~94m NW of historic occurrence point. XYCO occur on N facing slope
4/15/2014	XYCO7B	597053	3716640	58	2	46	12	4	XYCO occur on N facing cliff face in rocky, erosional depressions; XYCO is continuous E of transect for at least 50m
4/15/2014	XYCO7C	597344	3716715	14	2	13	1	2	historic point is nearby in wash (unsuitable habitat); XYCO occur on N facing slope
4/15/2014	XYCO7D	597191	3717083	90	5	79	11	7	XYCO occur mostly on N facing slopes, but also on all other aspects
4/22/2014	XYCO8A	598196	3716256	95	0	82	13	11	XYCO occur on cliff face and canyon bottom

Survey date	Site and transect	utm_x	utm_y	Total XYCO individuals	XYCO Flowering	XYCO Adult	XYCO Juvenile	XYCO Dead	Notes
4/22/2014	XYCO8B	598586	3716394	122	3	105	17	11	specimen #17 collected; XYCO occur on N facing slope
4/22/2014	XYCO8C	598352	3716637	15	0	12	3	4	Historic occurrence record is ~65m NE from transect; XYCO occur along bottom of a narrow slot canyon
4/22/2014	XYCO8D	597960	3716656	53	1	50	3	5	XYCO occur on N facing slope and near canyon wash bottom
4/25/2014	XYCO9A	599853	3717417	21	0	21	0	2	XYCO occur on rocky hard packed N facing canyon slope, ~30m from historic occurrence record which occurs in the wash
4/25/2014	XYCO9B	599773	3717184	0	0	0	0	0	No XYCO
4/25/2014	XYCO9C	599719	3718237	5	0	4	1	1	specimen #18 collected; XYCO occur on N facing canyon slope
4/25/2014	XYCO9D	599064	3717106	12	0	7	5	4	XYCO occur on silty sandstone slope
3/27/2014	XYCO10A	600863	3721493	0	0	0	0	0	No XYCO
3/27/2014	XYCO10B	600521	3720407	0	0	0	0	0	No XYCO; Near historic occurrence record
3/27/2014	XYCO10C	600316	3720114	0	0	0	0	0	No XYCO
3/27/2014	XYCO10D	600433	3719784	0	0	0	0	0	No XYCO
5/5/2014	XYCO11A	600038	3715415	70	0	65	5	9	XYCO occur on N facing slope adjacent to a wash
5/5/2014	XYCO11B	599983	3715162	44	0	37	7	4	XYCO occur on a N facing slope adjacent to a wash
5/5/2014	XYCO11C	600158	3715638	33	0	33	0	0	XYCO occur on N facing slope adjacent to a wash
5/5/2014	XYCO11D	600493	3715736	0	0	0	0	0	No XYCO
4/23/2014	XYCO12A	601532	3716542	45	0	45	0	4	XYCO (26 indiv.) occur on a W facing slope that curves into a N facing slope; 19 individual occur in between XYCO12A and XYCO 12B
4/23/2014	XYCO12B	601817	3716747	0	0	0	0	0	No XYCO
4/23/2014	XYCO12C	601568	3716776	0	0	0	0	0	No XYCO
5/12/2014	XYCO12D	601286	3716315	0	0	0	0	0	No XYCO

Survey date	Site and transect	utm_x	utm_y	Total XYCO individuals	XYCO Flowering	XYCO Adult	XYCO Juvenile	XYCO Dead	Notes
5/13/2014	XYCO13A	586513	3722819	0	0	0	0	0	No XYCO
5/14/2014	XYCO13B	586321	3722906	55	3	54	1	8	specimen #22 collected; flowering individuals near the wash
5/14/2014	XYCO13C	586276	3723272	10	0	10	0	1	XYCO occur ~30m upslope on a N-NW facing slope
5/13/2014	XYCO13D	585810	3723478	28	7	26	2	1	specimen #23 collected (585798, 3723483); XYCO occur on N facing slope
5/30/2014	XYCO14A	585450	3724270	14	2	14	0	5	specimen #20 collected; XYCO occur on N facing cliff face
5/1/2014	XYCO14B	585106	3724178	0	0	0	0	0	No XYCO
5/1/2014	XYCO14C	585268	3723903	1	0	1	0	0	
5/1/2014	XYCO14D	585447	3724055	36	0	36	0	21	XYCO present at historic point; majority of XYCO occur on N facing slope of slot canyon, many occur near wash in canyon bottom
5/1/2014	XYCO15A	584830	3724436	0	0	0	0	0	No XYCO
5/1/2014	XYCO15B	585118	3724634	0	0	0	0	0	No XYCO
5/1/2014	XYCO15C	584849	3724691	0	0	0	0	0	No XYCO
4/29/2014	XYCO16A	575892	3735125	0	0	0	0	0	No XYCO
4/29/2014	XYCO16B	575652	3735278	0	0	0	0	0	No XYCO
4/29/2014	XYCO16C	575835	3734992	1	0	1	0	0	XYCO occur on SW facing slope, ~81m SW of historic point
4/29/2014	XYCO16D	576327	3734722	0	0	0	0	0	
4/30/2014	XYCO17A	569444	3739074	103	0	103	0	3	XYCO occur on N facing slope, especially in depressions on slope face
4/30/2014	XYCO17B	569772	3739200	65	1	65	0	2	XYCO occur on N-NW facing slope with depression of rocky erosional alluvium
4/30/2014	XYCO17C	569274	3739387	146	19	142	4	3	specimen #19 collected; XYCO occur on N facing slope; fairly continuous beyond transect
4/30/2014	XYCO17D	569246	3739175	0	0	0	0	0	No XYCO; Near historic occurrence record

Survey date	Site and transect	utm_x	utm_y	Total XYCO individuals	XYCO Flowering	XYCO Adult	XYCO Juvenile	XYCO Dead	Notes
4/30/2014	XYCO18A	568385	3740636	7	0	7	0	0	XYCO present at historic point and concentrated at transect start
4/30/2014	XYCO18B	568528	3740301	0	0	0	0	0	No XYCO
4/30/2014	XYCO18C	568708	3739873	0	0	0	0	0	No XYCO
4/30/2014	XYCO18D	568379	3739740	0	0	0	0	0	No XYCO
5/12/2014	XYCO19A	561605	3745959	0	0	0	0	0	No XYCO
5/12/2014	XYCO19B	561906	3746141	0	0	0	0	0	No XYCO
5/12/2014	XYCO19C	562232	3746017	0	0	0	0	0	No XYCO
5/12/2014	XYCO19D	562516	3745793	0	0	0	0	0	No XYCO
5/12/2014	XYCO20A	560570	3744553	0	0	0	0	0	No XYCO
5/12/2014	XYCO20B	560494	3744315	0	0	0	0	0	No XYCO
5/12/2014	XYCO20C	560265	3744045	0	0	0	0	0	No XYCO
3/31/2014	XYCO_EXTRA1	591583	3719813	20	0	20	0	0	Location of specimen #3
3/31/2014	XYCO_EXTRA2	591967	3719452	1	0	1	0	0	Location of specimen #4
3/31/2014	XYCO_EXTRA3	592243	3719587	35	6	30	5	3	XYCO occur on N facing slope ~100m from road
3/31/2014	XYCO_EXTRA4	591494	3719700	54	1	50	4	1	XYCO occur on N facing cliff face
4/9/2014	XYCO_EXTRA5	593156	3720122	25	0	25	0	0	Location of specimen #7
4/9/2014	XYCO_EXTRA6	593555	3720097	95	0	87	8	11	Location of specimen #6
4/9/2014	XYCO_EXTRA7	592933	3720025	2	1	2	0	0	In between transects; XYCO occur on N facing bedrock cliff face
4/9/2014	XYCO_EXTRA8	593345	3720165	4	1	4	0	0	XYCO occur on N facing slope
4/9/2014	XYCO_EXTRA9	593612	3720097	21	1	20	1	1	Beyond XYCO3C transect; XYCO occur along a W facing cliff face that curves to S facing aspect
4/16/2014	XYCO_EXTRA10	592635	3721021	1	0	1	0	0	Specimen #16 collected
4/16/2014	XYCO_EXTRA11	592564	3720726	10	0	10	0	0	XYCO occur on SW and NW facing cliff faces, ~20m N of XYCO4B transect
4/10/2014	XYCO_EXTRA11	594790	3716400	22	0	22	0	0	
4/10/2014	XYCO_EXTRA12	594843	3716679	22	0	22	0	0	XYCO occur upon most aspects in a slot canyon

Survey date	Site and transect	utm_x	utm_y	Total XYCO individuals	XYCO Flowering	XYCO Adult	XYCO Juvenile	XYCO Dead	Notes
4/9/2014	XYCO_EXTRA13	594443	3716609	15	1	13	2	1	
4/14/2014	XYCO_EXTRA14	595295	3717367	5	0	4	1	0	XYCO occur on W facing slope 50m E of XYCO6A's end point
4/14/2014	XYCO_EXTRA15	595656	3717260	17	0	17	0	0	XYCO occur on W facing slope, 238m E from XYCO6B transect
4/14/2014	XYCO_EXTRA16	596101	3717418	2	0	2	0	0	specimen #13 collected
4/15/2014	XYCO_EXTRA17	596824	3716863	1	0	1	0	0	specimen #14 collected
4/15/2014	XYCO_EXTRA18	597115	3716902	59	2	47	12	7	specimen #15 collected; XYCO occur on N facing cliff slope in large canyon
4/22/2014	XYCO_EXTRA19	598248	3716315	35	0	33	2	3	XYCO occur on cliff face near mouth of slot canyon where XYCO8A transect is located
4/22/2014	XYCO_EXTRA20	598406	3716315	40	1	40	0	0	XYCO occur on N facing cliff face, 40+ individuals; Near historic occurrence record
4/22/2014	XYCO_EXTRA21	598656	3716746	1	0	1	0	0	XYCO occur sparsely from this point in a side canyon out to the main road. Historic occurrence point was likely taken from the road
4/25/2014	XYCO_EXTRA22	599565	3717403	1	1	1	0	0	very large flowering XYCO occurring beneath a palo verde on a SE facing slope
4/9/2014	XYCO_EXTRA23	593045	3720102	32	0	32	0	0	Likely within XYCO3B transect; XYCO occur on N facing slope
4/25/2014	XYCO_EXTRA24	599927	3715295	1	0	1	0	0	
4/25/2014	XYCO_EXTRA25	600028	3715534	26	0	26	0	0	XYCO occur ~20m N of historic point (which is located in a wash)
4/23/2014	XYCO_EXTRA26	601538	3716628	16	0	16	0	1	
5/30/2014	XYCO_EXTRA27	585267	3724211	1	0	1	0	0	
5/30/2014	XYCO_EXTRA28	585380	3724270	1	0	1	0	0	
5/1/2014	XYCO_EXTRA29	585360	3724011	1	0	1	0	0	
5/1/2014	XYCO_EXTRA30	585440	3724069	1	0	1	0	0	Specimen #21 collected
4/29/2014	XYCO_EXTRA31	575504	3735160	15	0	15	0	1	XYCO occur on NE facing slope, ~90m SW of XYCO16B transect

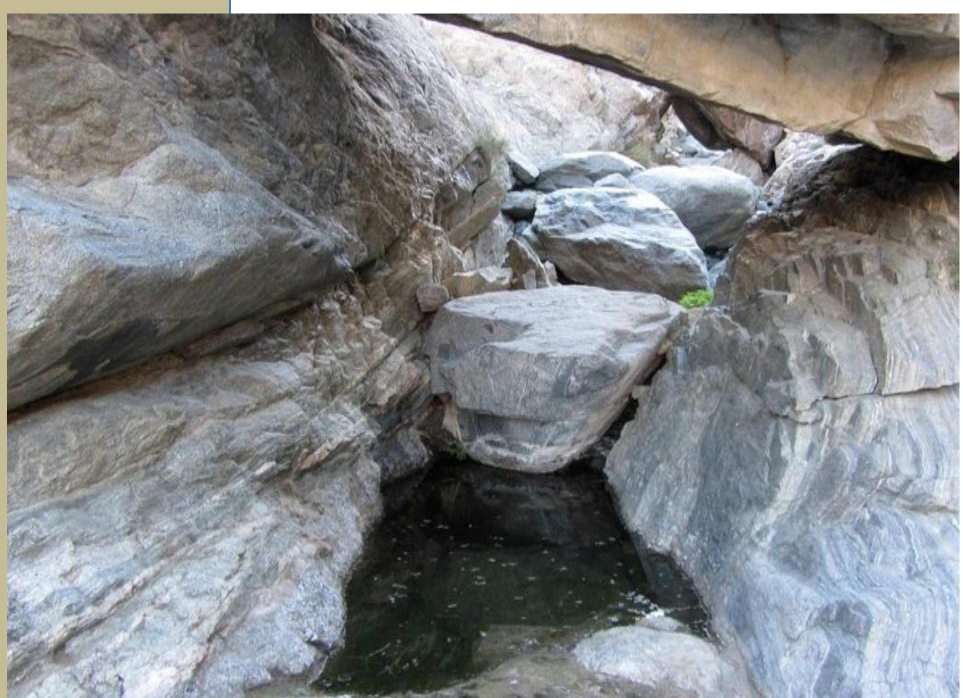
Survey date	Site and transect	utm_x	utm_y	Total XYCO individuals	XYCO Flowering	XYCO Adult	XYCO Juvenile	XYCO Dead	Notes
4/30/2014	XYCO_EXTRA32	569698	3739249	25	0	25	0	0	XYCO occur on N facing slope, especially in depressions on slope face
4/30/2014	XYCO_EXTRA33	569395	3739477	1	0	1	0	0	Fairly continuous XYCO population extending beyond XYCO17C transect on N facing slope
NA	XYCO_EXTRA33	592778	3720343	80	0	80	0	0	
NA	XYCO_EXTRA34	592869	3720366	4	0	4	0	0	
NA	XYCO_EXTRA35	593582	3721937	7	0	7	0	0	
NA	XYCO_EXTRA36	593064	3720888	4	0	4	0	0	
NA	XYCO_EXTRA37	585480	3723475	1	0	1	0	0	
NA	XYCO_EXTRA38	585545	3723528	1	0	1	0	0	
NA	XYCO_EXTRA39	586027	3723426	1	0	1	0	0	
NA	XYCO_EXTRA40	586097	3723387	1	0	1	0	0	
NA	XYCO_EXTRA41	586400	3722931	1	0	1	0	0	
NA	XYCO_EXTRA42	592985	3720060	9	0	9	0	1	XYCO occur at base of N facing bedrock cliff face

Appendix 2B
Assessing Climate-Related Changes in Water Resources in the Santa Rosa and San Jacinto Mountains National Monument

Bureau of Land Management **Coachella Valley Conservation Commission**

Santa Rosa and San Jacinto Mountains National Monument and
Coachella Valley Multiple Species Habitat Conservation Plan &
Natural Community Conservation Plan

Assessing Climate-Related Changes in Water Resources in the Santa Rosa and San Jacinto Mountains National Monument



Prepared by The University of California Riverside's
Center for Conservation Biology for
The Bureau of Land Management and the
Coachella Valley Conservation Commission
July 2014

Assessing Climate-Related Changes in Water Resources in the Santa Rosa and San Jacinto Mountains National Monument

Prepared for the
Bureau of Land Management
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By the
University of California Riverside's
Center for Conservation Biology

Cameron Barrows, PhD, Principal Investigator
Geoffrey McGinnis, Lead Field Surveyor

July 2014

Contents

Introduction

The Santa Rosa and San Jacinto Mountains National Monument (hereafter "Monument"), situated at the convergence of multiple ecoregions, is comprised of steep, complex topography with elevations ranging from below sea level to well over 3000m. These characteristics contribute to its high level of biodiversity (Barrows et al. 2013). Given this species richness, questions of how climate change will impact the distribution and occurrence of the Monument's flora and fauna, and what if any management actions might reduce potential losses to its biodiversity, become increasingly important. A component of this biodiversity that has been a focus of public interest in recent years is Peninsular bighorn sheep, *Ovis canadensis nelsoni*, federally listed in 1998 as an endangered population. A previously developed model of how bighorn sheep will adjust to expected levels of climate change predicts there is adequate elevational space within the Monument to accommodate the bighorn's anticipated up-slope habitat shift (Barrows and Murphy, 2010 unpublished report). However, since no information was available at the time to identify trends in water availability, the model assumed water resources within the Monument would not change.

Accessible water is a key component of habitat for bighorn sheep (Jones et al. 1957, Blong and Pollard 1968, Cunningham and Ohmart 1986, Andrew 1994). Casual observations indicate there has been a general drying of historic water sources, especially in the Santa Rosa Mountains portion of the Monument (Harry Quinn, Duncan Harkleroad, and Bud Wellman, pers. com.). Understanding how water sources within the Monument are changing is a critical benchmark for assessing the quality of bighorn sheep habitat, as well as habitat for other wildlife species, now and into the future.

Climate change is one of several potential causes for changes in surface water availability within the Monument. Other causes may include over-drafting of the aquifer by residential communities located above water sources; seismic activity, resulting in the opening or closing of pore spaces within the rock matrix where an aquifer may reside; changes in abundance of invasive, "thirsty" phreatophytic plant species such as tamarisk (*Tamarix ramosissima*, also known as salt cedar); and faltering maintenance of human-enhanced water sources, particularly guzzlers. Identifying which one or combination of causes actually impacts the availability of water within the Monument requires long-term monitoring of inputs (precipitation, especially snow packs) and outputs (stream flows, well extractions, and consumption by phreatophytes); such data are not currently available for most of the Monument. Nevertheless, the multiple potential causes of changes in surface water availability have particular "signatures": growth/eradication of invasive plant species and guzzler maintenance to ensure continued water supplies would have local, site-specific effects, whereas climate change or aquifer overdraft would have much broader, regional influences.

Our primary objective here is to document the current extent of surface water availability within the Monument compared to historic conditions, building on previous surveys conducted by the BLM in 2003. Additionally, we explore hypotheses that might, as more data are obtained, explain the changes we observed. To the extent that changes in surface water availability can be explained, the most effective management approaches to sustain or enhance water availability may be undertaken.

One such hypothesis is that changes in snow accumulations as a consequence of climate change are, in part, responsible for declines in surface water. Reductions in snow packs are predicted to result from climate change (Intergovernmental Panel on Climate Change [IPCC] 2013). Snow, more than rainfall, has a greater impact on the recharging of mountain aquifers due the slower release of water and reduced runoff from snow melt. The closest station with long-term records of snow accumulations is Idyllwild, California, located about three miles outside the Monument on the western slope of the San Jacinto Mountains. These records show there has been a change in the frequency of heavy annual snow accumulations greater than 70 inches (178cm) with five such years occurring between 1946 and 1979, and none since (Figure 1). Such pattern of snow accumulation is consistent with findings by Kelly and Goulden (2008) that describe a shift in the rain-to-snow ratio to more rain and less snow over the same time period. These indicators (reduced heavy snow packs and increased rain-to-snow ratios) are consistent with climate change predictions (IPCC 2013). To the extent that these indicators affect surface water availability within the Monument, we predict a greater overall reduction of surface water in the Santa Rosa and San Jacinto Mountains as the climate warms.

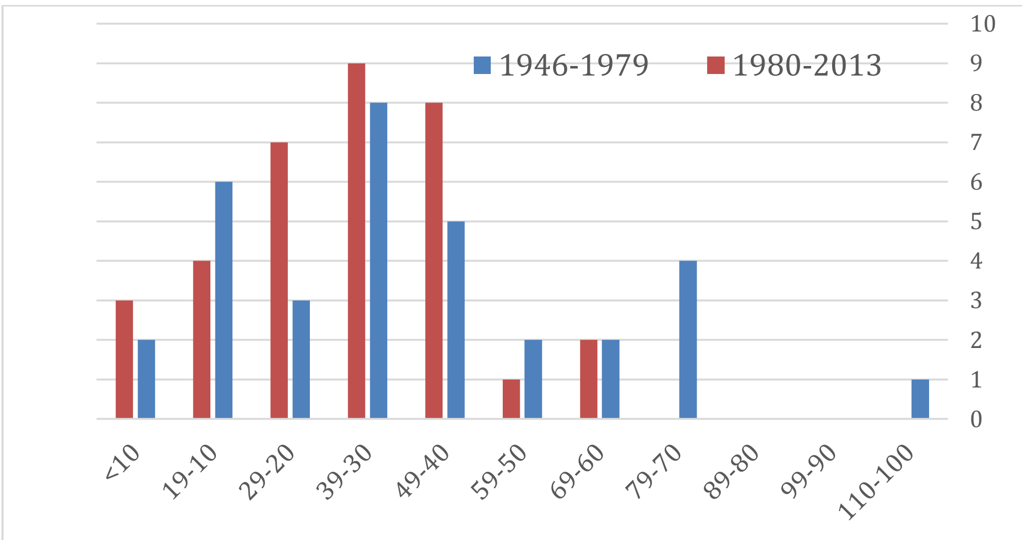

Figure 1. Annual snow accumulations at Idyllwild, California. Values along the x-axis are inches of snow; values along the y-axis are the number of years these snow accumulations were recorded. Data are from the Desert Research Institute's Western Regional Climate Center (http://www.wrcc.dri.edu/).

Understanding the trend of surface water availability within the Monument, as well as reasonable hypotheses for its causes, may have direct implications for both water management and Peninsular bighorn sheep recovery. Several of the water sources we surveyed were developed or enhanced by humans in the past. For some sites, the legacy of enhancement may extend back to prehistoric times of the Cahuilla Indians, but certainly includes periods when water sources were developed to support cattle grazing and, more recently, recovery of bighorn sheep, especially in the Santa Rosa Mountains.

Methods

Our study primarily focused on lands administered by the Bureau of Land Management (BLM) and the USDA Forest Service within the Santa Rosa and San Jacinto Mountains National Monument. Additional lands surveyed include those within the Palm Canyon watershed, as well as Mount San Jacinto State Park and Wilderness. Survey sites were selected because of known current or historic water availability, or the presence of phreatophytic vegetation detected in aerial imagery. In total, 216 sites were visited: 71 in the San Jacinto Mountains/Palm Canyon (SJMTS) and 145 in the Santa Rosa Mountains (SRMTS) (Figure 2).

At each site, water, vegetation, and wildlife occurrences were assessed. Water was categorized as follows: (a) surface water was available and the dimensions of the pool or stream were quantified; (b) damp/wet soil was present with no standing surface water; or (c) the site was dry. If surface water was present, samples were collected and analyzed for stable isotopes $\delta^{18}O$ and $\delta^{2}H$ to determine if seasonal inputs to water differ between the SJMTS and SRMTS; summer monsoons and winter rains have different isotope signatures. Analyses of those samples, however, showed no discernable differences and therefore will not herein be further addressed.

Vegetation was quantified by estimating percent cover of the five most abundant perennial plants; these data are presented in the attached spreadsheet. Because non-native, invasive phreatophytic vegetation may have a role in reducing surface water availability, the percent cover of the two most common non-native species—tamarisk (*Tamarix ramosissima*) and fountain grass (*Pennisetum setaceum*)—are separately noted in the spreadsheet. Estimated percent cover of these invasive species is described, with sites assigned to one of three categories: (1) no presence of the invasive species, (2) present but less than 5% cover, or (3) equal to or greater than 5% cover. Several species of tamarisk occur in the desert southwest, however *Tamarix ramosissima* is the predominant invasive species in the local area. Wildlife activity at water sources was noted by direct observations of animals, the presence of tracks, and/or the presence of scat.

In lieu of quantitative data addressing potential causes of change in surface water availability within the Monument, we sought opinions and insights from people who have observed changes over time. We interviewed several residents who have lived in, worked in, and/or explored the Santa Rosa and San Jacinto Mountains for the past 60-80 years. They include Harry Quinn, a professional geologist; Duncan Harkleroad, a naturalist with expertise on bighorn sheep; and Bud Wellman, a cattle rancher. Harkleroad and Wellman developed and enhanced many water sources for cattle (Wellman) and wildlife (Harkleroad). All three noted reduced available water in recent years, and pointed to different potential causes. Quinn identified tapping water for human use and reduced snow pack in the Santa Rosa Mountains as likely reasons for less surface water, whereas Harkleroad and Wellman identified neglect of structures created to enhance water availability. These and other individual's recollections of when specific sites had surface water, were damp, or were dry are recorded in the spreadsheet.

Results

Raw data from the 216 site surveys are provided in a separate spreadsheet. The following table summarizes some results of these surveys:

Table 1. Summaries of data collected at current and historic springs, seeps, tenajas, and streams.

Sub-region	Number of sites surveyed	Sites with open/surface water	Sites where bighorn sheep were sighted or tracks/scat were observed	Sites with tamarisk	Sites with fountain grass
SJMTS	71	52 (73%) see Figure 3	10 (14%) see Figure 4	15 (21%)	25 (35%)
SRMTS	145	62 (43%) see Figure 5	56 (39%) See Figure 6	48 (33%)	28 (19%)

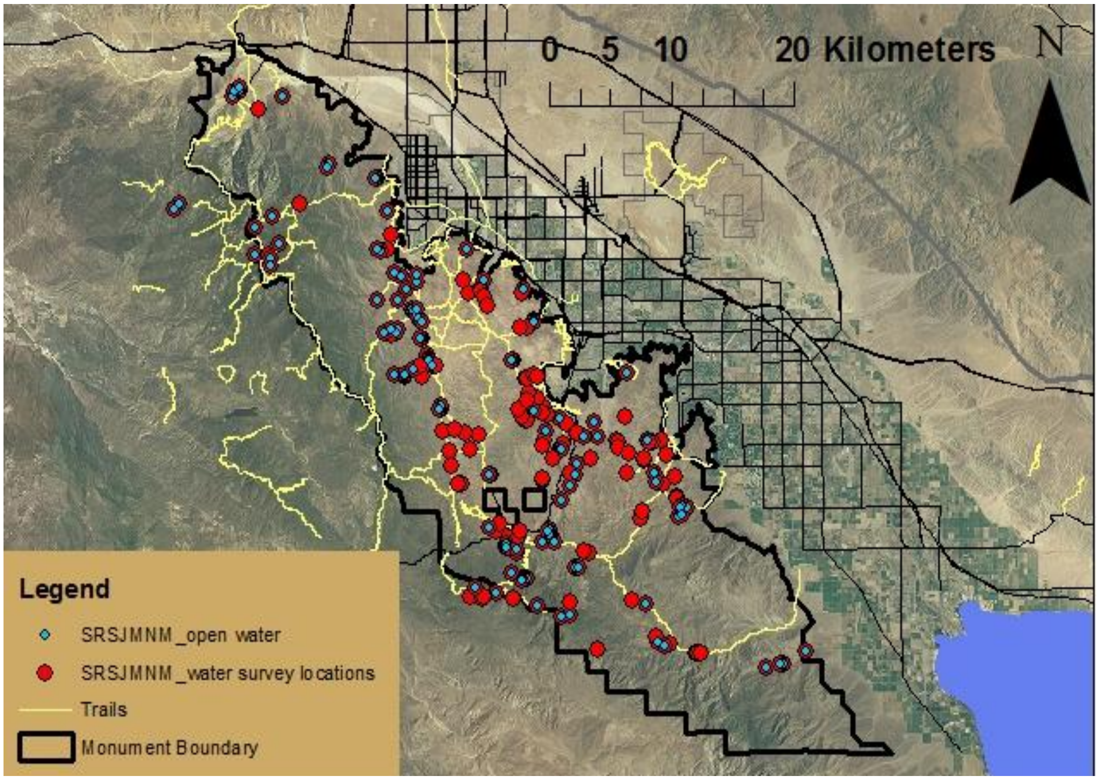

Figure 2. Water survey locations and open water sites.

A higher proportion of sites in the SJMTS had open water, less bighorn sheep sign, and more fountain grass, whereas sites in the SRMTS had relatively less surface water, more sheep sign, and more tamarisk. These findings indicate the two mountain ranges may possess differences in hydrology and/or potential invasive species stressors that could require different management strategies to maintain or enhance water availability.

In 2003, BLM conducted a similar survey of water sources within the Monument; all but one of the survey sites occurred in the SRMTS. Although an attempt was made to revisit the same sites for the 2014 study, we discovered that more than half the Geographic Positioning System (GPS) coordinates provided for the 2003 survey did not coincide with features described in the associated report, such as vegetation types or the presence of natural water catchments. The challenge in finding sites based on decade-old GPS coordinates may be due to differences in GPS equipment used then and now, improvements in accuracy of newer equipment, and poor satellite signals both today and in 2003 when surveyors are deep within canyons. Although the 2014 survey sites are more numerous, they generally cover much of the same area surveyed in 2003 (Figure 7). Of the 39 sites surveyed in 2003, we are reasonably confident the recent survey includes 16 of the exact same sites. Of these sites, 13 showed no change in water conditions, one went from being wet in 2003 to dry in our current survey, and one went from dry in 2003 to wet in 2014; water tanks were installed since 2003 at the last of the 16 sites.

As previously mentioned, individuals possessing historic knowledge of water source conditions observed drying in the SRMTS. Of the 64 sites that were confirmed as historically being wet (i.e., having open water or damp soil), 13 (20%) are now dry, and three (5%) changed from open water to wet sand; much of this drying occurred within the past 2-3 decades. The other 48 wet sites (75%) were observed in 2014 as remaining wet. Almost all historical observations were from the SRMTS, so we weren't able to discern any differences between mountain ranges based on these accounts.

Comparisons of current conditions at native palm oases with previous surveys and historical observations also reveal a drying trend in the SRMTS. Open water, or at least damp soil, is a prerequisite for native palm establishment; hence, the presence of native palms at each of the 54 palm oases we surveyed indicates a historic, perennial source of surface or near-surface water. However, of the 27 palm oases visited in the SRMTS during the 2014 survey, 17 (63%) had no surface water or visible surface moisture (Table 2). Many of these palm oases—such as found in Magnesia Canyon, along the Art Smith Trail (at the "first oasis"), Grapevine Canyon, the lower edge of Bear Creek Palms, Dos Palmas (at Pinyon Crest), and the Murray Hill-Potrero Trail region—showed signs of water stress, such as a reduced number and size of living palm fronds in the crowns of palm trees. Of the 27 sites surveyed in the SJMTS, five (19%) lacked open water or visible surface moisture, and none of the palms showed signs of water stress. These observations suggest a greater level of drying in the SRMTS compared to the SJMTS.

We then attempted to determine whether an abundance of invasive species at palm oases provides an explanation for inter-mountain differences. Like native palms, tamarisk is a phreatophyte requiring perennially wet or damp ground to germinate and become established. If tamarisk is more abundant at dry sites, it may indicate that tamarisk has a role in reducing the availability of water for palm trees. Our observations showed that while tamarisk is more widely distributed in the SRMTS—located at 18 of 27 sites in the SRMTS versus 6 of 27 sites in the SJMTS—the proportion of dry oases with tamarisk is not significantly different from that of oases with surface water (Table 2): in the SRMTS, 70% of dry oases included tamarisk, while 67% of oases with surface water included tamarisk; in the SJMTS, 20% of both dry oases and those with surface water included tamarisk. The proportions of fountain grass were equally uninformative as a cause for drying in oases. These findings, however, do not indicate that invasive species have not contributed to the drying of springs and other surface waters within the Monument; indeed, within the SRMTS the densest, most extensive stands of tamarisk were often found at dry oases. Therefore, other factors with broader as opposed to site-specific impacts may be affecting water availability differently in the SRMTS than the SJMTS. Such factors may include localized effects of climate change; aquifer extractions by residents in the communities of Pinyon Crest, Pinyon Flats, and Royal Carrizo; and/or differential seismic activity.

Table 2. Water conditions and tamarisk/fountain grass presence at palm oases in the Santa Rosa and San Jacinto Mountains.

Region	Number of Palm Oases Surveyed	Water Condition	Tamarisk Presence	Fountain Grass Presence
Santa Rosa Mountains	17	Dry	12 sites (70%)	6 sites (35%)
	4	Damp/wet sand	2 sites (50%)	3 sites (75%)
	6	Surface water present	4 sites (67%)	2 sites (33%)
San Jacinto Mountains	5	Dry	1 site (20%)	1 site (20%)
	2	Damp/wet sand	1 site (50%)	1 site (50%)
	20	Surface water present	4 sites (20%)	11 sites (55%)

<u>Water availability for Peninsular bighorn sheep</u>

The use of water sources by Peninsular bighorn sheep appears to differ between the SJMTS and SRMTS: bighorn sheep and/or their tracks/scat were observed at 10 of 52 sites with open water in the SJMTS (19%), and 56 of 62 sites in the SRMTS (90%) (Table 1). While this difference could be attributed to fewer sheep occupying the SJMTS compared to the SRMTS—the subpopulation in the northern SRMTS recovery region increased in size from an estimated 22 adults in 1998 to 90 adults in 2010; the subpopulation in the SJMTS recovery region, however, does not reflect the same upward trend: 23 adults were estimated in 1998, 21 adults in 2006, 26 adults in 2008, and 16 adults in 2010 (USFWS 2011)—or the relatively greater abundance of water in the SJMTS—74% of surveyed sites in the SJMTS had surface water versus 22% in the SRMTS—such conclusions are not supportable absent more focused research in this regard.

To examine how the bighorn sheep's use of water sources might be affected by climate change, we compared the distribution of open water with modeled distributions of bighorn sheep under current and a +3°C shift in mean maximum summer temperature (Figures 8 and 9); these habitat models are from an unpublished report by Barrows and Murphy (2010). Under current climate conditions, 32 of 52 open water sources in the SJMTS and 17 of 62 in the SRMTS occur within modeled suitable habitat for bighorn sheep. If the mean maximum summer temperature increases by 3ºC, 16% and 30% of currently available open water in the SJMTS and SRMTS, respectively, would fall outside modeled sheep habitat. Palm, Deep, and Sheep Canyons, with their larger watersheds and more continuously available water at their higher and cooler elevations, may provide the best opportunities for bighorn sheep to adapt to a warmer climate.

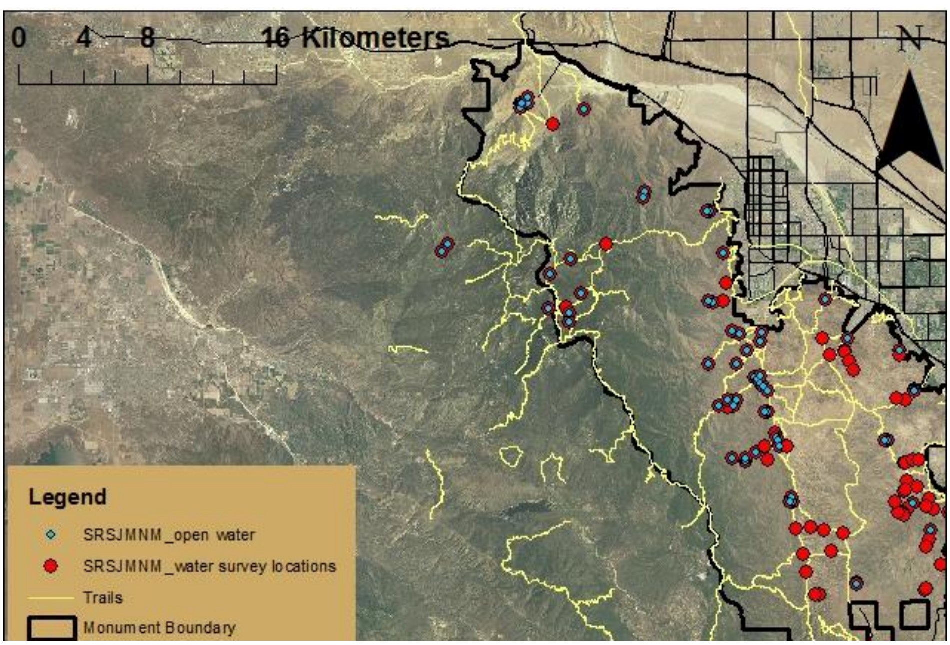

Figure 3. Water survey locations and open water sites: SJMTS detail.

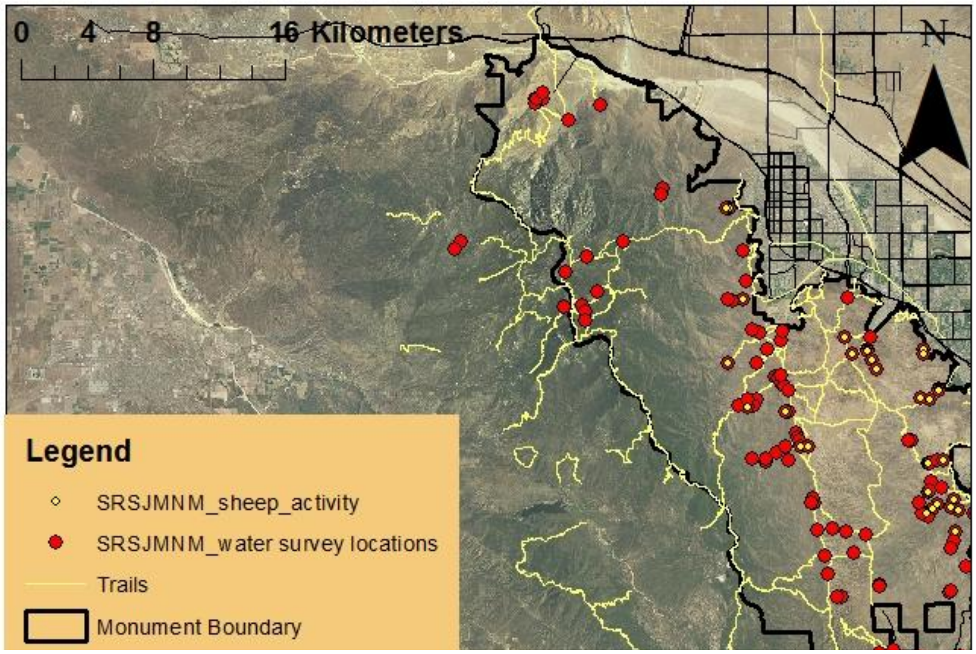

Figure 4. Water survey locations and bighorn sheep activity sites: SJMTS detail.

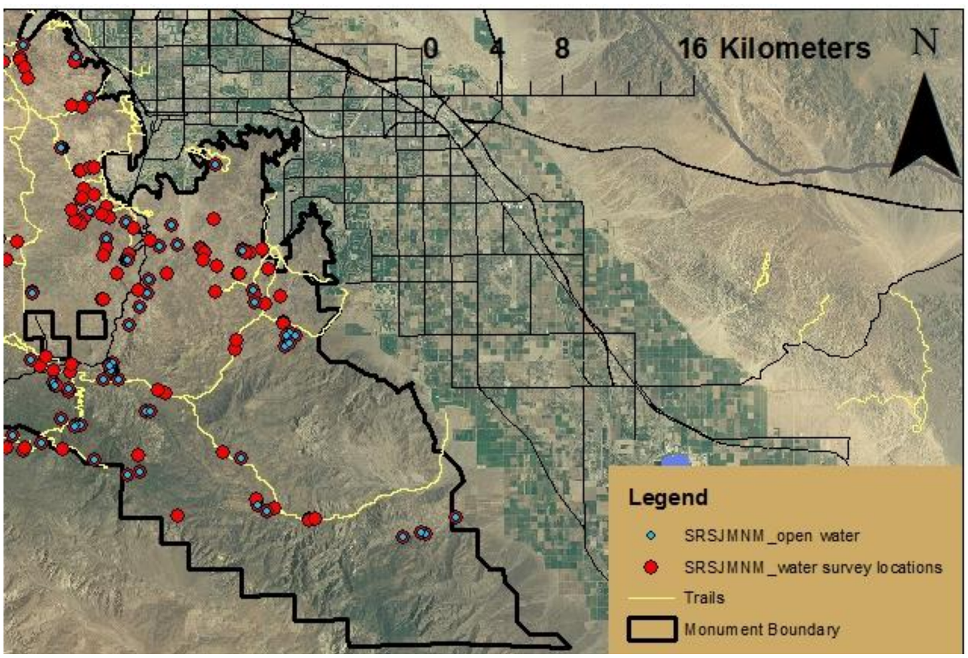

Figure 5. Water survey locations and open water sites: SRMTS detail.

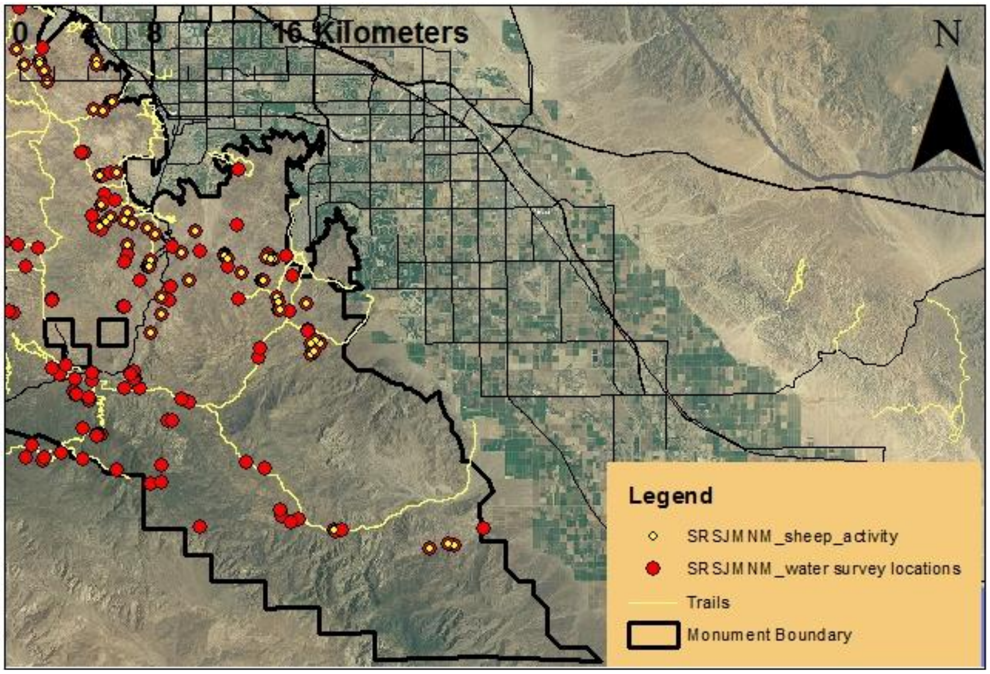

Figure 6. Water survey locations and bighorn sheep activity sites: SRMTS detail.

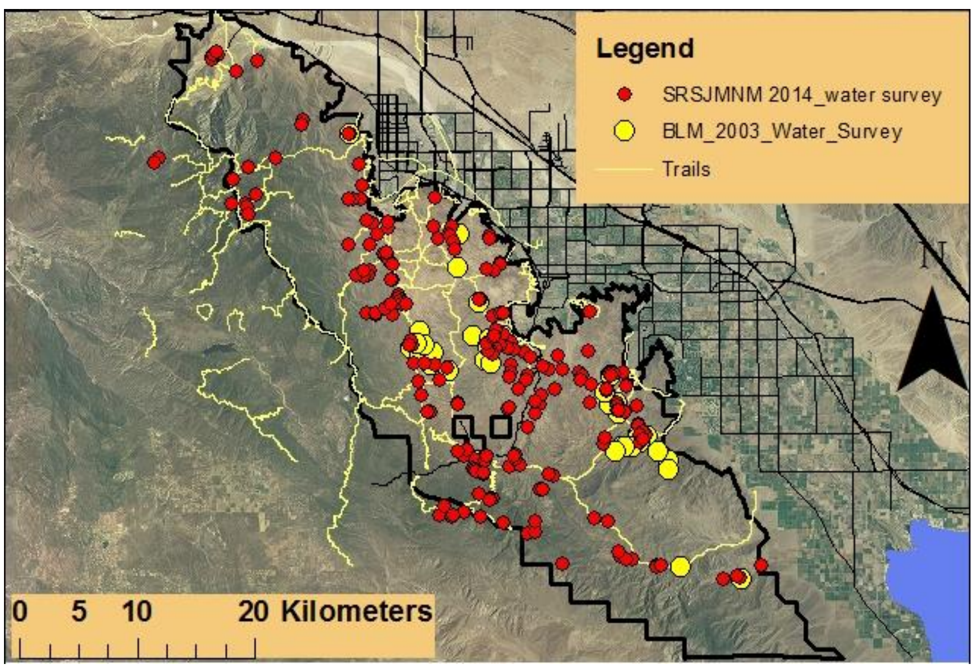

Figure 7. 2003 and 2014 water survey sites.

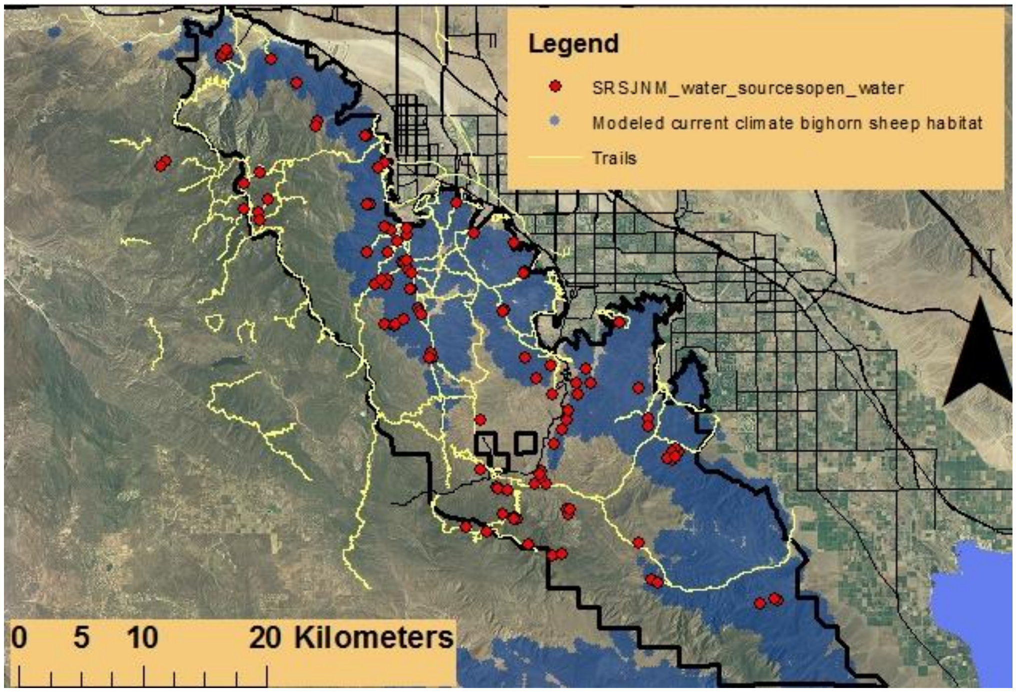

Figure 8. Open water sources and modeled distribution of bighorn sheep habitat: current climate.

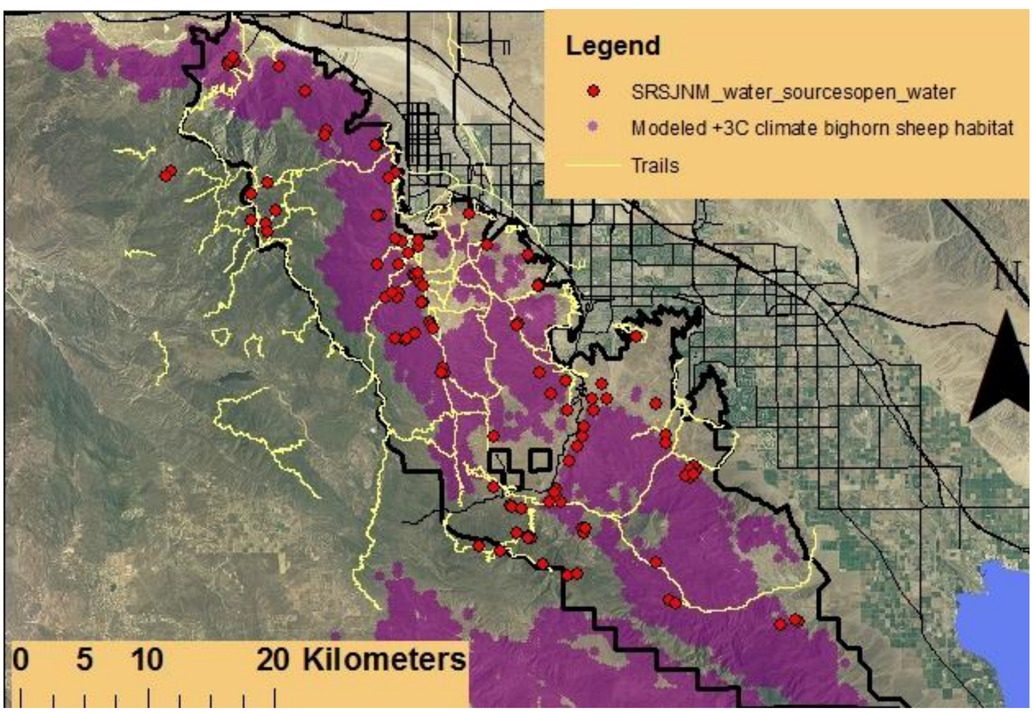

Figure 9. Open water sources and modeled distribution of bighorn sheep habitat: +3°C shift in mean summer maximum temperatures.

Discussion

Without long-term, historic monitoring data for water sources in the Monument, identifying trends of water availability and causes for changes thereto with a high degree of confidence is not possible. Therefore, based on the 2003 water source survey, the recollections of knowledgeable individuals regarding prior and current conditions of water sources, and other available resource information (e.g., maps showing invasive species distributions in addition to spring and other water source locations), we visited 216 sites that are now or once were water sources for wildlife; data collection at these locations comprises the beginning of what is anticipated to be a long-term, focused monitoring effort. The principal questions we considered are whether changes in available water to wildlife have occurred, and what may have caused any observed changes. One aspect of our survey to determine if there is an overall drying trend in the Monument, consistent with casual observations in this regard, focused on water availability at palm oases, a species that requires perennial surface moisture to become established and, at the very least, near-surface water to survive.

Our observations of water availability and vegetative composition at the 216 sites visited in 2014, when considered in light of recollections of certain knowledgeable individuals regarding historic water source conditions, suggest that water sources within the Monument are drying, with greater levels of drying unexpectedly occurring in the SRMTS compared to those in the SJMTS. Data for sites visited in both 2003 and 2014 (16 of 216 sites, or 7%, for which location coordinates reasonably match), however, show no indication of drying; such lack of change may indicate these particular water sources may have stabilized since 2003, though additional monitoring over several years will be required to ascertain whether these findings are anomalies with respect to an overall pattern of drying. Sites in particularly large watersheds, such as Palm Canyon, Deep Canyon, and Sheep Canyon, provide less evidence of drying than those in smaller watersheds. While there were greater levels of tamarisk occurrence at sites in the SRMTS compared to the SJMTS (33% versus 21%, respectively; see Table 1), the patterns of water source drying and tamarisk occurrence were too variable to ascribe tamarisk as the cause of that drying. If tamarisk is a leading cause of water source drying, we would expect such drying to be proportional to the level of tamarisk growth—i.e., the greater the level of tamarisk growth, the greater the drying—but that was not what we observed. Instead, we observed more generalized patterns of drying; while tamarisk clearly contributes to the drying of water sources, there appears to be no direct correspondence between the amount of tamarisk present and the extent of drying.

The difference between the SRMTS and SJMTS in the proportion of sites with surface water (43% of sites surveyed versus 73%, respectively; see Table 1), as well greater levels of drying in the SRMTS compared to the SJMTS as previously discussed, may also be explained by the relative geographic position and heights of the two mountain ranges. The SJMTS are higher and situated further west, and as such they are better able to capture precipitation from winter storms originating in the northwest. Snow packs comprise a key component of recharging aquifers, which concomitantly affects water flows at springs. While snow packs in both mountain ranges have declined over the past four decades, they have probably declined to a greater degree in the SRMTS (DRI western Regional Data center data for Idyllwild; Kelly and Goulden 2008; Harry Quinn, pers. com.). The reduction in snow packs is consistent with the effects of climate change (IPCC 2013), and follows from other research in the SRMTS revealing the early effects of climate change (Kelly and Goulden 2008, Hargrove and Rotenberry 2011).

Our data support a hypothesis that available water for wildlife and vegetation within the Monument has diminished over the last several decades. However, water source surveys should be repeated within 5-10 years to determine whether water availability has stabilized at the current reduced level (which may be indicated by the lack of difference between the 2003 and 2014 surveys), may rebound upon emergence from the current drought, or continues to decline. Despite acknowledged uncertainties as to causes, these findings should catalyze discussions as to what, if any, management actions should be initiated to reduce adverse effects of drying water sources should such be the case.

Acknowledgements

We would like to thank everyone who participated in helping with the 2014 water source survey: Duncan Harkleroad for helping with his vast knowledge of the mountains and their history—without this knowledge the job would have been impossible; Ada Nuckels for introductions to volunteers of the Friends of the Desert Mountains and her organizational skills; Steve Harris for laminating field maps; Harry Quinn, John Purcell, Bud Wellman, and Justin Conley and his crew for their vast knowledge and expertise; Mark Fisher and staff at the Boyd Deep Canyon Research Center for showing us around, plant knowledge, and the ride; and Denise Stewart for her support and patience. Citizen Scientists, whose help made these surveys possible, include (in order of the number of surveys in which they participated): Matty Shaw, Gordon Fidler, Bjarni Serup, Colin Barrows, George Raymond, Brandon and Cait McGinnis, Larry Heronema, Ken Larson, Missy Hewitt, Valerie Garza, Ada Nuckels, Patty Andersen, Bill Malik, Bill Baker, Gary Ward, Sean Gitmed, and Brad Ouellette. We would also like to thank the Agua Caliente Band of Cahuilla Indians for permission to access their lands in the Palm Canyon area.

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Appendix A. Use of Citizen Scientists

The Monument is comprised of rugged canyons and steep slopes, making access to isolated water sources a challenge. That challenge includes ensuring that those conducting the surveys are safe. To that end we employed a “citizen science” approach, soliciting experienced hikers from various sources. The safety objective was to never have just one person conducting the surveys, rather to have multiple members of each survey crew so that if anyone was hurt or could not get back to the trailhead, others were there to help and to bring first responders to the injured member if necessary. No one was injured during these surveys, but the safety precautions were a critical component of our survey protocol. Each survey was led by trained staff to ensure the consistency and quality of the data collected. Training included use of GPS, estimating percent cover of vegetation, identification of plant species typical of the Monument, and the ability to identify wildlife species by sighting, tracks and their scat. A Facebook page was created to attract and schedule citizen scientists and proved to be an effective tool for organizing surveys. The Friends of the Desert Mountains (FODM) and College of the Desert’s Ecologic Club (CODEC) were the primary sources of citizen scientists. Those volunteers, in order of the number of surveys they participated in, included: Matty Shaw (CODEC), Gordon Fidler (FODM), Bjarni Serup (FODM), Colin Barrows (FODM), George Raymond (FODM), Brandon and Cait McGinnis, Larry Heronema (FODM), Ken Larson, Missy Hewitt (CODEC), Valerie Garza, Ada Nuckles (FODM), Patty Andersen (USFS), Bill Malik (FODM), Bill Baker (FODM), Gary Ward (FODM), Sean Gitmed, and Brad Ouellette (CODEC).

Appendix B: Site Visit Narratives

Sheep Canyon

Surveys: Sheep 1, 2 and 3

Sub-Region: Sumac/Sheep Canyon
Date: 1/15/14
Distance: 6 miles; 9.6 km
Starting Point: NAD 83; 574597/3706991
Crew: Geoffrey McGinnis, Gordon Fidler, and Bjarni Serup

This canyon is known by the “Old Timers” as Sumac Canyon but is now listed on the maps as Sheep Canyon. According to Duncan Harkleroad, he has been here several times since the 1950’s. In his opinion, this canyon is one of the best canyons throughout the Monument for bighorn sheep, the location is isolated and there is always water flowing here. To gain access into the canyon you have to cross through a maze of farmlands and get permission to cross through private property to get back onto public lands. The canyon starts with a large winding sand wash heading south until you reach a piece of bedrock that is over 50m long and 10m wide. The platform has one large boulder sitting on the southern side and there are several Cahuilla bedrock mortars spread about the rock’s surface

Sheep 1 572920/3705740

Further up the canyon where the walls begin to narrow, there is a section of the canyon wall that has fallen down to the bottom of the canyon. This is where we first found water. There was a small pool of water that measured 20cm in diameter and 3cm deep. Above that, the water flowed intermittently up the canyon for about 5 kilometers. The lower section of the canyon was completely choked out by fountain grass, (*Pennisetum setaceum).* As we continued up the canyon, the amount of water increased the further up we went, some areas were open where the water flowed over bedrock like a stream.

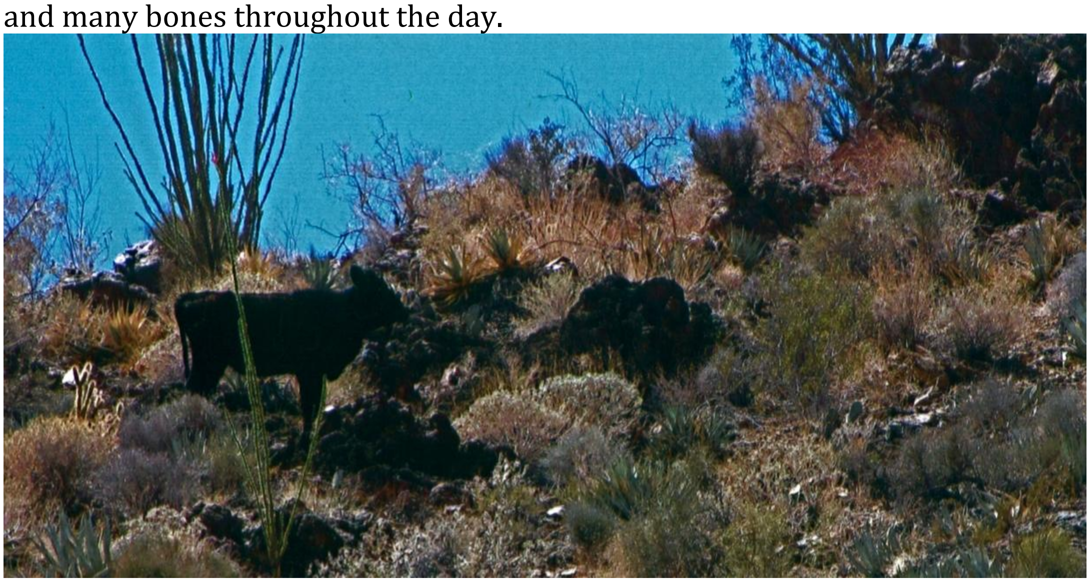
Gordon Fidler

Sheep 2 572583/3705863

The flow created some small waterfalls and pools (some over 2m in diameter), while other sections of the canyon floor were flat and the soil was completely saturated with water from canyon wall to canyon wall. These flat sections were so thick with vegetation *Juncus sp.* and, arrow weed (*Pluchea sericea*) that it made travel extremely difficult. We found some date palms (*Phoenix canariensis*) and salt cedar, (*Tamarix ramosissima*) scattered along the way as we traveled up the canyon.

Sheep 3, 571460/3705563

The upper section of the canyon had less fountain grass, (*Pennisetum setaceum*) than the lower. There was an increase of native plants such as *Juncus sp.,* arrow weed, (*Pluchea sericea*), cat claw (*Senegalia greggii*) and honey mesquite, (*Prosopis glandulosa*). I had been in this canyon a few years before with Duncan Harkleroad; he told me that he had found a feral steer living in this section of the canyon. When we went together we found the steer and that it had destroyed much of the natural habitat, the only good thing is that the steer was eating all of the fountain grass in this section of the canyon. On our trip for the surveys we found that there were no signs of the steer except some old piles of manure, the fountain grass was gone; in its place were thick stands of arrow weed, (*Pluchea sericea*) and *Juncus sp.* The canyon's vegetation continued to thicken and became too rugged to continue so we decided to head back. We found bighorn sheep tracks, scat and many bones throughout the day.



Agua Alta and Martinez Canyon

Surveys: Martinez side canyon, Agua Alta, Jack Miller Cabin and Martinez Canyon

Sub-Region: Martinez Side Canyon and Agua Alta
Date: 3/25/14
Distance: 5 miles; 11.2km
Starting Point: NAD 83; 556074/3723646
Crew: Geoffrey, Cait, Brandon McGinnis and Colin Barrows
The following surveys in this section were conducted as part of a four-day trek from the Cactus Springs trailhead to the bottom of the Martinez canyon these are listed by region rather than in chronological order. The first sets of surveys are listed in the following region, Cactus Spring Trail to Horsethief Creek

Martinez Side Canyon 560490/3710741

To get there we used the Cactus Springs trail, headed south and crossed the northern side of the saddle that divides Santa Rosa Mountain from Martinez Mountain. Along the way, we conducted a survey in a dry side canyon that flowed into Martinez canyon to show representation of the many waterways in the region. Vegetation here comprised *Baccharis serigloides*, scrub oak, (*Quercus cornelius-mulleri*), pinyon pine, (*Pinus monophylla*), redshank, (*Adenostoma sparsifolium*), sugar bush, (*Rhus ovata*) and a variety of cacti species. There were no obvious signs of wildlife.

Agua Alta Spring 561651/3710394

After hiking for most of the day we finally made it to Agua Alta Spring.
This place was an old Cahuilla camp, which has always been relied upon by people and wildlife travelling through the area. From the trail we to headed up the wash and passed through a large area that was full of deer grass, then up an embankment that opened up to a large sandy area. There was a fire ring in the middle of the wash and two small embankments on either side that closed the spot in. This is where we camped. Further up the wash, there is a stand of honey mesquite, (*Prosopis glandulosa*) that had remnants of human activity beneath them, old cans and a broken shovel, etc. Beyond the mesquite there is another area that is covered with deer grass, (*Muhlenbergia reigns*) and *Baccharis serigloides*. Within the vegetation was the spring. An old air compressor tank with the top cut off by a torch acted as the watering trough. It was practically empty. The bottom of the tank held some water that measured less than 1cm deep by 2cm wide, which ran the length of the tank, around 50cm. All of the old timers that we had interviewed said that this place was a reliable water source. After a closer inspection we found that the pipe that taps into the spring was rusted out and needed replacement. The soil that surrounded the tank and pipe was wet. The only sign of wildlife was an old piece of mountain lion scat.

Sub-Region: Agua Alta to Jack Miller Cabin
Date: 3/26/14
Distance: 4 miles; 8km
Starting Point: NAD 83; 561651/3710394
Crew: Geoffrey, Cait, Brandon McGinnis and Colin Barrows

The next day 3/26/14, we packed and headed down into Martinez Canyon. We continued down the Martinez Trail for a few hours, crossing several small dry waterways until we eventually came to the edge of the Martinez Canyon. The canyon's bottom was a few hundred meters below; to get down we had to follow a narrow ridgeline down a steep mountain. Some of the areas we crossed had loose gravel, which made for an interesting trip. Once we reached the bottom we headed up stream towards the Jack Miller Cabin, where there were a few springs shown on the map.

Martinez Canyon Narrows 563183/3707171

The canyon was wide where had entered it but became narrower the further up we went, eventually we came to a section of the canyon that turned into a set of small cascading falls. In the falls were several pools that held water, the pools got larger as we went up; the largest was 2m in diameter by 1m deep. Vegetation here consisted of false indigo (*Amorpha californica*), willow, (*Salix sp*.), *Baccharis serigloides*, deer grass, (*Muhlenbergia reigns*), cattail, (*Typha latifolia*), and juniper, (*Juniperus californica*). The only sign of wildlife here were some California tree frogs. Our water concerns were over.


Caitlin McGinnis, Brandon McGinnis and Geoffrey McGinnis

We continued up to the cabin that was about another kilometer away, we looked forward to making camp and exploring this part of the canyon for water. Jack Miller was a homesteader that built the cabin in the early part of the 1900's. The cabin is the last that stands, Duncan Harkleroad and Harry Quinn told me that there were several cabins in the canyon and that there was a road that led to this place. A large storm washed out the road and all of the other cabins. The cabin is no longer in use, it is considered an archaeological site.

Jack Miller Cabin Spring 562533/370872

When we arrived, there was very little water. The spring above the cabin that was previously tapped into for the cabin's use had no water and a dense stand of date palms, (*Phoenix canariensis*) had grown had grown over the spot where we assumed the spring was. Other vegetation here consisted of arrow weed, (*Pluchea sericea*), *Baccharis serigloides* and honey mesquite, (*Prosopis glandulosa*).

Jack Miller Cabin 562637/3707482

Below the cabin there was some water in the creek, but it was not flowing and had algae growing over it. This section of the creek was drying up. Vegetation primarily consisted of: false indigo, (*Amorpha californica*), *Baccharis serigloides* and deer grass, (*Muhlenbergia rigens*).

Colin Barrows, Geoffrey McGinnis, Caitlin McGinnis and Brandon McGinnis

Sub-Region: Jack Miller Cabin to Martinez Canyon Trailhead
Date: 3/27/14
Distance: 6miles; 8km
Starting Point: NAD 83; 562637/3707482
Crew: Geoffrey, Cait, Brandon McGinnis and Colin Barrows

The last day we left camp and headed down the canyon to the waterfalls to collecta few more gallons of water.

Dry Surveys 563666/3707299, 565749/3706695, 567722/3706850

Along the way we conducted a series of surveys, 5 in total, all were dry. Three of the surveys generally consisted of the same types of conditions: wide wash areas with a sandy bottoms, many stones and boulders. Vegetation consisted of desert willow, (*Chilopsis linearis*), cat claw, (*Senegalia greggii*), sweet bush, (*Bebbia Juncea*), palo verde, (*Parkinsonia florida*), desert lavender, (*Hyptis emoryi*), creosote, (*Larrea tridentata*), honey mesquite, (*Prosopis glandulosa*), brittlebush, (*Encelia farinosa*), cheese bush, (*Ambrosia salsola*), agave, (*Agave deserti*), *Baccharis serigloides*, and a variety of cacti species. The closer we came to the entrance of the canyon the more we found fountain grass, (*Pennisetum setaceum*) and salt cedar, (*Tamarix ramosissima*).

Arundo Surveys 565808/3706569, 566185/3706671

The other two survey sites that we had surveyed were different. The first was below a large embankment on the eastern side of the canyon, there was a large stand of what we believed to be carrizo, (*Phragmites australis*). The stand seemed to be growing out from a spring. We had concerns about snakes and decided not to explore the inside of the stand for water. The cane was between 2m and 3m tall and spanned an area that was nearly 50m long, by 20m wide. Other vegetation at this site included salt cedar, (*Tamarix ramosissima*), *Baccharis serigloides* and false indigo (*Amorpha californica*). The next survey was in an area with very dense vegetation. We had to climb up to the top of the canyon's embankment to go around it. We assumed that there may have been a spring or that this area collected a large amount of water during rain events from the flat that was above it. The vegetation in the canyon consisted of: cottonwood trees, (*Populus fremontii*), salt cedar, (*Tamarix ramosissima*), several stands of carrizo, (*Phragmites australis*) , arrow weed, (*Pluchea sericea*), and Baccharis serigloides. Above this section of the canyon to the south there was a large flat that we used to escape the thick vegetation below. The flat was an "ocotillo forest".

Cactus Spring Trail and Horsethief Creek

Surveys: Grapevine Creek, Horsethief Creek (Upper and lower) and Cactus Spring

Sub-Region: Cactus Springs Trail
Date: 11/19/13
Distance: 11.5 miles; 18.5 km
Starting Point: NAD 83; 551319/3715638
Crew: Geoffrey McGinnis and Duncan Harkleroad
Our trip began near the Cactus Spring trailhead. We headed east with Cactus Spring as our final destination.

Grapevine Creek/Spring 553234/371560

The Cactus Springs Trail crosses Grapevine Creek. The creek is narrow with varying depths and widths. The water is clear and may or may not flow year round, depending on snow pack. Historically it flows throughout most of the year (Duncan Harkleroad recalling as far back as the 1950's). Vegetation is too dense to continue exploration further up the creek to the spring that supplies the water in the creek. From the trail, only 75m of the creek can be seen. The vegetation in this area is combination of willow, (*Salix sp.*), false Indigo, (*Amorpha californica*), *Baccharis serigloides*, cattail, (*Typha latifolia*), manzanita (*Arctostaphylos sp*.) and scrub oak, (*Quercus cornelius-mulleri*). At the creeks edge there was no sign of wildlife, however, along the way there were multiple signs of deer (tracks and scat).

Horsethief Creek 554137/3715178

The Cactus Springs Trail crosses the Horsethief Creek. It was wider than the previous creek and it had a strong water flow and some pools. There were many large trees typical to riparian areas. The creek stops flowing during the summer months but will still have some possible pooling (Duncan Harkleroad recalling back as far as the 1950's). From this part of the trail, water can be seen flowing for over 100 m in either direction. The vegetation in this area included cottonwood, (*Populus fremontii*), white alder, (*Alnus rhombifolia*), false indigo, (*Amorpha californica*) and California sycamore, (*Platanus racemosa*). There were no signs of animal use within the survey area but outside of it there were multiple signs of deer use (scat and tracks).

Update 6/25/14: Grapevine Creek and Horsethief Creek are both dry at the coordinates listed above.

Cactus Spring 557051/3714371

We found wet sand here; the spring appears to have been covered over with sand from a major rain event. According to John Purcell this is a common and that people occasionally come and dig out the spring with a shovel. The last time he saw surface water here was in 2007. There was thick vegetation, primarily *Baccharis serigloides*, deer grass, (*Muhlenbergia rigens*), and pinyon pine, (*Pinus monophylla*). The only sign of animals were human tracks and 2 separate mountain lion scat piles.

Further exploration

Along the way to cactus spring we explored other canyons on the lower portions of the west side of Sheep Mountain. No water was found. Duncan Harkleroad reported that he and former California Department of Fish and Game biologist Bonner Blong had installed an artificial guzzler in this area during the 1960's, we found no evidence of the guzzler. We came across 2 deer carcasses and a set of dropped deer antlers. Vegetation in this area was pinyon/juniper woodland.

Sub-Region: Lower Horsethief Creek to Deep Canyon
Date: 2/8/14
Distance: 10 miles; 16.09km
Starting Point: NAD 83; 529607/3750986
Crew: Geoffrey, Cait, Brandon McGinnis and Brad Ouellette

Lower Horsethief Creek to Deep Canyon (553775/3716181)

Our trip began at the Cactus Spring trailhead; we travelled down to Horsethief Creek, passed the point that we had previously surveyed and then headed down stream. Our goal for the day was to make it down stream to the point where the creek merged into Deep Canyon. We walked along the creek bed for about a mile and a half, the flow in the creek was strong most of the time but in some places went underground and then reappeared further downstream. Vegetation was thick and made it difficult to travel through, we found that it was easier to walk in the center of the creek. We surveyed at 4 different places along the creek, there was very little difference in conditions. Vegetation included, cottonwood, (*Populus fremontii*), white alder, (*Alnus rhombifolia*), false indigo, (*Amorpha californica*) manzanita, (*Arctostaphylos sp*.), agave, (*Agave deserti*), willow (Salix sp.), pinyon pine, (*Pinus monophylla*), California sycamore, (*Platanus racemosa*), sugar bush, (*Rhus ovata*) and a variety of cacti. Further downstream there were some pools that had accumulated, one was large enough to swim in, and the water was cold. We stopped just after Deep Canyon and Horsethief had merged.

Sub-Region: Upper Horsethief Creek
Date: 3/24/14
Distance: 7miles; 11.2km
Starting Point: NAD 83; 550992/3715718
Crew: Geoffrey, Cait, Brandon McGinnis and Colin Barrows

The following surveys in this section are the first half of our four-day survey from the Cactus Spring trailhead to the bottom of Martinez canyon.

Horsethief Creek Spring 556074/3723646

One of our survey expeditions took us on a 4-day hike from the Cactus springs trailhead, 22 miles to the south and east to the end of Martinez Canyon (572036/3708664). We camped at the upper portion of Horsethief Creek at a spring that was marked on the topo map. The creek and the spring were dry. The spring was in the middle of a stand of cottonwood, (*Populus fremontii*) and willow, (*Salix sp*.) trees. John Purcell told me in a conversation before our trip that, the spring was seasonal and may be dry but he thought that the small canyons above this spot that flow into the creek should have some water in them this time of the year.

Horsethief Side Canyon 555799/3713196

We needed the water for our trip, if we could not find any nearby we would have to back track to the lower section of the creek to collect some. That evening we headed up to the first of two small canyons. It looked promising because there was water indicating plant species up the canyon within the middle of chaparral. We climbed up through the drainage and came to steep area that had exposed rock and some small pools, one of which had water that measured 50cm by 30cm by 30cm deep. This was not the stand where we had seen the water indicating plants. Vegetation here contained redshank, (*Adenostoma sparsifolium*), manzanita, (*Arctostaphylos sp*.), scrub oak, (*Quercus cornelius-mulleri*) and sugar bush, (*Rhus ovata*). There were no obvious signs of wild life. We collected enough water for the evening. Further up the canyon we found the remnants of a man made dam. There were stones built up on the lower section of a natural pool and was lined with a tarp. There were several irrigation hoses that were strung in all directions.

The pool was empty. It seemed obvious that it was used at one time for a marijuana growing operation.

Horsethief Side Canyon 2 556032/3712793 and 556084/3713182

The next morning we headed up the second canyon to an area that looked very green. Along the way up the canyon we came to an area that had a small flow of water. The water was enough to fill several small pools on top of a series of small rocky waterfalls. Vegetation here consisted of *Baccharis serigloides*, willow, (Salix sp.), manzanita, (*Arctostaphylos* sp.) and redshank, (*Adenostoma sparsifolium*). There were multiple deer tracks and scat. We continued to explore the canyon; the vegetation was becoming too thick to continue up the center so we used the nearby ridgeline that followed the creek to continue up the slope. At the highest point that we could reach, we conducted our final survey for the Horsethief Creek area. The canyon walls were steep but with the help of a marijuana irrigation line, Colin was able to reach the canyon's bottom. The creek was flowing slowly here and the canyon walls had many seeps. Vegetation included: willow, (*Salix sp.*), *Baccharis serigloides*, manzanita (*Arctostaphylos sp*.), scrub oak, (*Quercus cornelius-mulleri*) pinyon pine, (*Pinus monophylla*), redshank, (*Adenostoma sparsifolium*) and wild grapevine, (*Vitus girdiana*). There were no obvious signs of wildlife. From the set of pools below, we collected 5 gallons of water and headed out to Agua Alta.

Devil's Canyon and Guadalupe Creek

Surveys: Devil's Canyon and Guadalupe Creek

Sub-Region: Cactus Springs Trail to the Guadalupe Trail
Date: 1/2/14
Distance: 15.3 miles; 24.6 km
Starting Point: NAD 83; 550999/3715715
Crew: Geoffrey McGinnis, Colin Barrows, Larry Heronema and Gary Ward

We started at the Cactus Springs Trail Head and headed east towards Horsethief Creek, we went up the escarpment to Little Pinyon Flats and continued to Cactus Spring. These areas were previously surveyed for water along this trail. After passing through the cactus springs area we headed to the Guadalupe Trail, which branches off towards the north. The Guadalupe trail goes between Sheep and Martinez Mountains, then heads west towards the La Quinta Cove. The saddle that goes between the two mountains is the beginning of the Guadalupe Creek. This creek was known to have flowing water in it, but we did not find any as we passed through the area. We may have not traveled down the creek far enough to find it. The creek was covered with thick chaparral, it seemed too difficult at the time to look any further and we had seven more miles of hiking to complete before the sun went down. As we headed down from the saddle we passed through and area known by the old timers as Hobo Joe's or to contemporaries as Cowboy Camp. It is still unclear how it got there but there are remnants of an old shack, a wood burning stove and several cooking implements. Inside of the old stove are several logbooks that people have signed and tell their stories as they passed through the area.

Devil's Canyon Upper 1 and 2 561240/3717587, 562475/3719844

Further down the trail we came across two different creeks that seem to head towards Devil's Canyon. The only moisture here was some wet sand. Vegetation here consisted of primarily *Baccharis serigloides* and salt cedar, (*Tamarix ramosissima*).

Sub-Region: Devil's Canyon and Lower Guadalupe Creek
Date: 1/9/14
Distance: 7 miles; 11.2 km
Starting Point: NAD 83; 566455/3717949
Crew: Geoffrey, Cait and Brandon McGinnis

Guadalupe and Devil's Canyon Junction 564934/3717852

The entrance to the Devil's Canyon starts at the end of the Boo Hoff trail at the top of the canyon's alluvial fan. The lower part of the canyon was dry, we walked for what I would approximately a mile and once we reached what seemed like the end of the canyon, there was a waterfall carved out of the bedrock face. The fall was approximately 6 meters high and had some flowing water coming over it. The water formed a pool that was around 1m by 50cm and 20cm deep. The area had less than 1% vegetation, cat claw, (*Senegalia greggii*). There were multiple sheep signs (tracks and scat). From the pool, the water continued to flow about 10 meters and then sank into the sand. At the time I had not realized that this was the end of Guadalupe Creek. I had assumed that it was part of Devil's Canyon. The waterfall was impassible at this point, so we looked for a way to get around it. We went up an adjacent hillside to the west and realized that the Devils' Canyon forked off to the west above a smaller waterfall and continued in that direction. After looking at the map, it was clear that the two canyons were running parallel with each other. The terrain looked easier to traverse in Devil's Canyon, so we decided to take a chance and followed it up in hopes that there was a way to cross back over to Guadalupe Creek once we had completed surveys there.

Caitlin and Brandon McGinnis

Devil's Canyon lowest 564624/3718833

As we went up the canyon we found water almost immediately. The pool measured 6cm deep by 20cm by 50cm. The small amount of vegetation here was primarily cat claw (*Senegalia greggii*). There were signs of multiple bighorn sheep (tracks and scat), bobcat tracks and signs of human activity.

Devil's Canyon Oasis 564402/3717833

We continued up the canyon and found several salt cedar, (*Tamarix ramosissima*) and fountain grass, (*Pennisetum setaceum*) along the way. Finally, the canyon came to what seemed to be the end was a small California fan palm oasis (*Washingtonia filifera*). Behind the oasis there was a series of cascading waterfalls. There were several seeps and some small pools of water at the base of the fall. We continued up the falls to find that there were several more pools, most of which measured over 1 meter in diameter. At the top of the falls there was one final pool that measured 130cm in length, 50cm in width and was 15 cm deep. The canyon at this point was more like a creek, it was in open area with flowing water. Just beyond our final survey site was another small palm grove. There were multiple signs of bighorn sheep (tracks and scat). We decided that it was time to move to the Guadalupe Creek, we had conducted surveys previously further up Devil's Canyon. The only thing separating the two waterways was a small ridge to the east. It took us about 45 minutes to cross from one creek to the other.

Guadalupe 1 (lowest section) 564576/3717380

We surveyed at the top of the first waterfall that we had found earlier that morning. There was zero vegetation

Guadalupe Creek 2 (middle section) 564329/3717200

We reached Guadalupe, we were approximately 2km up-steam from the first waterfall we had found. The creek was flowing, we went up stream we found that the creek would disappear under the sand for a short distance and then reappear when bedrock was exposed.

Guadalupe 3 and Waterfall (upper section) 563974/3717300

We traveled approximately another 1.5 kilometers to find that this portion of the canyon came to a boxed end. The walls of the canyon had narrowed around us and turned from a southern direction to the west and then to the south again. At the end there is a waterfall that measures nearly 25 meters high. There was a small stream of water flowing over the waterfall. At the bottom of the waterfall there was a large pool that measured 10m by 8m and was 50cm deep. The pool and survey area had very little vegetation in fact the only vegetation here was salt cedar, (*Tamarix ramosissima*) which were scattered along the way.

After finishing our survey, we decided to head back, the waterfall was completely impassable from here and the day was coming to an end.

Throughout the day we found along the creek: airplane engine parts, some bobcat tracks that followed the creek for a long way, and multiple signs of bighorn sheep. The majority of the vegetation along the way included desert lavender, (*Hyptis emoryi*), cat claw, (*Senegalia greggii*), brittlebush, (*Encelia farinosa*) and *Baccharis serigloides*.

Santa Rosa Mountain

Surveys: Sawmill Road and 4x4 trail, Santa Rosa Mountain road, Omstott Creek and Toro Peak

Sub-Region: Sawmill Road
Date: 12/20/13
Distance: 12.5 miles; 20 km
Starting Point: NAD 83; 551315/371563
Crew: Geoffrey McGinnis, Colin Barrows, Larry Heronema, Gordon Fidler, Bill Malak, Gary, and Matt Shaw

Saw Mill Road and canyon bottom 551113/3714398

The lower portions of the road only had water in one place. At the base of a 20m waterfall there was some seepage and wet sand. Vegetation here included willow, (*Salix sp*.) and some *Baccharis serigloides.*

Streams and Spring 551876/3712382, 551625/3712382, 551530/3712325

Further up the mountain there were two drainages that were flowing from recent snow events. We also found a hose that was protruding from the ground that had water flowing out of it. It was unclear to us what the source of the water was; we felt that it may have been tapped into a spring.

Kiln Pond 551564/3712437

The water from the hose was flowing towards a pond that was developed near the old kiln. According Duncan Harkleroad, Harry Quinn and Bud Wellman the kiln used to burn the sawdust produced by a logging camp that used to operate here. Bud Wellman actually worked there as a young man. It is unclear to me when he worked there but he is now 93. Harry Quinn had mentioned that he had become aware of the creeks and pond in this area as early as 1946 and to the best of his knowledge, the pond always keeps some water.

4x4 trail 550695/3712784

We departed from the kiln area following an old 4X4 path that was on the map. We found some other creeks that were flowing, one of which had a 1m diameter pool near the road. The vegetation in these areas consisted of, incense cedar, (*Calocedrus decurrens*), yellow pines (*Pinus jeffreyi*), white fir, (*Abies concolor*), manzanita, (*Arctostaphylos sp.),* and live oak, (*Quercus sp.).* Throughout the day we saw several deer tracks and some grey fox tracks.

Sub-Region: Santa Rosa Mountain Road
Date: 4/16/14
Distance: 20 miles; 32km (Driving)
Starting Point: NAD 83; 545318/3714337
Crew: Geoffrey McGinnis, Gordon Fidler and Matt Shaw

Garnet Queen Creek 547329/3711005

We started where Highway 74 and the Santa Rosa Mountain Road came together. We drove nearly 5 miles on the western side of the mountain until the road started to switchback. We came to the Garnet Queen Creek and it was dry. Vegetation here was primarily live oak, (*Quercus sp*.).

Santa Rosa Spring 549447/3711286

We continued for a few more miles up the switchbacks and came to a sign with an arrow pointing to Santa Rosa Spring We followed the sign to a campground; there was a pipe coming out of the ground that formed the shape of a square walking cane, it filled a cement basin directly below. The basin was approximately 75cm in diameter and 25cm deep. Vegetation here consisted of: incense cedar, (*Calocedrus decurrens*) white fir, (*Abies concolor*) and jeffrey pine, (*Pinus jeffreyi*). There were deer tracks at the site. We continued to the top of the mountain and found no other sources of water. We knew that there was more springs further up the mountain road but decided that those springs would have to be surveyed at another time.

Final Surveys 548340/3710863, 548444/3711010, 547690/3711740

We surveyed at three other locations on the way back to the highway.
The first two survey sites were dry. The primary vegetation at both sites was live oak, (*Quercus sp*.). The final survey was further down at another site along the Garnet Queen Creek. The creek bed was over grown with vegetation and when we saw one place along the creek that had some exposed rocks we knew that it might be the only place to find water. The rocky outcrop formed a series of small waterfalls and pools that were full of water. The largest of the pools was 2m by 1m by 20cm deep. The primary vegetation here was willow, (*Salix sp*.) and manzanita, (*Arctostaphylos sp*.). There were deer tracks surrounding the waterhole.

Sub-Region: Omstott Creek
Date: 4/23/14
Distance: 2miles; 3.2km
Starting Point: NAD 83; 550781/3715697
Crew: Geoffrey McGinnis

Omstott Creek Survey 1 550254/3715702

I parked at the entrance of the Ribbonwood Equestrian Campground in Pinyon Flats. I followed a trail that led me to the creek where I found a 3 inch galvanized pipe running up into the canyon. I followed the pipe to the first survey site, there was a set of boulders and waterfalls at the beginning of the canyon. (The falls were dry but you could tell by the waterlines on the rock surfaces that there had been some water in the pools recently. Vegetation here was primarily hollyleaf cherry, (*Prunus ilicifola*) Sugar bush, (*Rhus ovata*) and *Baccharis serigloides.*

Omstott Creek Survey 2 550209/3715008

Not much further up the canyon was a second waterfall. The pools here had some water, the largest of which was nearly 50cm by 20cm by 2 cm deep. The survey site was primarily bedrock with a small amount of vegetation, hollyleaf cherry, (*Prunus ilicifola*).

Omstott Creek Survey 3 550321/3714809

As I continued up the canyon, following the metal pipe, the vegetation was beginning to become too thick to continue up the creek. In the middle of the thick vegetation there was another pool of water that was 20cm by 10cm by 3cm deep. Plant life here consisted of: willow, (*Salix sp*.), *Baccharis serigloides*, redshank, (*Adenostoma sparsifolium*) and sugar bush, (*Rhus ovata*). There were no signs of wildlife.

Lower Omstott 549378/3716003

After finishing in the canyon I drove to the place where the Omstott Creek crossed Palm Canyon Road. The creek was dry near the crossing, vegetation here consisted of: willow, (*Salix sp*.), *Baccharis serigloides*, redshank, (*Adenostoma sparsifolium*) and sugar bush, (*Rhus ovata*).
There were no signs of wildlife.

Sub-Region: Toro Peak
Date: 5/23/14 and 5/24/14
Distance: 12 miles; 19.31km
Starting Point: NAD 83; 551333/3711285
Crew: Geoffrey McGinnis and Colin Barrows

We drove to a camp spot near the cabin on Santa Rosa Mountain, we quickly set up camp and then headed out to find water sites for me and pinyon pines for Colin's survey.

Toro Peak Drainage 1 and 2 554753/3709401, 555474/3709521

We drove to the end of the mountain road near Toro Peak and head down a large drainage towards Martinez Canyon. Along the way through the creek, we found two springs. The first seemed to be coming out of the side of the mountain from underneath a log. It flowed for a few meters and then sunk back underground. As we walked through the creek we found an area that had been used to grow marijuana, it was inactive when we found it and someone had cut the irrigation hoses that were strung about. The second spring was in the middle of the creek, a pool had formed just below some boulders. The pool was nearly 1m in diameter by 20cm deep. It had algae growing over it. Vegetation at both places were very similar, they consisted of: jeffrey pine, (*Pinus jeffreyi*), white fir, (*Abies concolor*), incense cedar (*Calocedrus decurrens*), and live oak, (*Quercus sp*.). There were several deer tracks and scat.

Stump Springs 550768/3710883

The next day we went to stump springs and found no water inside the two cement basins that were at the spring. They were previously used for the nearby cabin. Vegetation here consisted of: jeffrey pine, (*Pinus jeffreyi*), white fir, (*Abies concolor*), and an unidentified type of grass.

Toro Peak Drainage 3 555402/3710511

We headed back towards Toro peak and used a ridgeline to get to lower elevations to conduct our surveys. The area between Little Pinyon Flats and Toro Peak was below the tree line. We surveyed in a creek and found that it was mostly dry. The only water came from a recent rain that filled a small shallow pool and further down there was some wet sand. The little vegetation here was manzanita (*Arctostaphylos sp*.), and scrub oak, (*Quercus cornelius-mulleri*).
There were many deer tracks and scat.

Virgin Spring 552726/3710298

The final survey would take us back to the top of the mountain. We drove to what may have been Virgin Spring. It was a cement hole on the side of the dirt road we were using. The hole was full of water and measured 75cm in diameter, the depth was around 75cm as well. There were no signs of wildlife.

Pinyon Flats and Upper Palm Canyon

Surveys: Asbestos Spring, Portrero Spring, Dutch Charley, Little Paradise, upper Palm Canyon, and Around Pinyon Flats.

Sub-Region: Asbestos Springs, Portrero Springs, Dutch Charley Canyon and Palm Canyon
Date: 1/21/14
Distance: 6 miles; 9.6 km
Starting Point: NAD 83; 548925/3720467
Crew: Geoffrey McGinnis, Bill Malak and Larry Heronema

Asbestos Spring and Tanks 548925/3720467, 548885/3720418

We drove to Palm Canyon Road at Pinyon Flats, took it west beyond the first gate and parked at the second gate near Asbestos Mountain. We walked from the cars over the hill to where we thought the spring was located. We did not know exactly where the spring was. We could see from the hilltop that there were two tanks in the area below. We assumed that the spring was being tapped to fill the tanks and then used for water in the local neighborhood. We spread out to find the original spring with no success at first. While searching for the spring we took a few moments to inspect the water tanks. One of the two tanks was allowed to leak from a pipe, it looked like it had been leaking long time, enough time to create its own mini ecosystem. While the surrounding area was covered with desert plant species, this spot was thick with *Baccharis serigloides*, and scrub oak (*Quercus cornelius-mulleri*). We had almost given up finding the spring when we came upon an old watering trough that had a pipe attached to it. The trough was over two meters in diameter, dry and no longer in use. The pipe went up a small drainage. Bud Wellman had previously told me that he had tapped into the spring to water his cattle and for wildlife to use. From here we followed the pipe, we found that it was going into an embankment on the side of a small hill. Below the area where the pipe penetrated the hillside, the ground was wet; we assumed that this was the original spring. Vegetation here included *Baccharis serigloides* and pinyon pines (*Pinus monophylla*). The area around the spring and tanks had obvious use by cattle and deer (tracks and scat).

Asbestos Spring Trough

Portrero Spring 548031/3723506

Portrero Spring was further down Palm Canyon Road a few kilometers to the west Asbestos Spring. This spring is another that Bud Wellman had tapped into. It had a pipe run to a water trough from the natural spring, and is no longer in use. Bud had mentioned that the spring was seasonal and was effected by seismic activity. When we surveyed, the spring was dry and the vegetation was either dead or dying it consisted of honey mesquite (*Prosopis glandulosa*) and *Baccharis serigloides.* After surveying the site we continued down the canyon a short way and found a healthy looking stand of Cottonwood trees. There were many deer tracks in the area.

Dutch Charley Canyon 547336/3722412

From Portrero Spring we backtracked on Palm Canyon Road to the Dutch Charley Canyon, which runs west from the road down to Palm Canyon. We parked across the road from an old pistachio orchard that was no longer in use. Although the Canyon was dry, we did conduct one survey at the only waterfall in the canyon to show representation of the area. Vegetation here was primarily *Senegalia greggii* (Cat Claw), honey mesquite, (*Prosopis glandulosa*) and agave, (*Agave deserti*). Throughout the canyon there was an abundance of scrub oak, (*Quercus cornelius-mulleri*), honey mesquite, (*Prosopis glandulosa*) and pinyon pines (*Pinus monophylla*). It looked as if there had been some resent activity in salt cedar removal. There were signs of deer and cattle (tracks and scat).

Almost Hidden Falls 5455540/3722268

We entered Palm Canyon. This part of the canyon is more like a small valley with a large stand of trees to the west. We continued to the south looking for a place called Hidden Falls. We surveyed what we thought were the falls, we found no water there. I found out later that Hidden Falls was further to the east. The majority of vegetation consisted of red shank, (Adenostoma sparsifolium) and desert apricot, (*Prunus fremontii*).

Sub-Region: Portrero Canyon to Little Paradise and Side Canyon
Date: 4/26/14
Distance: 7miles; 11.2km
Starting Point: NAD 83; 548031/3723506
Crew: Geoffrey McGinnis, and Bjarni Serup

Portrero Canyon 546903/3723690

We started our hike at Portrero Spring, we walked down the canyon early that morning and it was cold. Further in the mountains beyond there was a fresh layer of snow from the day before. We stopped and surveyed in the middle of an area that had dense vegetation that consisted primarily of: honey mesquite, (*Prosopis* glandulosa), *Baccharis serigloides* and sugar bush, (*Rhus ovata*). We continued down the canyon and found no water along the way until we came to some boulders and realized that we had made to the intersection of Palm and Portrero canyons.

Upper Palm and Portrero canyons 544975/3725464

On the other side of the boulders there was a large set of waterfalls and at the end of the boulder set, there was a large sheer waterfall. We later found after trying to go around that the fall was at least 75m to the bottom. Back at the top of the falls were several pools of water that had flow between them. The largest was 3m by 2m by 1m deep. We conducted our survey and found that the scarce vegetation here consisted of: willow, (*Salix sp*.) and cottonwood, (*Populus fremontii*). We followed the water flow up stream for a short while and found that it was flowing out from the sand in the canyon floor.

Little Paradise 544877/3725744

Bjarni went around the hill that led over to the other side of the waterfall, I tried to go down the area near the face of the waterfall. They way that I chose was impassible, so I headed towards the direction that Bjarni took. We caught up with each other on the side of the hill and we could see a place known as Little Paradise. Little paradise is a riparian area that is approximately 100m long and 50m wide. It is surrounded on three sides by the canyon walls and is full of large cottonwood trees. Water surrounds and flows past the trees, there are two sources from where it comes, the waterfall that we hiked around flows into the basin and up one of the slopes that surround the place has a spring that flows down. The vegetation at the survey site consisted of: desert willow, (*Chilopsis linearis*) cattail, (*Typha latifolia*), salt cedar, (*Tamarisk ramosissima*) 10% out of 90%, honey mesquite, (*Prosopis glandulosa*) and cottonwood, (*Populus fremontii*). There were no signs of wildlife.

Little paradise

Little Paradise Spring 544770/3725430

We climbed up the slope that had the spring. The slope was around 50m wide and at least 200m long. We conducted our survey and found that the vegetation here consisted of: deer grass, (*Muhlenbergia reigns*), willow, (*Salix sp.*) and honey mesquite, (*Prosopis* glandulosa). The entire slope was covered in vegetation. We could not find one particular source of water, it seemed as if the entire slope was one large flowing seep. The matted grass had to be spread open to see the water and while walking the ground, it felt like we were walking on one big sponge.

Outside of the spring area, there were some old remnants of cattle work and a camp. The only sign of wildlife here was an old piece of mountain lion scat.

Our next goal was to find another place known as Agua Bonita. It was upstream in Palm Canyon, so we cut back to the trail and headed up stream. Without realizing it, we had passed Agua Bonita and decided not to go back to it. Bud Wellman and Duncan Harkleroad both told me that this spot in the canyon usually had water in it, with the exception of the hottest part of the summer.


Little Paradise Spring

Palm Canyon Grove 545087/3723824

We continued up the canyon to an area that was large and open, like a small valley. We had been here before on the opposite side and conducted a survey just outside of the tree area (5455540/3722268). This time we surveyed in the middle of the trees. The area was very dry and the vegetation here looked as if it was struggling. Vegetation was comprised of: salt cedar, (*Tamarisk ramosissima*) 30% out of 100%, honey mesquite, (*Prosopis glandulosa*), willow, (*Salix sp.*), and some *Baccharis serigloides*.

Palm Canyon Side Canyon 1 546075/3723881

Rather than using Dutch Charley Canyon to get back to the car, we used another small canyon that ran parallel to it. The small canyon was dry all of the way up but we still conducted a survey to show representation of the canyon. The vegetation consisted of sugar bush, desert apricot, desert agave, manzanita, (*Arctostaphylos sp*.) and California juniper, (*Juniperus californica*). There was no signs of wildlife within the survey area but there were many deer tracks and scat along our route through the canyon.

Sub-Region: Side Canyon 2, into Palm Canyon
Date: 5/2/14
Distance: 10 miles; 16 km
Starting Point: NAD 83; 546614/3719712
Crew: Geoffrey McGinnis and Gordon Fidler

While conducting surveys in the upper portions of Palm Canyon, we had hoped to of had enough time to make it to Hidden Falls, The Rock House and Oak springs. Each time we tried, we seem to have run out of time before we could make it to these places. Gordon and I drove as close as possible to the rim of Palm Canyon, we used one of the old dirt roads that runs through the area.

Rather than taking one of the canyons that we had used previously, we chose another to get to the bottom of Palm Canyon, Hidden Falls and beyond. We had a great deal of difficulty getting down the canyon because the terrain was extremely rugged. Vegetation in some places was very dense and one of the dry waterfalls could not be climbed down. We had to go around it and were forced to slide down a steep embankment of scree.

Side canyon 2 546614/3719712, 546325/3719741

We conducted two surveys in the canyon. The first survey site was in a thick patch of *Baccharis serigloides* and *Juncus sp*. There was also willow, (*Salix sp*.), sugar bush, (*Rhus ovata*) and scrub oak, (*Quercus cornelius-mulleri*).
There was no sign of wildlife. The next survey had a small seep and a patch of wet sand at the bottom of a small waterfall. Vegetation at the site consisted of: salt cedar, (*Tamarisk ramosissima*) 2% out of 40%, *Baccharis serigloides,* cottonwood, (*Populus fremontii*), deer grass, (*Muhlenbergia reigns*) and scrub oak, (*Quercus cornelius-mulleri*). There was no sign of wildlife usage. We finally made it to the bottom of the canyon and decided that it would be too difficult to complete our trip or go back up the canyon we used to come down.

Palm Canyon below Hidden Falls 545759/3721110

We did conduct one more survey in an area where the canyon flowed through a large set of boulders, small waterfalls and several rock pools.
This section of the canyon was dry. Vegetation at the survey site consisted of: salt cedar, (*Tamarisk ramosissima*) 10% out of 35%, *Baccharis serigloides,* cottonwood, (*Populus fremontii*), felt leaf yerba santa, (*Eriodictyon crassifolium*), willow, (*Salix sp*.), cat claw, (*Senegalia greggii*) and desert willow, (*Chilopsis linearis*). The only sign of wildlife here was a garter snake and some spiny lizards.

Sub region: Pinyon Flats Spring/ Wells
Date: 7/16/14
Crew: G. McGinnis
Surveys: Firehouse Spring

Harry Quinn is a local in the Pinyon Flats area; he and his family have lived there since the 1940's. Harry is a practicing geologist, archaeologist and paleontologist. Harry was kind enough to mark down several places on a map and wrote some details to explain the history for those particular waterholes. In addition he spent the better part of a day showing me in person where these places were.
I selected a handful of the places that he had shown me and conducted surveys there.

Firehouse Spring/ Well (551131/37166380).

The first survey was conducted behind the local firehouse. Behind the firehouse there was a small waterway that had a thick stand of *Baccharis serigloides* and pinyon trees, (*Pinus monophylla*). The source of water was a spring on the side of one of the embankments of the waterway. The source was not accessible to wildlife because it was covered by a chimney type structure that had a piece of plywood and some rocks placed on top to keep things out. The water was nearly two meters below its cover and was hard to tell the exact measurements were. I would place the water's diameter at nearly 80cm. I believe that the firehouse and possibly the restaurant that is across the street use the water.

Sugarloaf Spring/Well (551304/3716052)

From the firehouse the small waterway continues into an area that merges with several other small waterways. At the surface these waterways are all dry but there are several wells installed along the way. At a place where these areas converged there was a large stand of desert olive trees, (*Forestiera pubescens*), *Baccharis serigloides* and pinyon pines (*Pinus monophylla*). Harry told me that this was an old site like many others in the area that the cattlemen would use and was controlled by a fault line.
Because of the amount of vegetation here, I think that it probably still does hold some water, at least seasonally.

Alpine Water Well/Spring and Pump Station (548857/3716348)

This is another spring that Harry said used to have running water flowing from the ground year round. There is a wellhead and a water tank with Alpine Water Company's name on it. The ground's surface is dry and the vegetation here is sparse. The only water on the surface was from one of the connections dripping from the tank.
I have seen other tanks dripping from this company and wonder if they are trying to give something back to nature or if it there is some other reason for the leaks. Vegetation consisted of a small amount of *Baccharis serigloides* and false indigo, (*Amorpha californica*).

Historical Spring (549705/37165065)

Harry remembers this spring flowing in good years into late spring. This same drainage continues downstream into what used to be the Wellman Ranch and was tapped into for a well. According to Harry, the well is also on a fault line but is still in use today. Harry used to conduct water table monitoring for the community at the well site until the property was sold to someone else. The spring up the drainage where Harry recalled seeing surface water was dry. Vegetation here consisted of some type of current or other berry (*Ribes sp*.), ribbon wood, (*Adenostoma sparsifolium*) and pinyon trees, (*Pinus monophylla*).

Spring Crest Gas Station (546598/3714519)

The Gas Station is no longer in use, the infrastructure for the well and pump are still on site; this equipment that was tapped into the spring's water has all been abandoned. There was a large platform that was used as a pump station and there is a shack with a filtration system too. The spring appears to be just up a small canyon that may have flowed into the large manmade pools below. It is unclear to me how the whole system worked. According to Harry Quinn "It was a good spring that flowed year round and provided water for Mr. Howell's old Ribbonwood development". Vegetation in the spring was very thick and consisted of desert olive (*Forestiera pubescens*), willow, (*Salix sp*.), sugar bush (*Rhus ovata*) and ribbonwood, (*Adenostoma sparsifolium*). There were no signs of wildlife.

La Quinta Cove

Sub-Region: Bear Creek Oasis
Date: 12/12/13
Distance: 10 miles; 16 km
Starting Point: NAD 83; 563280/3723469
Crew: Geoffrey, Matt Shaw and Missy Hewitt

Ephemeral pool 562905/3723075

We started at the La Quinta Cove on the southwestern side of the neighborhood. We crossed the flood basin and went up a waterway towards the base of the hills that separate La Quinta from Deep Canyon. It was reported to me by Cameron Barrows that there was a pool of water in this area that he had seen some during the early 1990's. We found a large pool in the sand that was on the drainage bottom it was dry but had obviously been created by water; it measured nearly 3m in diameter by 2m deep. It was unclear if the hole held water annually or if it was simply caused by a flash flood. There were no water indicating plants in this location with the exception of a single blue palo verde tree, (*Parkinsonia florida*), the remaining vegetation here was primarily creosote, (*Larrea tridentata*).

Bear Creek Oasis 560082/3720534

We continued our hike towards the Bear Creek Oasis it is about five miles up a steep slope that takes you nearly to the top of Sheep Mountain. All of the "Old Timers" that were interviewed said that there had always been water at the oasis but when our crew arrived and spread out to find it, there was none. Vegetation here was nearly 100% California fan palm, (*Washingtonia filifera*). The oasis seemed to be in good health. There were no signs of wildlife. After finishing our survey we headed back down the trail and found a herd of bighorn sheep approximately 2 km from the trailhead. The heard consisted of 12 sheep with several ewes, some juveniles, and four large rams.

Sub-Region: LA Quinta Cove West Canyon
Date: 2/4/14
Distance: 2miles; 3.2km
Starting Point: NAD 83; 563280/3723468
Crew: Geoffrey McGinnis, Matt Shaw and Gordon Fidler

La Quinta West Canyon 561772/3723130, 561717/3723017

Once again we were in search of the pool of water that Cameron Barrows had told us about starting at the southwest corner of the La Quinta Cove Neighborhood.
We had looked at Google earth the day before and he showed me the place that he believed the pool was. We hiked up the canyon to two possible places where water could have accumulated. We found no water at either place. The vegetation there did not indicate that this was a wet area, they included small amounts of: creosote, (*Larrea tridentata*), white rhatany, (*Krameria grayi*), brittlebush, (*Encelia farinosa*) and desert lavender, (*Hyptis emoryi*).
There were several signs of bighorn sheep (tracks and scat).

Sub-Region: LA Quinta rock island
Date: 3/15/14
Distance: 2miles; 3.2km
Starting Point: NAD 83; 563280/3723468
Crew: Geoffrey McGinnis and Cait McGinnis

Rock island 563259/3721903

During a hiking trip in the La Quinta cove my daughter and I came across a small set of waterfalls on the rock island. They were dry by obviously held water ephemerally. Vegetation here was less than 1% but included: (*Larrea tridentata*) and brittlebush, (*Encelia farinosa*).

Sub-Region: Boo Hoff Trail and Portions of Devil's Canyon
Date: 12/17/13
Distance: 6 miles; 9.65 km
Starting Point: NAD 83; 563861/3723406
Crew: Geoffrey McGinnis and Gordon Fidler

Prior to the hike, we shuttled a car to the end of the Boo Hoff trail near Devil's Canyon and then drove back to the La Quinta cove.

La Quinta East Canyon 564066/3720224

We started our trip on the eastern side of the La Quinta Cove at the Boo Hoff trailhead and headed south along the trail. As we passed through a large wash we lost track of the trail and found ourselves in the back of a small box canyon. It was dry but still had some indicators of water flow in prior years. The primary vegetation here was cat claw, (*Senegalia greggii*).

Other waterways 563082/3719724,

After exploring the canyon, we back tracked to the trail and continued up the slope. Along the way we saw several dry drainages, we surveyed one of them to show some sort of representation for the area. The primary vegetation in these areas was brittlebush, (*Encelia farinosa*) and chuparosa, (*Justicia californica*).

Ox Bow at Devil's Canyon 564213/3718655, 564222/3718596)

We reached the top of the divide and were now heading down towards Devils Canyon. From here you can see the Salton Sea. The Boo Hoff Trail intersected one of the Devil's Canyon oxbows; we conducted two surveys at this junction, as the area was very lush and we thought there might have been some springs. The section of the canyon did not have any water. Vegetation consisted of *Brandegea bigelovii,* rock daisy, (*Perityle emoryi*), brittlebush (*Encelia farinosa*), desert lavender, (*Hyptis emoryi*) and cat claw, (*Senegalia greggii*). The only sign of wildlife was an old bighorn sheep bone.

Sub-Region: Bear Creek Canyon
Date: 12/27/13
Distance: 4.5 miles 7.2km
Second trip distance: 5.5 miles; 8.8 km
Starting Point: NAD 83; 563278/3723467
Crew: Geoffrey McGinnis and Matt Shaw

Canyon Junction 552730/3728060

Cameron Barrows told me about a side canyon that intersected with Bear Creek Canyon from the south that had some springs in it. We headed south towards Bear Creek Canyon from the La Quinta Cove. We hiked up the wash about 1 mile. As the wash turned into canyon there was an intersection from the west; this was Bear Creek Canyon. We walked the main body of the canyon for approximately a third of a mile and found the junction of the two canyons. There were some large pool areas in the sand between the two canyons but no water.

Bear Creek Side Canyon Springs 562382/3720566, 562475/3719844

We travelled up the side canyon and over several large boulders and medium sized waterfalls that came to a large sandy area. At the far end of the sandy area there was a boulder that span the distance across the two canyon walls. Below the boulder there was a spring that was approximately 2.5m long, 1m wide and 50cm deep. The water was clear and the area surround it showed sign of heavy usage by bighorn sheep. There was very little vegetation here cat claw (*Senegalia greggii*) was the only species within the survey area. Update: on 6/2/14 the spring still had water in that measured 1m by 1m by 30cm deep. Just up canyon from the last was another pool measuring 15cm by 30cm by 7cm deep. The pool had some red spotted toads. There was very little vegetation around the spring because we were in bedrock. We continued up the canyon until we reached a large sheer waterfall, it was at least 10m high.

Bear Creek Side Canyon Spring

Sub-Region: Bear Creek Canyon
Date: 1/8/14
Distance: 5.5 miles; 8.8 km
Starting Point: NAD 83; 563278/3723467
Crew: Geoffrey McGinnis, Valerie Garza, Bjarni Serup, Ada Nuckles and Gordon Fidler

Large Waterfall 562462/3720309

The second trip to the area started out the same, when we reached the large waterfall where we had stopped before, we went up and over a saddle on the hillside and continued up the canyon. Cameron Barrows had also mentioned that there was an oasis further up that we were looking for. There were signs that there may have been one, we found dead palm trunks and old pieces of palm fronds.

Upper Waterfall 562488/3719824

We continued up the canyon and came to another large waterfall, larger than the last. Below it there was a flat sandy area and a small pool of water approximately 30cm in diameter by

5cm in depth. The pool was surrounded by small red spotted toads (25). The waterfall had less than 1% vegetation and the area outside of the survey had species like brittlebush, (*Encelia farinosa*) and creosote, (*Larrea tridentata*).

Boyd Deep Canyon Desert Research Center

Surveys: Deep Canyon Side Canyons, Deep Canyon Lower Section, Deep Canyon Upper Section, Hidden Palms and The Living Desert/ Eisenhower Mountain

Sub-Region: Coyote Creek
Date: 2/5/14
Distance: 5miles; 8 km
Starting Point: NAD 83; 557849/3723307
Crew: Geoffrey McGinnis, Mark Fisher, Larry Heronema and Ada Nuckles

Coyote Creek 559174/3723143

After gaining access into the Boyd Deep Canyon Research Center, we met with Mark Fisher at his office. From there he guided us to Coyote Creek, () to the first five of our survey sites and then further to the edge of the Deep Canyon property line. There was no water on this side of the divide. Mark had said that the pools along the creek were all ephemeral. We surveyed five different ephemeral pools on the west side of the divide. The vegetation in these places were all less that 7% and contained small amounts of desert species that included: creosote bush, (*Larrea tridentata*), desert lavender, (*Hyptis emoryi*), brittle bush, (*Encelia farinosa*), cat claw, (*Senegalia greggii*), pygmy cedar, (*Peucepephyllum schottii*), chuparosa, (*Justicia californica*) agave, (*Agave deserti*), sweet bush, (*Bebbia juncea*), indigo bush, (*Psorothamnus schottii*), ocotillo, (*Fouquieria splendens*) and several different types of cacti species. Some coyote and bighorn sheep tracks and scat were seen along the way. Coyote Creek has two sides, one side flows into Deep Canyon's alluvial fan and the other flows into the area known as the La Quinta cove. There is a saddle that separates the two sides of the creek. Along this divide there are a series of Cahuilla trail makers that are made up of large piles of rocks. Some are nearly 3 m in diameter and 1 meter high. I asked Harry Quinn later what he thought they were, he speculated that when the Cahuilla would pass through an area, they would add another rock to the pile for good luck.

Coyote creek 6 561517/3721616

On the La Quinta side of the creek we found a series of dry waterfalls carved out of the bedrock, in an area that was shaded from the sun, at the bottom of the fall, there was some wet sand. The survey site had less than 1% vegetation. The vegetation outside of the survey site was consistent with the previous list from above. This section of the canyon had sign of bighorn sheep (scat). Further down the creek, there were some salt cedar bushes scattered within the canyon.

Sub-Region: Deep Canyon, Olla Canyon and Quail Canyon
Date: 2/6/14
Distance: 4 miles; 6.4 km
Starting Point: NAD 83; 557745/3723327
Crew: Geoffrey McGinnis, Mark Fisher and Ada Nuckles

Guzzler 557745/3723327

Once again we met with Mark Fisher at the Boyd Deep Canyon Research Center, he showed us an artificial guzzler near the research center that was piped in from the water main and controlled by a float valve. The cement basin was 2m long, 1m wide and around 30cm deep. It was surrounded by desert lavender, (*Hyptis emoryi*), cholla, (*Cylandropuntia bigelovii*), brittlebush, (*Encelia farinosa*) and indigo, (*Psorothamnus schottii*). The only signs of wildlife were some coyote tracks.

Olla Canyon 557424/3724551

Olla Canyon is on the west side of the Deep Canyon's alluvial fan in which it flows into. The rocky outcrop is a series of small waterfalls at the bottom of a small canyon. It was an unassuming place that has several small pools that had water within them. Below the rocks there are Cahuilla pot shards spread around, thus giving the place its name. The largest pool was murky, it was nearly 2m in diameter and had an unknown depth. The surrounding area's vegetation contained: palo verde, (*Parkinsonia florida*), creosote bush, (*Larrea tridentata*), desert lavender, (*Hyptis emoryi*), cat claw, (*Senegalia greggii*) and indigo, (*Psorothamnus schottii*). There were multiple signs of bighorn sheep (tracks and scat).

Quail Canyon 559981/3724916

Quail Canyon is on the opposite side of Deep Canyon's alluvial fan and a few hundred meters further to the north from the last. The walk starts at the Deep Canyon Camping area, up the canyon for approximately 1 km. The small set of waterfalls have several small rock pools. These pools were dry when we visited them; Mark told us that they were ephemeral. The vegetation included: creosote bush, (*Larrea tridentata*), desert lavender, (*Hyptis emoryi*), brittlebush, (*Encelia farinosa*), cat claw and (*Senegalia* greggii). The only sign of wildlife here was some bighorn sheep scat.

Sub-Region: Bee Seep Oasis
Date: 2/26/14
Distance: 2 miles; 3.2km
Starting Point: NAD 83; 557849/3723307
Crew: Geoffrey McGinnis and Mark Fisher

Bee Seep Oasis 556621/3723307

Starting from the research center office we headed northwest to the small canyon that flows towards the alluvial fan of Deep Canyon. Around a mile up the canyon is a small oasis that that is completely dry. Mark fisher said that the only time that he saw it flowing with water was during the El Niño of 1993. Within the survey zone there was California fan palm (*Wahsingtonia filifera*), desert lavender, (*Hyptis emoryi*), creosote, (*Larrea tridentata*) and honey mesquite, (*Prosopis glandulosa*). Signs of wildlife included: bighorn sheep, (scat) and coyote, (tracks).

Sub-Region: Pipistrelle Canyon
Date: 3/5/14
Distance: 4 miles; 6.43km

Starting Point: NAD 83; 557849/3723307
Crew: Geoffrey McGinnis, Mark Fisher, Larry Heronema and Gordon Fidler

Pipistrelle Canyon is a smaller canyon that intersects the lower portion of Deep Canyon on the side of Sheep Mountain; we started our hike from the Deep Canyon Research Center heading south. Mark Fisher told us that the canyon was dry unless there was rain. The canyon was typical; wide at the bottom, rocky and then narrowing the further up we went with larger boulders.

Pipistrelle Canyon pool 556621/3723309

We hiked for about half a mile, came to a turn in the canyon where much of the bedrock was exposed and found one singular pool of water that measured 150cm by 75cm by 10cm deep. The source of the water was a resent rainstorm that had passed through the canyon. Vegetation here consisted of: chuparosa, (*Justicia californica*), desert lavender, (*Hyptis emoryi*) and cat claw, (*Senegalia greggii*). There was also a small amount of fountain grass, Pennisetum setaceum). Signs of wildlife included bighorn sheep scat and tracks.

Pipistrelle Canyon Falls 557094/3721633

We continued up the canyon and eventually came to a set of dry falls. Vegetation here was less than 3% with equal distribution of the following species: desert arrow leaf, (*Plurocoronis pluriseta*) sweet bush, (*Bebbia juncea*), cat claw, (*Senegalia greggii*), brittlebush, (*Encelia farinosa*), *ephedra sp*., barrel cactus, (*Ferocactus cylindraceus*), agave (*Agave deserti*) and cholla, (*Cylandropuntia bigelovii*). Wildlife signs include bighorn sheep tracks and scat.

Sub-Region: Deep Canyon lower section
Date: 2/7/14
Distance: 5 miles; 8km
Starting Point: NAD 83; 557849/3723307
Crew: Geoffrey McGinnis, George Raymond, Larry Heronema and Gordon Fidler

We started again at the Boyd Deep Canyon Research Center. The rest of the crew who participate in the Weed Warrior Program, had been in the canyon the week before to help remove fountain grass, and knew that there as water 2km up the canyon. This first section of the canyon started out as a wide sandy wash but the further into the canyon we went, the narrower it became and the floor of the canyon became lined with large stones and boulders. There were some large dry pool areas that had thick layers of dried algae in them.

First Pool 556398/3721675

Eventually the canyon came an area that was much narrower. This is the furthest point that any of us had gone before. The passage was around 3 meters wide. There was a pool of water at the bottom of the narrow canyon opening that spanned across the passage and was around 1m deep. The choice was to either wade through the water or climb across the walls. They walls steep but capable of being crossed using only fingers and toes to hold on. I went first using the side and once across I had to express my opinions about the importance of continuing up the canyon. With some hesitation, Gordon also used the walls to get across the pool, George opted to stay behind and wait for us to come back and Larry decided to strip down to nothing and waded across the

pool. We all got a pretty good laugh out of that. Once across we conducted the survey. The pool of water wad supplied from above by a small stream of water. The pool had a surveillance camera above it to monitor animal usage. We asked Mark about it later and he said that it was in disrepair. There wasn't very much vegetation here but of the total 10%, 2% was fountain grass, (*Pennisetum setaceum*). The other plants included a small stand of cattail, (*Typha latifolia*) and some cat claw, (*Senegalia greggii*). Signs of wildlife included California tree frogs and bighorn sheep scat.
There was water flowing most of the way up the canyon, in some places the water would sink back underground then way exposed again in areas of bedrock. There were also many pools of water along the way.

Water Tower 556000/3721199

The next survey site was in an area that was wider than the last and here there was a tower that is used for measuring the depth of water during times of heavy flow. Around the tower there were several pools of water that were over 3m in diameter and water flowing between them. Vegetation here was mostly fountain grass, (*Pennisetum setaceum*) 25% of 35%. There was also some salt cedar, (*Tamarix ramosissima*). The Weed Warriors took note and will be back next season. Signs of wildlife included many bighorn sheep tracks and scat. We continued further passed the water tower, we came to a turn in the canyon and beyond it were more waterfalls that comprised cut pools in the bedrock and several large boulders. Eventually the canyon opened up to an area that was like a wash, there were boulders and smaller stones that lined the canyon's bottom.

Large Pool 556401/3721669

Continuing even further and after crossing some other very large boulders we came to another series of pools and waterfalls. The largest of which was at least 6m across and nearly 2m deep. The pool was clear. It and the other smaller pools below had two types of water boatmen species and California tree frogs in them. The vegetation was comprised of fountain grass, (*Pennisetum setaceum*) 15% of 30%, salt cedar, (*Tamarix ramosissima*), cottonwood, (*Populus fremontii*), California fan palm, (*Washingtonia filifera*), desert lavender, (*Hyptis emoryi*) and cat claw, (*Senegalia greggii*). Wildlife sign here were bighorn sheep scat and tracks.

The entire lower section of the canyon was spectacular and obviously an extremely important part of bighorn sheep habitat. Mark Fisher told us that even if the canyon water stops flowing, there is always water in many of the pools. We decided to turn back; we knew that there were impassable waterfalls around the next bend and that the day was getting late.

Larry Heronema and Gordon Fidler

Sub-Region: Deep Canyon upper section
Date: 2/12/14
Distance: 2.5; 4km
Starting Point: NAD 83; 553984/3718891
Crew: Geoffrey McGinnis and Bjarni Serup

The majority of the water in Deep canyon flows in from Horsethief Creek. It is part of the northern side of the Santa Rosa Mountain water shed.
Across Highway 74 from Carrizo Road there is a small, gravel area where we parked. We had been told about a trail that lead partially down into the upper portions Deep Canyon. We took the trail until it disappeared and then zigzagged through a cholla field down the canyon side.

Survey 1 554779/3718452

Once we reached the bottom we started our first survey, we were approximately a mile away from the Horsethief Creek and Deep Canyon junction. Here the water flowed well and continuous in either direction for as far as we could see. The creek varied as it flowed, creating small pools and little rapids along the way. The vegetation here was comprised of: fountain grass, (*Pennisetum setaceum*), *Baccharis serigloides*, desert apricot, (*Prunus fremontii*), honey mesquite, (*Prosopis glandulosa*), creosote, (*Larrea tridentata*), various cacti species and salt cedar, (*Tamarix ramosissima*). The only signs of wildlife that we saw were either bighorn sheep or deer tracks. We continued downstream for over a mile and found the same type of vegetation coverage. We saw fresh mountain lion tracks following the creek bed.

Survey 2 555472/3719603

Eventually the canyon started to narrow where we came to small waterfall and a 2m by 4m pool of water below it. The fall was impassible without getting wet, from here we decided to climb up the sidewall of the canyon to get a better perspective. Once we reached the top of the sidewall we could see a large waterfall with a deep pool further down the canyon. We knew that we were done with our hike in the canyon and preceded to conduct our final survey at the site. There was little vegetation that included: salt cedar, (*Tamarix ramosissima*) 3% out of 4% total and willow, (*Salix sp*.). Wildlife signs were bighorn sheep tracks and scat. After conducting our survey we found a bighorn sheep trail that lead us back to the top of the canyon rim. We hike for about 15 minutes and stopped for a moment to catch our breath when Bjarni spotted four bighorn ewes and a newborn lamb.


Ewe and Lamb

Sub-Region: Hidden Palms Ecological Preserve
Date: 5/7/14
Distance: N/A
Starting Point: NAD 83; 555407/3720619
Crew: Geoffrey McGinnis and George Raymond

Hidden Palms Ecological Preserve 555407/3720619

We parked at the turnout on Highway 74 near the oases. We walked a short way to the rim of Deep Canyon. From here we could see three small canyons that converged into one and then flowed into Deep Canyon. The sides of the canyons were very steep so we surveyed the canyon (furthest north) from above. There has been some debate as to which of the three canyon oases is the actual Hidden Palms. At the top, we were over 100m from the oasis. Below, the vegetation was primarily CALIFORNIA fan palm, (*Washingtonia filifera*) and some *Baccharis serigloides*. The outside area of the site was surrounded by cholla, (*Cylandropuntia bigelovii*), and brittlebush, (*Encelia farinosa*). The other small canyons had the same types of vegetation with the exception of one having some willow, (*Salix sp*.) and cottonwood, (*Populus fremontii*). We could not see any flowing water from our vantage point; there is a possibility that there may have been some moisture below the vegetation. On our way back to the car we encountered 3 bighorn sheep ewes and a lamb.

Sub-Region: Eisenhower Mountain/Living Desert
Date: 2/14/14
Distance: 5 miles; 8km
Starting Point: NAD 83; 557909/3729132
Crew: Geoffrey McGinnis, George Raymond and Gordon Fidler

George Raymond told me that we should go to the Living Desert Zoo because there was a canyon on their hiking trail that had a large pool of water in it. Gordon Fidler had some free passes, so the three of us went. The loop trail is 5 miles long and the pool of water is about a mile up the portion of the trail that traverses through the canyon.

Living Desert Pool 560054/3728266

We reached the pool and conducted our survey to find that pool was nearly 10m at its widest point by 8m at the narrower end. The depth was unknown to us as the water was a murky. The only vegetation here were rock daisies, (*Perityle emoryi*) around the edge of the pool.
Signs of wildlife were comprised of coyote and bobcat tracks.
After the survey we finished the loop trail and left.


George Raymond

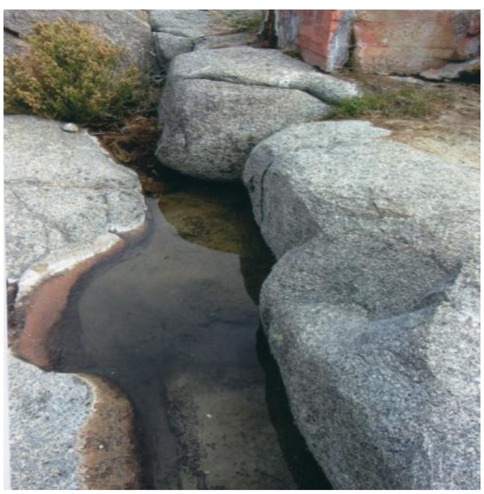
Grapevine Canyon

Sub-Region: Grapevine Canyon, Royal Carrizo Guzzler and the Adams Oasis
Date: 11/18/2013 and 12/7/13
Distance: 2 miles; 3.7 km
Starting Point: NAD 83; 553454/3723731
Crew: Geoffrey McGinnis and KD Fleming.

We accessed the area from highway 74 and Royal Carrizo Road, headed down through the neighborhood to the north and followed the dirt road back to the west and parked within 200 meters from our first survey site.

Grapevine Canyon 553454/3723731

A cement guzzler sits at the top of a series of mid-sized falls. The guzzler's source is a solar powered pump/well that is approximately 1km up the canyon. The guzzler's estimated depth is sloped to 30cm at one end by 50cm wide and 100cm long. The water overflows from the guzzler into a series of naturally occurring rock and sandy bottom pools of various sizes. The largest of these pools measured nearly 2m in diameter and was around 20cm deep. The guzzler and pools are well maintained and are free from a large amount of debris and algae. This water source shows a significant amount of wildlife sign such as: multiple bighorn sheep (scat and tracks), deer (tracks and scat), coyote (tracks) and bobcat (tracks). This water source is in an area surrounded by brittlebush (*Encelia farinosa)*, agave (*Agave deserti*), *Baccharis serigloides* and some Cattail (*Typha latifolia*). Duncan Harkleroad recalled water here as early as the 1980's when the well, pump and guzzler were installed by the California Dept. of Fish and Game, under the supervision of Vern Bleich.



The picture above is the cement guzzler that overflows into several pools below. The following picture was captured using a camera trap at one of the lower pools that Duncan Harkleroad developed.

Courtesy of Duncan Harkleroad

Grapevine Canyon Oasis/ solar powered pump location 553395/3723133

There is no sign of surface water here, however it was important to document the well that supplies the artificial guzzler further down canyon. The solar panel and pump station seem to be in a good condition, access to the pump itself was not possible because the cinder block house that it is kept in is locked. The oasis and surrounding areas have a high percentage of vegetation cover including arrow weed, (*Pluchea sericea*), Calif. fan palm, *(Washingtonia filifera*) and honey mesquite, (*Prosopis glandulosa*). This section of the canyon has 100% vegetation 15% of that is (*Tamarix ramosissima*). The section of canyon between the well and guzzler also contains some fountain grass, (*Pennisetum setaceum*). There were no visible animal signs. According to Bud Wellman, Mike Dunn, creator of Dunn Road, was the person who paid for the original well to be drilled.

Adams Oasis (553227/3722688)

This is the name that several people have given to this place. The Adams family home is the nearest landmark to the oasis. The oasis is part of the Grapevine Canyon, it consists of several large boulders that form a series of small cascading waterfalls. Among the boulders is a stand of fan palms, (Washingtonia filifera) and *Baccharis serigloides*. Cameron Barrows told me that Sue Adams reported flowing water most of the year during the 1970's, but none since then. During my survey, the only water I found were some seeps coming from the cracks between the rock face and some wet sand. It was obvious that someone had recently come to this area and cut/removed some salt cedar trees, (*Tamarix ramosissima*) from this section of the canyon. There were no signs of wildlife.

Royal Carrizo Guzzler 554637/3722419

The Royal Carrizo Community donates water that supplies to two plastic tanks, the tanks then supply a metal guzzler overlooking Carrizo canyon. This guzzler was installed around the same time as the last entries (early 1980's) (Duncan Harkleroad, pers. comm.). The tanks were only half full when we surveyed this site. They are supplied from a 1/2" pipe that runs approximately 2km to the community's water main and meter. After the tanks, water flows through another pipe approximately 300m to finally connect to a galvanized steel guzzler. The guzzler is in good, clean order and holds approximately 3 gallons. Another line that branches from the original has been isolated with a ball valve. This pipe runs further down into the canyon and formerly supplied to another guzzler. This guzzler is no longer in use because a spring has been developed in its place (next entry). The vegetation percentage here was low, they included: brittlebush, (*Encelia farinosa*) agave, (*Agave deserti*) and a few different species of cacti. There were some signs of bighorn sheep (tracks and scat). This was never historically a spring or wetland prior to the construction of the guzzler

Carrizo Canyon

Surveys: Upper, Lower, Mid Sections of Carrizo Canyon and Dos Palmas
Sub-Region: Upper Carrizo Canyon
Date: 12/7/13
Distance: 2 miles; 3.2 km
Starting Point: NAD 83; 554552/3720396
Crew: Geoffrey McGinnis

Duncan Harkleroad and Harry Quinn reported to me that the upper portions of Carrizo canyon, near the Royal Carrizo Road had some ephemeral pools and sometimes running water. When I explored the area just north of Royal Carrizo road the only water that I found was some wet sand below a small, seeping waterfall (554104/3721629). It was obvious that there had been a significant amount of water that had passed over the fall in past years, as there was a large buildup of mineral deposits on its face. The vegetation here was low, a small dead stand of cattail, (*Typha latifolia*), *Baccharis serigloides*, and salt cedar, (*Tamarix ramosissima*). The only animal signs in the canyon were some coyote tracks and scat.

Sub-Region: Carrizo Canyon mid section
Date: 11/18/2013 and 12/7/13
Distance: 2 miles; 3.7 km
Starting Point: NAD 83; 554900/3723032
Crew: Geoffrey McGinnis and KD Fleming.

Carrizo Canyon mid-section, ephemeral pool 554820/3722419

We entered the canyon from a turn out on Highway 74. There are 2 springs in this section of the canyon that are approximately 1km apart, the lower (developed in 2007 by Duncan Harkleroad) stays full for most of the year. During our survey it was wet but no surface water was found. Vegetation includes *Baccharis serigloides*, willow (*Salix sp.*), fountain grass, (*Pennisetum setaceum*) 10% out of 20%.

Carrizo Canyon mid-section, spring 554695/3722440

The upper spring stays full year round and is well maintained. This spring was originally developed in the 1960's by Bonner Blong, who was a biologist for the CDFG. The original spring was filled with sand during a flood event and was later redeveloped by Duncan Harkleroad during the 1990's. The spring was re-exposed 10 meters down-stream, next to a large overhanging boulder to protect it during storms and to provide some shade for wildlife. A small cement dam was installed to help retain larger amounts of water (Duncan Harkleroad, pers. Comm.). The spring is nearly 150 cm in diameter and the deepest point in the pool is about 20 cm. Vegetation here includes: brittlebush, (*Encelia farinosa)*, agave (*Agave deserti*), *Baccharis serigloides* and some Cattail, (*Typha latifolia*) honey mesquite, (*Prosopis glandulosa*), willow, (*Salix sp*.) and California fan palm, (*Washingtonia filifera*). Animal sign included: multiple adult bighorn sheep (tracks and scat), human (tracks), dog/coyote (tracks).

Courtesy of Duncan Harkleroad

Sub-Region: Lower Carrizo Canyon
Date: 11/29/13
Distance: 3miles; 4.8km
Starting Point: NAD 83; 554876/3725486
Crew: Geoffrey and Brandon McGinnis

From the Art Smith parking lot we headed up the wash and came to the place that, Carrizo and Indian Canyons merge. Up Carrizo (the west fork) a short distance we came to the first of several waterfalls in the canyon. The first waterfall had a small pool below it. The pool was 50cm. long, by 20cm. wide, and 5cm. deep. The vegetation was low, primarily cat claw, (*Senegalia greggii*) and desert lavender, (*Hyptis emoryi*). Above the first waterfall the canyon narrowed for a short distance, the ground along this path was wet from seeps coming out of the rocks in the canyon floor. There were some salt cedar, (*Tamarix ramosissima*) 2% out of 10% and fountain grass, (*Pennisetum setaceum*) 2% out of 10%, in this section of the canyon. Other vegetation included: willow, (*Salix sp*.), California fan palm, (*Washingtonia filifera*), and western cottonwood, (*Populus fremontii*).

The Second waterfall that we came to was a huge boulder that completely blocked the canyon. We had to back track for a short distance and then followed a bighorn sheep trail along the canyon wall to get to the other side. After passing the fall, the canyon became a boulder field with many smaller waterfalls along the way. Eventually we came to a tall waterfall that was greater than 70 meters high with several small shelves going up its face. Within the shelves are several small rock pools that hold ephemeral water. The rocky face has no vegetation. According to Duncan Harkleroad, he can recall seeing running water in this section of the canyon in 1983 and 1984 but not since then. Above the falls the canyon flattens out and becomes a sandy wash for some time until you get to another set of smaller falls that are just below the ephemeral pool listed above. The canyon has multiple signs of bighorn sheep throughout (tracks and scat). Indian Canyon ends as it merges into the lower portions of Carrizo Canyon. Exploration of this canyon was limited, no water was found in its lower waterfalls (555113/3724399). The primary vegetation at the survey site was cat claw, (*Senegalia greggii*) and creosote, (*Larrea tridentata*). The only sign of wildlife was an old bighorn sheep bone.

Sub-Region: Dos Palmas, Carrizo canyon
Date: 4/10/14
Distance: .25 miles; .4km
Starting Point: NAD 83; 553221/3720081
Crew: Geoffrey and Ada Nuckles

Access to Dos Palmas is near Carrizo road. The oasis is part of Carrizo Canyon that used to flow with water year round. Harry Quinn told me that he and his family used to go there when he was a kid (1950's) to celebrate Independence Day. They would swim in the pools below the waterfall and picnic above the palms underneath a large pinyon tree. He also told me that his Grandfather would hunt for rattlesnakes there. Harry had no recollection of when the creek stopped flowing.

Dos Palmas Oasis 553146/37200022

There were more than two palm trees at the survey site in the middle of the sandy wash. The only water found here was some wet sand near the palm trees. Primary vegetation consisted of: California fan palm (*Washingtonia filifera*), *Baccharis serigloides*, willow, (*Salix sp*.), pinyon pine, (Pinus monophylla), sugar bush, (*Rhus ovata*) and false indigo, (*Amorpha californica*).

Dos Palmas Waterfall 553221/3720081

Further down canyon below a small set of falls, we searched for water and found none. Vegetation here primarily consisted of: *Juncus sp*., *Baccharis serigloides*, sugar bush, (*Rhus ovata*), desert willow, (*Chilopsis linearis*) and honey mesquite, (*Prosopis glandulosa*). The only sign of wildlife were some old jackrabbit bones.

Art Smith Trail

Surveys: Dead Indian Canyon, Ebbens Creek and Cat Creek

Sub-Region: Dead Indian Canyon oasis
Date: 12/18/13
Distance: 3 miles; 4.8 km
Starting Point: NAD 83; 554865/3725497
Crew: Geoffrey McGinnis, Valerie Garza, Missy Hewitt and Matt Shaw

Although Dead Indian Canyon oasis is only about two km from the trailhead it took two attempts to make it there. The first trip I was alone and came upon a herd of bighorn sheep at the old Art Smith trailhead. There were twelve sheep browsing on cat claw and other vegetation on the hillside. The herd consisted of three large rams, ewes and juveniles.

Dead Indian Oasis 553400/3725629

The next day I came back with my crew hoping to encounter the sheep again, we had no luck. We made it to the oasis and found one small seep and wet sand. Vegetation consisted of: California fan palm, (*Washingtonia filifera*), honey mesquite, (*Prosopis glandulosa*), and chuparosa (*Justicia californica*). Of the 40% vegetation cover, 13% was fountain grass, (*Pennisetum setaceum*). Throughout the trip up the canyon we found many signs of bighorn sheep (tracks and scat).

Sub-Region: Art Smith Trail/Oases and Portions of Cat Creek
Date: 12/23/13
Distance: 10 miles; 16 km
Starting Point: NAD 83; 554740/3725884
Crew: Geoffrey McGinnis, Matt Shaw, Larry Heronema, Gordon Fidler. Gary Ward, Colin Barrows and Bill Malak

The trip started at the Art Smith trailhead, our plan was to survey along the way and at Cat Creek.

Dry oases 552712/3726372

We went up the trail about 2 miles when we came to the first of 3 dry palm oases, the trees in these spots looked as if they were struggling and some were already dead.

3 Oases 551793/3727850, 551890/3727890, 552432/3728086

We continued up the trail to what we thought was Cat Creek Canyon. We later realized that Cat Creek was further down the trail and that this canyon actually flowed into Cat Creek below us down the mountainside. We could see an oasis down canyon a few hundred meters below the Art Smith Trail. When we got there we looked around and found that there was no water but the grove seemed to be healthy looking. We went further down the canyon to another oasis, the trees here also appeared to be healthy and once again there was no water. The canyon descended rapidly towards Palm Desert and after crossing through a long series of dry cascading waterfalls we came to another oasis that was at the junction of the canyon we were traveling through and the main canyon of Cat Creek. The oasis looked very green and healthy like the others. The vegetation at the three oases were similar: California fan palm, (*Washingtonia filifera*), cat claw, (*Senegalia greggii*) *Baccharis serigloides* and honey mesquite, (*Prosopis glandulosa*) Along the way there were many salt cedar, (*Tamarix ramosissima*) and fountain grass, (*Pennisetum setaceum*).

Cat Creek Seep 552731/3728059

The only water found that day was further down the canyon at the base of a waterfall; there was a small seep and some wet sand. This spot had less than 1% vegetation: rock daisy (*Perityle emoryi*). There were multiple signs (tracks and scat) of bighorn sheep throughout the day.

Sub-Region: Cat Creek
Date: 4/5/14
Distance: 10 miles; 16 km
Starting Point: NAD 83; 554740/3725884
Crew: Geoffrey McGinnis, Gordon Fidler, Bill Baker, Sean Gitmed and Brandon McGinnis

Cat Creek Oasis 550796/3729229, 550661/3729220

Our second attempt to reach Cat Creek was more successful. We started at the Art Smith trailhead and hiked directly to Cat Creek five miles up the trail. From the trail we could see a string of oases that led down the mountain towards the first expedition sites. The trail intersected the canyon and when we got there it did not take long to find water. The first pool measured nearly 75cm by 50cm and was 30cm deep. Just beyond the first pool there was a second that measured 30cm in diameter by 20cm deep. Both of the pools were below a large oasis and were surrounded by thick vegetation that consisted of: an unidentified grass sp., California fan palm, (*Washingtonia filifera*), *Baccharis serigloides*, brittlebush, (*Encelia farinosa*), agave, (*Agave deserti*) and honey mesquite, (*Prosopis glandulosa*). Of the 40% vegetation cover, 15% was fountain grass, (*Pennisetum setaceum*). Along the trail the only signs of wildlife were some bighorn sheep scat and two chuckwallas.

Sub-Region: Dead Indian Canyon to Ebbens Creek and back to Art Smith Trail.
Date: 4/11/14
Distance: 12 miles; 19.3 km
Starting Point: NAD 83; 554740/3725884
Crew: Geoffrey McGinnis, Matt Shaw, and Gordon Fidler

The goal for the day was to cover the area that span between Asbestos Mountain and Haystack Mountain. We would go up through the Dead Indian Canyon to an area that had several palm groves, then across through the basin to Ebbens Creek/Canyon and continue on to the Art Smith trail to exit the area. We started at the Art Smith trailhead and went up to the Dead Indian Canyon oasis. The oasis marks the point where all of the drainages from above come together. The main two creeks are Dead Indian and Ebbens Creek. We went up the Dead Indian side because the Ebbens creek side was impassible from here.

First Survey 553658/3725034

The canyon going up slope was steep and was full of large boulder that had to be either climbed over or around. The first of the surveys was conducted at a small sandy area below a small set of falls. The place was dry and had little plant life.
Vegetation consisted of primarily fountain grass, (*Pennisetum setaceum*), 3% of 5%, and chuparosa, (*Justicia californica*). There was bighorn sheep scat within the survey area.

Second Survey 553201/3725219

We continued up the canyon and conducted another survey. Vegetation was consisted of: fountain grass (*Pennisetum setaceum*) 5% of the total 10%, and salt cedar, (*Tamarix ramosissima*) 2% of the total 10%, there was also some chuparosa, (*Justicia californica*).

Third Survey/Small Pool 552435/3725364

Further up the canyon we finally found some water, it was a small pool that was leftover from the last rain. It was around 20cm in diameter and 10cm deep. Vegetation here was primarily, fountain grass (*Pennisetum setaceum*) 5% of 10% salt cedar, (*Tamarix ramosissima*) 2% of 10% and small amount of cat claw, (*Senegalia greggii*). Near the water hole we found some mountain lion signs (tracks and scat) and bighorn sheep sign (tracks and scat).

Fourth Survey 552137/3725125

The canyon opened up to an area that was full of thick vegetation, the primary types consisted of: salt cedar, (*Tamarix ramosissima*) 30% of 65%, California fan palm, (*Washingtonia filifera*), *Baccharis serigloides*, chuparosa, (*Justicia californica*) and desert lavender, (*Hyptis emoryi*). There was no water in or around the survey area. Signs of wildlife included: Mountain lion (tracks) and bighorn sheep (tracks and scat).

Matty Shaw and Gordon Fidler

Palm Groves 551745/3724853

We kept going and finally made it to the point where the canyon turned into wash. There were several palm groves scatter further in the basin that had patches of mesquite and arrow weed. The first site we surveyed was thick with vegetation that consisted mostly of arrow weed, (*Pluchea sericea*), followed by California fan palm, (*Washingtonia filifera*), *Baccharis serigloides*, honey mesquite, (*Prosopis glandulosa*) and fountain grass, (*Pennisetum setaceum*), 2% out of 90%. There was no water here. Wildlife sign was the same as before, mountain lion (tracks) and bighorn sheep (tracks and scat).

Small Oasis 551843/3724693

The next site we surveyed was a small oasis with only a few California fan palm, (*Washingtonia filifera*), brittlebush, (*Encelia farinosa*), and a California Juniper tree, (*Juniperus californica*). This site was dry.

Dead Indian Canyon Feeder 1 553658/3725034

We then went to an adjacent wash and surveyed from the west about 100 meters away. This other water way was also scattered with palm and other plant species. We did not see any sign of water on the grounds surface. Vegetation here consisted of; California fan palm, (*Washingtonia filifera*), salt cedar, (*Tamarix ramosissima*) and honey mesquite, (*Prosopis glandulosa*).

Highest point of Dead Indian 5515503/ 3724855

We felt that we needed move to another area but before we did we conducted one last survey at the highest point of Dead Indian Canyon for the day. This survey site was dry, the vegetation here consisted of: California fan palm, (*Washingtonia filifera*), salt cedar, (*Tamarix ramosissima*) 20% of 80%, honey mesquite, (*Prosopis glandulosa*), brittlebush, (*Encelia farinosa*), and *Baccharis serigloides*.

Ebbens Creek side canyon 551281/3725494

We had been heading south up the slope for the majority of the day and were now headed in a western direction across the basin towards Ebbens Creek. Between Dead Indian and Ebbens Creeks there was another oasis that needed to be explored for water. The site was dry again. Vegetation here consisted of: California fan palm, (*Washingtonia filifera*), salt cedar, (*Tamarix ramosissima*), 20% of 100%, brittlebush, (*Encelia farinosa*), arrow weed, (*Pluchea sericea*) and *Baccharis serigloides*. There were no signs of wildlife.

Ebbens Creek 551869/3726120

We headed down stream to a point that we could see another large oasis to the west. As we headed in that direction we crossed over a small ridgeline and were looking into a deep canyon, it was Ebbens Creek and our oasis was on the opposite side of it. We followed the edge of the canyon south for a short while to a place that we could climb across to the other side. Before crossing we conducted another survey from the top of the canyon that represented what we saw below. There was no water in the creek. The vegetation here consisted of a few California fan palm, (*Washingtonia filifera*), fountain grass, (*Pennisetum setaceum*) 2% of 10%, a few scattered salt cedar, (*Tamarix ramosissima*), brittlebush, (*Encelia farinosa*) and creosote, (*Larrea tridentata*). Above the canyon we saw signs of bighorn sheep (tracks and scat).

Burnt Oasis 551931/3726218

Finally we made it to our last survey site for the day. We were in the middle of a mature California fan palm, (*Washingtonia filifera*) oasis. The other vegetation here was only a small amount of brittlebush, (*Encelia farinosa*) and desert lavender, (*Hyptis emoryi*). The reason for the lack of vegetation was due to a recent fire. Although the trees were scorched, they seemed to be in good health. There was no sign of animal usage at this site. We continued to the west and came to the Art Smith Trail and followed it back to the trailhead.

Rancho Mirage and Cathedral City

Surveys: Magnesia Canyon, Bradley Canyon, Eagle Canyon and Cathedral Canyon

Sub-Region: Magnesia Canyon
Date: 11/21/13
Distance: 6 miles; 9.65 km
Starting Point: NAD 83; 553556/3733633
Crew: Geoffrey McGinnis and Matt Shaw

Cement Basin 557050/3714371

Access into the canyon starts at a cement foot bridge that and continues up a path along side of a cement storm drain. At the top/beginning of the storm drain, there is a large flood basin that leads further west to the opening of the canyon. The large sand wash had an artificial cement pool near the first of several cascading waterfalls in the canyon. The cement pool measures about 1 meter in diameter and 30 centimeters in depth. There was a small amount of honey mesquite, (*Prosopis glandulosa*), and Mexican fan palm, (*Washingtonia robusta*). This section of the canyon had signs of: dogs/coyotes (tracks) and multiple bighorn sheep (tracks and scat).

Pool 2 552463/3732267

Beyond the cement pool, there was a dry waterfall/rock face that is approximately 3 meters high. Above it we came to a flat area between the lower fall and another fall up the canyon. Here we found a carcass of a bighorn sheep lamb (its head was missing) near a large pool of water below the next waterfall. The pool was approximately 3 meters in diameter. The exact depth of the pool was unknown to us as the water was too murky to see through. I would speculate that the water was around 1 meter deep. This survey point had less than 1% herbaceous vegetation.
We continued up the next fall that was nearly 10 meters high, once at the top of the fall we could see a herd of bighorn sheep (9) at the top of the canyon walls. The exact number of male and female was unclear to us. Further up the canyon we found no other significant sources of water. About half way up the canyon we came to an area of burnt palm trees where there was a small seep, possibly enough to drink from if dug out. We followed two different forks of the canyon that both ended near Dunn Road. Along the way we found evidence of several ephemeral pool that were all dry. Vegetation through the canyon consisted of salt cedar, (*Tamarix ramosissima*) and

fountain grass, (*Pennisetum setaceum*), California fan palm, *(Washingtonia filifera*) and honey mesquite, (*Prosopis glandulosa*). The canyon had multiple signs of bighorn sheep (tracks and scat).

Magnesia Mine Shaft 550940/3732403

On the way down the canyon, above the large pool of water (previously mentioned) we had not noticed that on the east side of the canyon's wall was an old mine shaft with a short cement wall to retain water. We had passed it up because we could not see it from the west side of the canyon. It was full of water and may have been what was keeping the pool below full. The excavation was approximately 2 meters in diameter. There was zero vegetation.

Near the mine, a young ewe watched us from above the canyon walls. Matty Shaw and I sat quietly and the ewe came down the canyon within 10 meters from us and we watched her for nearly 10 minutes.

Sub-Region: Bradley Canyon
Date: 11/22/13
Distance: 2 miles
Starting Point: NAD 83; 551584/3734752
Crew: Geoffrey McGinnis and Matt Shaw

Water Fountain 551584/3734752

While walking to Magnesia Canyon we met two ladies walking their dogs, they told us about a guzzler in Bradley Canyon. We asked them to show the site us so we could conduct a survey. The next day we met with them at the Thunderbird Estates, a private gated community. Meta McDowell was a homeowner in the community and part time resident from British Columbia. Once we met, they took us through another gate to the west, (outside of the community) and guided us along the fence to the end; this is where the fountain was. Meta said that the fountain was there the entire time that she owned her home that she purchased in 2004. The fountain had a catch basin below it on the ground that was around 30 centimeters in diameter and depth. The water came from a tank just below (25 meters) and was pumped up to the fountain.

The pool overflowed from the basin and sank into the surrounding soil. The water hole showed signs of bighorn sheep usage (tracks and scat). Out of 30% vegetation cover at the site, 10% of it was fountain grass, (*Pennisetum setaceum*). The other 20% was mostly arrow weed, (*Pluchea sericea*). On the outside of the fountain area there was some brittlebush, (*Encelia farinosa*) and creosote bush, (*Larrea tridentata*). Across the perimeter of the community was another guzzler that was no longer in use. An old bathtub that had holes in it and other remnants of a solar powered pump were still on site. These two sites were never wetland areas prior to the installation of the guzzlers.

Sub-Region: Eagle Canyon
Date: 12/5/13
Distance: 7miles; 11.2 km
Starting Point: NAD 83; 547865/3738786
Crew: Geoffrey McGinnis and Matt Shaw
Entrance to Eagle canyon was not easily accessible. We had to cross over a steep hill behind a shopping center in Cathedral City to avoid construction crews that were building a new flood control dam at the bottom of Eagle Canyon. After skirting around the construction site, we were in the canyon and started climbing over a series of large boulders and dry waterfalls up the canyon; the walls of the canyon were steep and high. There were a lot of make shift homeless camps that had been abandoned. It seemed as if there had been a major flood event inside the canyon and most of their belongings had been washed down the canyon.

Jane's Hoffbrau 546998/3737893

Further up the canyon we came to an oasis, there was some water coming from seeps that formed a small pool of water that was 6cm deep, 6cm long, 2 cm wide. There were large cables strung across the trees that created an area to keep horses tied to. Above the canyon we could see a steel sign that read "Jane's Hoffbrau", according to John Purcell, Jane Hoff the wife of Boo Hoff (Boo Hoff Trail), was one of the first white woman born in the Coachella Valley and a founding member of The Desert Riders, this place was named for her. Vegetation was mostly California fan palm, (*Washingtonia filifera*), fountain grass, (*Pennisetum setaceum*) 20% out of 50% and salt cedar, (Tamarix ramosissima) 10%out of 50%. There were no signs of wildlife. We continued up the canyon all the way to the end and found no other sources of water. At the end we were at the top of the Murray Hill Complex, overlooking the Indian Canyons.

Sub-Region: Cathedral side canyon and Dunn Road
Date: 4/4/14
Distance: 5 miles; 8km
Starting Point: NAD 83; 548094/3735873
Crew: Geoffrey McGinnis, Bjarni Serup, Gordon Fidler, and Matt Shaw

Cathedral Side Canyon 547198/3734496

At the top of the Cathedral City Cove there are two large canyons, one is Cathedral Canyon and the other is another that runs nearly parallel to the first. The canyon was dry all of the way up to Dunn Road. We conducted 1 survey at an oasis near the top of the canyon. Vegetation here consisted of: California fan palm, (*Washingtonia filifera*), honey mesquite, (*Prosopis glandulosa*) and cat claw, (*Senegalia greggii*).

Dunn Road Basin 546789/3735467

Near the top of the canyon we cut over to Dunn Road and took it back down the mountainside towards the starting place of our hike. Half way down there was a turn in the road that span across a small waterway. The water way had been filled in by the road, which formed a dam. The basin was dry now but had obviously held a large amount of water at some time recently. In this area there was a small stand of honey mesquite, (*Prosopis glandulosa*) and some cat claw, (*Senegalia greggii*). There were multiple signs of bighorn sheep.

Sub-Region: Cathedral side canyon and Dunn Road
Date: 4/4/14
Distance: 5 miles; 8km
Starting Point: NAD 83; 548363/3735685
Crew: Geoffrey McGinnis and Gordon Fidler

Water Tank Overflow 548371/3735517

We entered Cathedral Canyon from the wash below; we used a water district service road that led to two large water tanks. Below the road we could see a pool of water and water flowing into the wash. We went down to inspect the water, it was coming out of an underground culvert. We assumed that it must have been some type of overflow system coming from the water tanks above. The water was 20cm by 6cm by 7cm deep and continued to flow for a short distance, eventually sinking into the sand. The vegetation surround the water was green and healthy looking while the vegetation beyond was not as healthy looking. The vegetation at the survey site consisted of: cheese bush, (*Ambrosia salsola*), brittlebush, (*Encelia farinosa*), sweet bush, (*Bebbia juncea*), pygmy cedar, (*Peucepephyllum schottii*), and creosote, (*Larrea tridentata*). The only signs of wildlife were some coyote tracks.

Waterfall 548148/373461

The wash turned into a steep walled canyon until we came to a large waterfall that was at least 75m to the top. The area below the fall had a small patch of wet sand and a seep above it. There was very little vegetation here that primarily consisted of fountain grass (*Pennisetum setaceum*) 2% out of 5% and a small patch of young California fan palm, (*Washingtonia filifera*). There was some bighorn sheep scat scattered around the waterfall. Climbing up the waterfall was impossible but to the right of the waterfall was a steep channel of scree. There were some solid places among the scree so we used the slope to continue up the canyon.

Dry Seep and others 548190/3734635, 548441/3734116, 548663/3733535

Once at the top we continued on and found a place on the canyon wall that was dry but obviously a large seep. The canyon wall was covered with mineral deposits and dead algae. Below the wall was a dry pool. Vegetation here was a small amount of fountain grass, (*Pennisetum setaceum*). We continued up the canyon and conducted two more surveys to show representation of the area. We found no more water. Vegetation in the last two spots had very similar species that comprised: desert lavender, (*Hyptis emoryi*), sweet bush, (*Bebbia juncea*), creosote, (*Larrea *tridentata*), brittlebush, (*Encelia farinosa*), and cat claw, (*Senegalia greggii*). The further we went into the canyon the more signs of bighorn sheep we found (tracks and scat) of all different sizes. We eventually found one large ram at a point just beyond our last survey site. The canyon ends near Dunn Road, we used it until we reached the trail that followed the canyon back down to the bottom along the ridgeline. The trail also had many signs of bighorn sheep.

Indian Canyons

Surveys: Tahquitz, Andreas, Murray, West Fork, Palm, and Fern Canyons
Cedar Creek and Mad Woman Spring

Sub-Region: Tahquitz canyon
Date: 2/15/14
Distance: 2 miles; 3.2 km
Starting Point: NAD 83; 541400/3741178
Crew: Geoffrey McGinnis, Justin Conley and Patty Andersen

This was the first meeting with the water specialist from the Agua Caliente Band of Cahuilla Indians. Justin Conley was assigned to accompany us throughout our surveys in the Tahquitz and Indian Canyons.

Tahquitz 1 541144/3741118

We went through the canyon visitors center and headed directly to the creek that was only a few hundred meters away (). The creek was running strong. Vegetation here was comprised of: *Baccharis serigloides*, chuparosa, (*Justicia californica*), desert lavender, (*Hyptis emoryi*), felt leaf yerba santa, (*Eriodictyon crassifolium*) and other herbaceous plants. The only sign of wildlife here were some raccoon tracks.

Tahquitz Falls 540557/3740766

Once we finished with the first survey, we followed the trail up the creek to the Tahquitz Waterfall. The fall and surrounding areas were low in vegetation because of the recent fire and flash flooding that occurred after last years summer fire. The only vegetation here were California sycamore trees, (*Platanus racemosa*).

Sub-Region: Andreas Canyon
Date: 2/15/14 and 3/14/14
Distance: 2 miles; 3.2 km
Starting Point: NAD 83; 542975/3735885
Crew: Geoffrey McGinnis, Justin Conley and Patty Andersen
Andreas Canyon flows from the top of the ridgeline between Murray Canyon and Tahquitz Canyon, down into Palm Canyon. Not far from the entrance towards the east on S. Palm Canyon Road the creek crosses the road.

Andreas road crossing 542975/3735885

This is the lowest elevation survey we conducted on this waterway (). We were just above the place where the creek turned into the main stream of Palm Canyon. At the time, the creek had good flow in both directions. The vegetation here was scarce because of the fire at the top of the mountain and resent flooding that washed down an excessive amount of mud, the creek bed had been bulldozed to clear it out. Of the 3% there was some cheesebush, (*Ambrosia salsola*) and some desert willow, (*Chilopsis linearis*) at our survey site.

Andreas Oasis 541632/3735742, 541118/3736005

Further up the creek, the waterway turned into an oasis and became more canyon like. This part of the creek is a very popular tourist destination. We conducted two surveys in this section of the creek but were limited in travel because there is an adjacent property further up the stream that is private. The sign on the fence read that it is owned by the Canyon Club, a private community. Vegetation here consisted of California fan palm, (*Washingtonia filifera*), cottonwood, (*Populus fremontii*) and California sycamore, (*Platanus racemosa*), and fountain grass, (*Pennisetum setaceum*). There were no obvious signs of wildlife.

Sub-Region: Murray Canyon
Date: 2/22/14, 3/7/14 and 3/14/14
Distance: 13
Starting Point: NAD 83; 542910/3735316

Crew: Geoffrey McGinnis, Justin Conley, Ada Nuckles, Gordon Fidler, Ken Larson Matt Shaw, Brandon McGinnis and Bjarni Serup

Murray Canyon road crossing 542910/3735316

Murray Canyon flows from the top of the ridgeline between West Fork Canyon and Andreas Canyon, down into Palm Canyon. It too crosses S. Palm Canyon Road. This is the lowest elevation survey we conducted on this waterway. The creeks flow was strong here, further downstream it merges with the main stream of Palm Canyon. Vegetation here consisted of cheese bush, (*Ambrosia salsola*), desert willow, (*Chilopsis linearis*), desert lavender, (*Hyptis emoryi*) cat claw, (*Senegalia greggii*) and a small amount of fountain grass, (*Pennisetum setaceum*).

Murray Canyon Oasis 542115/3734794

The next section of the creek was further upstream where the creek turned into an oasis. At the survey site near the beginning of the oasis the vegetation consisted of California Fan Palm, (*Washingtonia filifera*), *Baccharis serigloides*, false indigo, (*Amorpha californica*), willow, (*Salix sp.*) brittlebush, (*Encelia farinosa*) and some honey mesquite, (*Prosopis glandulosa*).

Seven Sisters Waterfall 541383/3733953

The oasis was lush for the nearly two-mile trail that took us to the Seven Sisters Waterfall. Along the way there were several small waterfalls and other types of trees, cottonwood, (*Populus fremontii*) and California sycamore, (*Platanus racemosa*). We reached the waterfall; it was flowing well and was impassible. At the waterfall the only vegetation was a small amount California Fan Palm, (*Washingtonia filifera*) and fountain grass, (*Pennisetum setaceum*). The only wildlife found was a rosy boa snake.

Our final trip to Murray Canyon would take us up the Maynard Mine Trail (Starting point 541689/3735709) to reach the area above the Seven Sisters Waterfall. The trail follows the ridgeline between Andreas Canyon and Murray Canyon to the top of the summit and down the opposite side. The trail led us down towards the mine on the right side of the ridge.

Murray Canyon near Maynard Mine 539651/3733896

From this point (539568/3734273) there was a ghost trail on the left that led to the bottom of Murray Canyon. When we got there we could see that the passed summer's fire had reached this section of the canyon and that the majority of the vegetation here was gone. The survey site was in an oasis, vegetation consisted of California fan palm, (*Washingtonia filifera*), sycamore, (*Platanus racemosa*), willow, (*Salix sp*.), poison-oak, (*Toxicodendron diversilobum*) , and *Datura sp*. Further up the canyon the oasis ended and we could see water flowing as far as the eye could see. Along the trail throughout the day, we found multiple signs of bighorn sheep (tracks and scat).

Sub-Region: West Fork Canyon
Date: 2/15/14 and 3/14/14
Distance: 6 miles; 9.6km
Starting Point: NAD 83; 542734/3733191
Crew: Geoffrey McGinnis, Justin Conley, Matt Shaw and Ken Larson

West Fork Falls 542536/3733133

The first survey was taken near the Indian Canyons Trading Post. The resent flooding after the summer's fire had affected this canyon too. There was a thick layer of mud plastered to the canyon walls and boulders in the creek. The only vegetation here was a small amount of cat claw, (*Senegalia greggii*) and California fan palm, (*Washingtonia filifera*). The only sign of wildlife was some coyote scat. We were restricted from going up the canyon from here. We would have to use the West Fork trail to get to the upper regions of the canyon. We started at the Trading Post again to the west fork trail, went up the ridgeline that follows the canyon. Once we reached the top of the small mountain we could see that the valley that we were entering was affected by the resent fire. Along the way the primary plant that was on the ridgeline was brittlebush, (*Encelia farinosa*) and here in the valley there were several large patches that were burnt. We could see in another small waterway that was on the opposite side of the ridgeline from West Fork Canyon, had some water in it and that further up from the first spot was the Dos Palmas Oasis.

West Fork side canyon 541443/3731691

We went down to the first water and conducted our survey. There were 3 small pools of water in the small rocky set of cascading waterfalls. The largest was 1m in diameter and 20cm deep. The area surround the pools was burnt but there was still some vegetation here, most of which were new plants growing from the root systems of the burnt plants; these included: *Datura sp*., apricot mallow, (*Sphaeralcea ambigua*), and brittlebush, (*Encelia farinosa*). Outside of the survey area, there were several different types of wildflowers, new sugar bush, (*Rhus ovata*) plants growing from old root and new desert apricot, (*Prunus fremontii*).

Dos Palmas 541243/3731333

We continued up the small canyon to Dos Palmas Oasis, it was small with only a few palms. There was no surface water here, just a small amount of wet sand. This place was also burnt by the fire but still had some vegetation that included: *Datura sp*., apricot mallow, (*Sphaeralcea ambigua*), and brittlebush, (*Encelia farinosa*), California fan palm, (*Washingtonia filifera*), sugar bush, (*Rhus ovata*), felt leaf yerba santa, (*Eriodictyon crassifolium*) and flower that looked like golden rod.

Indian Spring 540889/3731274

This was another small oasis with a few palms. The spring came out of a small rocky outcrop and was tapped into with a PVC pipe that ran to a rusty sheet metal catch basin. The PVC pipe was burnt and had holes on it. There was only a small amount of water coming out of it for us to collect our sample from. Vegetation consisted of: California fan palm, (*Washingtonia filifera*), apricot mallow, (*Sphaeralcea ambigua*), sugar bush, (*Rhus ovata*) and scrub oak, (*Quercus cornelius-mulleri*). From here we went down to the West Fork and Jo Pond trail junction. Once there, Justin showed us a most impressive petroglyph that was on the side of a boulder.

West Fork Creek 1 and 2 540306/3731293, 540867/3731682

We went upstream for a short time, there was no vegetation at our survey site, it seemed that was the case all of the way up the canyon. The water was running strong throughout the canyon. We headed back down the canyon and found 5 California fan palms, (*Washingtonia filifera*) at the creek's edge below the canyon wall and conducted our next survey here. Other vegetation included very small amounts of: California sycamore, (*Platanus racemosa*) and sugar bush, (*Rhus ovata*). We found what we thought were skunk track on the edge of the creek.

Sub-Region: Cedar Creek and Mad Woman Springs
Date: 3/21/14
Distance: 12miles; 19.3km
Starting Point: NAD 83; 542734/3733191
Crew: Geoffrey McGinnis, Matt Shaw, Gordon Fidler and Ken Larson
Tribal Crew: Justin Conley, Daniel Lara, Roman Chavez and Rich Howe

We started at the Trading Post once again and headed up the Palm Canyon trail about 2.5 miles. Just beyond the stone pools was the turnout to the west to enter Cedar creek. This part of the Indian Canyons is off limits to the public and we had to be escorted by two guides. We passed through a large stand of honey mesquite that was between Palm and Cedar Canyons, once through, we dropped into the canyon and followed it up for a mile or so. We came to a turn in the canyon and in front of us wad a large rock dome that we would cross rather than taking the canyon bottom. The dome is known as Bullseye Rock, at the top of the dome it spans several hundred feet, in height I would guess that it is at least 200 feet high. On the face there is a large crack that runs diagonally across its face. We used the crack to get to the top of the dome, once on top of the dome we entered a large boulder field. As we zigzagged through the boulders we came across a grey fox that did not stay for pictures. Once we got through we could see the canyon again and were walking parallel with it. Eventually we came to another large pile of boulder that had several mortars carved into the stone. We crossed the creek and headed up a slope on the west side that seemed to get steeper as we went along. As we entered another boulder field, we turned to the south side-hill towards another small canyon that flowed into the main body of Cedar Creek.

Mad Woman Spring 541141/3728092

Hiding in the chaparral was Mad Woman Spring. It was a watering trough that was nearly 1m by 50cm and 50cm deep. The water in the trough was clear and full but was only trickling out of the pipe that was tapped into the spring. One of the guides was carrying a "fishtape", a tool that is normally used to pull wire through conduit. He used the tool to clean out the pipe. After doing so the spring water was flowing well for a while then slowed back down to a trickle. Vegetation surrounding the spring consisted of: *Baccharis serigloides*, felt leaf yerba santa, (*Eriodictyon crassifolium*), sugar bush, (*Rhus ovata*), redshank, (*Adenostoma sparsifolium*), chamise, (*Adenostoma fasciculatum*) and deer grass, (*Muhlenbergia rigens*). There were no signs of wildlife here. Just beyond the spring was an old stone cabin that had some old sundries and a log book that we all signed. We could see a waterfall from here that was near us back at Cedar Creek, this was the first water we could see in it. We attempted to make it to the falls but between very thick vegetation and rugged terrain we opted to go back down a similar route from which we came.

Justin Conley, Daniel Lara, Gordon Fidler, Rich Howe, Roman Chavez Matty Shaw and Ken Larson

Cedar Creek 1 541971/3727969

As we neared the creek bottom we could see a large stand of trees ahead and thought that there should be some water there. Vegetation was very thick, after some bush whacking I found a single pool of water to collect a sample from. The pool was 20cm in diameters and 2cm deep. Vegetation consisted of: cottonwood (*Populus fremontii*), sugar bush, (*Rhus ovata*), willow, (*Salix sp.*), and *Baccharis serigloides.* There were no signs of wildlife here.

Cedar Creek 2 546984/3728165

The rest of the crew was waiting downstream from the survey site.
They were waiting under a willow tree next to the creek that was flowing with water. They all laughed when I caught up with them because they knew that I had a difficult time collecting the last water sample and here they were kicking back next to the flowing creek. The water only flowed for around 50m and then went back underground. Vegetation here was comprised of: willow, (Salix sp.), *Baccharis serigloides*), sugar bush, (*Rhus ovata*), felt leaf yerba santa, (*Eriodictyon crassifolium*) and false indigo, (*Amorpha californica*).
The only wildlife signs were some deer tracks.

Bullseye Rock 542652/3728512

We headed back down the trail towards Bullseye Rock, when we got there we found a small pool of water in an area between some boulders that was inside of a crevice. After further exploration we could see the water coming out of a seep and accumulating in the pool. The pool was 20cm in diameter and 10cm deep. There was no vegetation or animal signs.

Matty Shaw

Cedar Creek 3 543219/3728904

After crossing Bullseye Rock we conducted one more survey in the creek. We found some wet sand below a small waterfall. Vegetation here included: False indigo, (*Amorpha californica*), fountain grass, (Pennisetum setaceum) 5% out of 40%, California fan palm, (*Washingtonia filifera*), *Baccharis serigloides*, brittle bush and some salt cedar, (*Tamarix ramosissima*). There were some deer tracks here. Form here we headed back to the trading post.

Sub-Region: Palm Canyon

Date: 3/21/14
Distance: 12miles; 19.3km
Starting Point: NAD 83; 542734/3733191
Crew: Geoffrey McGinnis, Justin Conley, Matt Shaw, Gordon Fidler and Missy Hewitt

We started at the Trading Post, our goal was to make it to the Palm Canyon and Portrero Trail junction. Justin and I had been in the Palm Grove a few weeks before hand to collect samples and conduct surveys of the springs near the trading post.

Trading Post and Fence Springs 542718/3733045, 542920/3732727

Trading Post Springs, are a series of three small springs that head in the general direction of the Palm Canyon Creek. The largest is around 75cm in diameter and 10cm deep. We also surveyed Fence Springs, it was about 1m in diameter and 30cm deep. Both locations primary vegetation consisted of California fan palm, (*Washingtonia filifera*) and honey mesquite, (*Prosopis glandulosa*).
Both springs had multiples coyote tracks.

Indian Hot Spring 543057/3732564

We continued down the trail and came to anther spring named Indian Hot Spring. It was about 2m long 40 cm wide and 10 cm deep. Vegetation here consisted of California fan palm, (*Washingtonia filifera*), cattail (*Typha latifolia*), and willow, (*Salix sp*.).

Clay Pool 543387/372270

As the canyon started it increase in in elevation, there is a fork that leads to a smaller side canyon to the north. At the place where the trail crossed this secondary creek, was another spring and smaller creek below it; this spring comes out of clay. This areas vegetation was mostly California fan palm, (*Washingtonia filifera*). There were no signs of wildlife. From the last survey site the trail leads up and out of the oasis over a good sized hill. The trail runs parallel with palm canyon for a few miles. We took the trail until we could see where Palm Canyon and Cedar Creek intersected. We headed south back into Palm Canyon then followed it down a short way to a large set of cascading waterfalls.

Palm Canyon above Cedar Creek Junction 543346/370993

At the top of the falls we could see several pools of water below. The largest of the pools was nearly 2m by 1m by 50cm deep, another measured 1m by 50cm by 20cm deep. The only vegetation here was fountain grass, (*Pennisetum setaceum*) and salt cedar, (*Tamarix ramosissima*); they split the 20% vegetation cover here.

Palm and Cedar Creek Junction 543179/3731016

At the bottom of the waterfall was the junction of Cedar and Palm Canyons. On the end of the Cedar Creek there were boulders, small waterfalls and a pool of water that was around 1m in diameter and 50cm deep. The area between the two canyons was a large basin that was full of water. We estimated that the body of water was 10m by 8m and had an unknown depth (maybe a meter or two). This is a loose measurement number do to the varying shapes of the pool. Vegetation surrounding the pool was in low numbers, they consisted of: California fan palm, (*Washingtonia filifera*), salt cedar, (Tamarix ramosissima), fountain grass, (Pennisetum setaceum), honey mesquite, (*Prosopis glandulosa*) and cat claw, (*Senegalia greggii*). There multiple signs of wildlife that included: bighorn sheep (tracks and scat), raccoon (tracks), bobcat (tracks) and coyote (tracks). We left the waterfalls and headed back up the canyon to Dry Creek and the junction of the original trail. Along the way we found some old potshards.

Stone Pools 543809/3729684

Once back on the trail, we headed to the stone pools. The pools were a series of holes that had been eroded in the bedrock. The largest was hole was over 2m in diameter and 1m deep. When we visited the pools they we dry. The majority of vegetation here was California fan palm, (*Washingtonia filifera*) and salt cedar, (Tamarix ramosissima). We found a chuckwalla while we were there, that was the only sign of wildlife. Update: 3/21/14 while passing through the Stone Pools on our return from Mad Woman Springs all of the pools of water were full.

Cattail and Swallows Nest pools 543876/3729413, 543968/3729199

Once we finished at the Stone Pools, rather than taking the trail, we decided to stay in the canyon and take it up as far as possible to our final destination. It wasn't long before we came the first of many tenajas. We surveyed at two of these sites. The first site we called Cattail Pool because it was full of cattail, (*Typha latifolia*), the other vegetation here was: willow, (*Salix sp.*), California fan palm, (*Washingtonia filifera*) and fountain grass, (*Pennisetum setaceum*) 2%of 37%. We found a fresh set of bobcat tracks here. The second survey site we called Swallow pool because of all of the swallow nests on the side of the canyon walls. This pool was around 6m by 8m by1m deep. The main types of vegetation here included: California fan palm, (*Washingtonia filifera*), fountain grass, (*Pennisetum setaceum*) 3% of 15%, salt cedar, (Tamarix ramosissima) 2% out of 15%, and cottonwood, (*Populous fremontii*). There was no visible sign of animal usage.

Palm Canyon Large Falls 544187/3728873

We continued further, there was a large waterfall ahead and more pools on the canyon floor as we continued. At the base of the waterfall was a large oasis that had many California fan palms, (*Washingtonia filifera*) and cottonwood trees, (*Populous fremontii*). The survey site had a pool that we estimated to be 3m by 2m by 1m deep. We found an abundance of bighorn sheep tracks and scat. We had to climb out of the canyon and over a hill to get back to the trial; the canyon above the waterfall was a large crevice that had several more pools in the bottom. We could not access to pools because the walls of the crevice were too tall and steep.

Palm and Portrero Trail Junction 543378/3728038

We finally made it to our final destination at Palm and Portrero Trail Junction. There was no more water to be seen, canyon had become a wash. Vegetation here consisted of: fountain grass, (*Pennisetum setaceum*) 2% of 15%, salt cedar, (Tamarix ramosissima) 3% out of 15%, cottonwood, (*Populous fremontii*) cat claw, (*Senegalia greggii*) and honey mesquite, (*Prosopis glandulosa*).

Dry Oasis 544535/3728911

We followed the Portrero trail back towards the Trading Post and conducted one more survey at an oasis that we found along the way inside one of the side canyons that flows into Palm Canyon. The dry oasis was small, Vegetation here consisted of: California fan palm, (*Washingtonia filifera*), fountain grass, (*Pennisetum setaceum*) 2% of 15%, cat claw, (*Senegalia greggii*) and honey mesquite, (*Prosopis glandulosa*) and creosote, (*Larrea tridentata*).
There were no signs of wildlife use.

Fern and Palm Canyon Junction 542885/3733235

We started at the parking lot near the Fern Canyon Trail. It starts at Palm Canyon Creek and heads up the small canyon. While we were there we conducted a survey at the creek. The creek was flowing well we were just below the large palm oasis that was upstream a short distance. Vegetation consisted of: California fan palm, (*Washingtonia filifera*), willow, (Salix sp.), fountain grass, (*Pennisetum setaceum*) 3% of 40% and brittlebush, (*Encelia farinosa*).

Fern Canyon Falls 543786/3733573

There was no sign of wildlife here.

We went up the Fern Canyon trail passed through a small oasis and found no water and then continued up to a waterfall that was around 4m high. There was a small seep and a small amount of wet sand. Vegetation consisted of fountain grass, (*Pennisetum setaceum*) 8% of 10% and some barrel cactus, (*Ferocactus cylindraceus*). Outside of the survey area there were salt cedar, (*Tamarix ramosissima*) scattered along the way. The only sign of wildlife was some coyote scat.

Palm Springs

Surveys: Blaisdale Canyon, Snow Creek, Chino Canyon, Oswit Canyon,
Snow Creek Surrounding Canyons and Tachevah Falls

Sub-Region: Blaisedale Canyon
Date: 1/17/14
Distance: 4 miles; 6.4 km
Starting Point: NAD 83; 535527/3749033
Crew: Geoffrey McGinnis, Gordon Fidler and Missy Hewitt

Blaisdale Canyon 574702/3706752

Blaisdale Canyon is at the top of a steep alluvial fan on the western side of Palm Springs. There are two large water district tanks on the eastern side of the alluvial fan. We took a trail that leads passed the tanks up the alluvial fan to the point where it turns into canyon. At this point the trail crosses a creek where we conducted our survey and continued up the canyon for about a kilometer until we reached a camp site. Among the trees was a cooking and sleeping area and a full set of camping supplies. It was obvious that it was no longer in use as the cooking area had several months of fallen leaves inside of it. We speculated that this camp might have been the remnants of a marijuana growing operation. We reported our findings to park managers. Along the creek bed the vegetation was primarily wild grape (*Vitus girdiana*), cottonwood, (*Populus fremontii*), white alder, (*Alnus rhombifolia*), Willow, (*Salix sp.*), felt leaf yerba santa, (Eriodictyon crassifolium) and California sycamore (*Platanus racemosa*). On the outside of the creek area were desert species that included cat claw (*Senegalia greggii*), brittlebush, (*Encelia farinosa*). There were signs (tracks and scat) of deer and or bighorn sheep along the way; it was unclear which species they were.

Sub-Region: Lower Snow Creek and Chino Canyon
Date: 1/24/14
Distance: 3 miles; 4.8km
Starting Point: NAD 83; 529316/3750416
Crew: Geoffrey McGinnis, George Raymond and Gordon Fidler

Lower Snow Creek 530042/3748650

Our trip was limited at Snow Creek due to restrictions from the Desert Water Agency. Snow Creek flows through their land to the south of the area that we surveyed. We parked near the Snow Creek Village and walked up the water district service road and then made a sharp turn to the east into the main body of Snow Creek. We walked up the creek bed for a kilometer and found no water along the way. Vegetation was around 60% in our survey area, 30% (half) of the total was fountain grass, (*Pennisetum setaceum*). The other vegetation was, *Baccharis serigloides* and felt leaf yerba santa, (*Eriodictyon crassifolium*). Further up the creek we could see stands of trees that contained primarily cottonwood, (*Populus fremontii*) and California sycamore, (*Platanus racemosa*). We could also see a waterfall towards the southeast that had water flowing down the face. Wildlife sign included deer (tracks, scat and bones) and bobcat (tracks).

Chino Canyon 1 and 2 535734/3744508, 535617/3744132

We continued the day in Chino Canyon near the Palm Springs Arial Tramway, one survey below and another above the tram station. The creek was flowing well. Exploration here was limited, due to many areas that were restricted access. Vegetation here consisted of white alder, (*Alnus rhombifolia*), California sycamore, (*Platanus racemosa*), wild grapevine, (*Vitus girdiana*), willow (*Salix sp.)* and live oak (*Quercus sp.).* Outside of the survey areas there were a large amounts of fountain grass, (*Pennisetum setaceum*) on the canyon walls. We did not see any signs of wildlife.

Sub-Region: Oswit Canyon
Date: 1/29/14
Distance: 5 miles; 8km
Starting Point: NAD 83; 542057/3737688
Crew: Geoffrey McGinnis and Larry Heronema

Oswit Oasis 540782/3738893

The trail to Oswit Canyon starts at the South Lykken Trailhead, rather than taking the trail, we headed due west into the canyon. From the bottom of the trail we could see an oasis up the alluvial fan to the northwest that was around a kilometer away; that is where we went first. We found that there was no water in the oasis. The most abundant vegetation cover was fountain grass, (*Pennisetum setaceum*), it was 50% of the total 70% vegetation cover, followed by California fan palm, (*Washingtonia filifera*) and brittlebush, (*Encelia farinosa*).

Oswit Canyon and Waterfall 539941/3737758, 539660/3737842

We continued further up the alluvial fan and found that there were many bighorn sheep signs (scat and tracks). We found that the canyon had a high concentration of fountain grass, (*Pennisetum setaceum*) all the way up the canyon. As the canyon started to narrow we found water that had a small flow and some small pools along the way. The flow continued up the canyon to a large waterfall that had a fig tree that was growing from the top of the fall all of the way to the ground below. The waterfall is about 15 meters high. Vegetation at the fall consisted of honey mesquite, (*Prosopis glandulosa*), cat claw, (*Senegalia greggii*) Calif. fan palm, (*Washingtonia filifera*), willow, (*Salix* sp.) and cattail, (*Typha latifolia*). On the way down we found some pictographs underneath an exposed section of a large boulder. This canyon has the most fountain grass of all that we have surveyed.

Larry Heronema

Sub-Region: Vargas Oasis, Snow Creek Village Canyon, and Dos Osos Canyon
Date: 1/31/14
Distance: 8 miles: 12.87km
Starting Point: NAD 83; 529607/3750986
Crew: Geoffrey McGinnis, Matt Shaw, Larry Heronema, and Bjarni Serup

These areas are to the east and west of Snow Creek and south of Highway 111 on the west side of Palm Springs.

Vargas Oasis 531913/3749584

The nearest access point to Vargas Oasis is on Snow Creek Road nearly 3 km away to the west. Vargas Oasis is a large palm oasis that has an old mine that was full of water when we surveyed. The mine is located at the lowest part of the oasis. The water in the mine is first seen at the entrance and continues back out of sight. The water that could be seen was approximately 1m wide. The oasis continues uphill for a few hundred meters and had a wide variety of vegetation which included: California fan palm, (*Washingtonia filifera*), yerba santa, (*Eriodictyon crassifolium*), brittle bush, (*Encelia farinosa*), sugar bush, (*Rhus ovata*) and cat claw, (*Senegalia greggii*). Further up the oasis there is wild grapevine, (*Vitus girdiana*) an unidentified grass species and willow, (*Salix* sp.). Signs of wildlife included: bobcat (scat), possible fox (scat) and coyote (tacks). These signs were found all near the entrance to the mine.

Snow Creek Village Canyon 1 528474/3750007

The nearest canyon on the west of the Snow Creek Village has no name listed on the USGS map. We parked at the nearest road to the canyon and walked along the base of the foothill among large scattered boulders. We had a difficult time reaching the area that indicated water. The canyon's bottom was extremely overgrown so we skirted around the area and finally made it to a large boulder in the center of the basin. From here we could see some water flowing between the vegetation on the canyon's floor. We actually had to jump into the bushes from the boulder to collect a water sample. Vegetation included California fuchsia, (*Epilobium canum*), brittlebush, (Encelia farinosa), sweet bush, (*Bebbia juncea*), climbing milkweed, (*Funastrum sp.*) yerba santa, (*Eriodictyon crassifolium*), willow (*Salix sp.*) and wild grapevine, (*Vitus girdiana*). Signs of wildlife included deer (track), and mountain lion (scat).

Dos Osos 3 528015/3749963

Dos Osos Canyon is another canyon that is about another 200 meters to the west, beyond the previous. The water was running strong and could be seen well beyond all of our survey spots in either direction. There were remnants of an old homestead at the bottom of the canyon that had two foundations and a fireplace. In the center of the canyon was a thick stand of willow trees that continued up and down the canyon for a few hundred meters in either direction. Further up the canyon there was a set of cascading waterfall that totaled more than 75m in height. We surveyed the water shed at three different places, staring with the first (number 3) above the waterfall. It was within a thick stand of willows, (Salix sp.). There was no sign of wildlife. We attempted to survey further up the canyon but found that the trail we were using lead us back to the upper portions of last canyon we had surveyed.

Snow Creek Village Canyon 2 527957/3749662

We conducted another survey at this junction. There was a small flow of water on the ground's rocky surface but quickly disappeared back into sand in either direction. The vegetation here mainly consisted of *Baccharis serigloides* and willow, (*Salix sp*.). There were some signs of deer (tracks and scat).

Dos Osos Survey 2 528090/3750005

We went back down the trail to the waterfall, half way down it, there was a way to access a spot between cascades,) we conducted our next survey here (number 2). The vegetation consisted of willow, (*Salix* sp.), *Baccharis serigloides*, wild grapevine, (*Vitus girdiana*) and a plant that looked similar to cat tail. There was no sign of wildlife use.

Dos Osos Survey 1 528413/ 3750307

The last place we surveyed (number 1) was downstream at the point where the creek changed from canyon to alluvial fan. Again, the majority of the vegetation was willow, (*Salix sp*.); there was also brittlebush, (*Encelia farinosa*) and cat claw, (*Senegalia greggii*). There was no visible sign of wildlife.

Sub-Region: Tachevah Falls
Date: 2/1/14
Distance: 6
Starting Point: NAD 83; 540671/3744629
Crew: Geoffrey McGinnis, Matt Shaw and Cait McGinnis

Tachevah Falls 1 539728/3743360

We started our hike from a Palm Springs neighborhood, we had to go through a hole in the fence and go around a storm water dike to reach the trail that lead to Tachevah Falls. The trail appeared to be heavily used by people, there was trash, graffiti and several networks of social trails. The fall is one of the largest sections of exposed bedrock on the entire range. At the top it looks to be nearly 100m in width and nearly the same in height, the bottom was narrower I guess somewhere near 50m. We conducted our first survey at the center base of the fall. There was a small amount of water that flowed from the top of the fall and created a small, shallow pool that measured 10cm by 20cm by 5cm deep. The pool's water sank into the sand that was underneath a large salt cedar tree. Vegetation here consisted of salt cedar (*Tamarix ramosissima)*, fountain grass, (*Pennisetum setaceum*), cat claw, (*Senegalia greggii*), chuparosa, (*Justicia californica*) and another type of grass species. There was a few bighorn sheep scat at the base of the fall. We decided to climb to the top of the waterfall. On the east side of the fall the ground ascends the waterfall diagonally around a 45 degree angle. We climbed to the top and realized that there was no direct way to the center of the fall, there was a cliff that blocked our path and was too dangerous to try to scale. Our only choice was to climb another rocky outcrop that would lead us up and over the dangerous cliff. We noticed that there was a large number of sheep tracks and scat in the area.

Tachevah Falls 2 539661/3743349

The top of the fall and canyon floor was wide and open, it was an area of exposed flat bedrock. On the bedrock surface there were several eroded rock pools/crevices that held water and a few large boulders. Although there were no bighorn sheep there at the time, it was obvious that this place was one of their favorites. There were thousands of sheep droppings here, several stands of cat claw, (*Senegalia greggii*) and honey mesquite, (*Prosopis glandulosa*). Within the survey site, 10% of the total 25% vegetation cover was fountain grass, (*Pennisetum setaceum*). There was also a large Mexican fan palm, (*Washingtonia robusta*) near the edge of the waterfall. After exploring the area we headed to the opposite side of the fall and used a bighorn sheep trail to get down. Along the way we found a large piece of bighorn sheep's skin.

Matty Shaw and Cait McGinnis

San Jacinto Mountain

Surveys: Long Valley, Round Valley, Wellman Cienega, Willow Creek Skunk Cabbage Meadow and Tahquitz Creek

Sub-Region: Long Valley
Date: 1/20/14
Distance: N/A
Starting Point: NAD 83; 533351/3741281
Crew: Geoffrey McGinnis

Long Valley 533351/3741281

Long valley is a large meadow near the San Jacinto Mountain Peak, it is just below the Palm Springs Arial Tramway building in the inner side of the ridgeline. The meadow was dry when I was there. Vegetation was 100 percent; the inner section of the meadow was deer grass, (*Muhlenbergia rigens*) and the outer area consisted of Jeffery pine (*Pinus jeffreyi*), white fir, (*Abies concolor*), manzanita (*Arctostaphylos sp.*), and scouler's willow, (*Salix scouleriana*). There were sign of deer (track and scat).

Sub-Region: Round Valley to Wellman Cienega
Date: 5/9/14
Distance: 6 miles; 9.6km
Starting Point: NAD 83; 535731/3744232
Crew: Geoffrey McGinnis and George Raymond

Round Valley 1 and 2 523507/3741312, 523105/3740863

We parked at the tram station in Palm Springs and rode the tram to the top and hiked up the Round Valley and Wellman Divide trail. The creek that runs along the trail was flowing at some places and at other points was not. We conducted two surveys along the way. Both places had some water flowing and had some pool accumulation as well. The primary vegetation in these two places consisted of: Jeffrey pines, (*Pinus jeffreyi*), White fir, (*Abies concolor*) and Scouler's willow, (*Salix scouleriana*). Wildlife sign here were some deer tracks.

Round Valley Spring 531095/3740433

We continued up San Jacinto and made it to the Round Valley Spring and nearby meadow. The spring was tapped into with a pipe and spigot that was left slightly open. The water that coming from the pipe comes out and sinks back into the ground almost immediately. Vegetation here comprised: lodgepole pine, (*Pinus contorta*), Jeffrey pine, (*Pinus jeffreyi*), white fir, (*Abies *concolor*) and an unidentified vine sp. After passing over Wellman's Divide, we started to descend into the area where the mountain fire had burned last summer. The burn zone consumed what looked like 40% of the trees below, in patches.

Wellman's Cienega 529797/3739505

We finally made it to Wellman's Cienega and the beginning of Willow Creek. The meadow came down the side of the mountain at a 20% angle. And where it crossed the trail there were some sections of the embankment that have eroded away. These eroded areas allowed the water to drip from the meadow and form into small pools below. The rest of the water here flows under the grass, further down the slope, until the meadow narrowed and became Willow Creek. Vegetation here consisted of California corn lily, (*Veratrum californicum*) and deer grass, (*Muhlenbergia rigens*). There were no signs of wildlife here.

Sub-Region: Humber Park to Willow Creek
Date: 5/16/14
Distance: 10.5 miles; 16.89km
Starting Point: NAD 83; 529082/3736116
Crew: Geoffrey McGinnis, Gordon Fidler, Patty Andersen and George Raymond.

Our trip started at the US Forestry office in Idyllwild, we had to meet with supervisors about safety in the burn zone. The area that we were heading to had burned during last summer's fire and was off limits to the public. The hike started at Humber Park, we used the Devil's Slide trail to get to the Saddle Junction and then on to Willow and Tahquitz Creek.

Middle Spring 529708/3737386

The first survey site was at a place called Middle Spring, it was half way up the trail we were using. There was a small flow of water that crossed the trail that came out from under some rocks in the creek. Vegetation here consisted of: lodgepole pine, (*Pinus contorta*), Jeffrey pine, (*Pinus jeffreyi*), white fir, (*Abies concolor*), an unidentified vine sp., live oak, (*Quercus sp.)* and some type of current, (*Ribes sp.*).

Skunk Cabbage Meadow 1 and 2 530845/3737425, 530975/3737108

From Saddle Junction we headed to Skunk Cabbage Meadow and conducted two surveys. The first location had no surface water present but further down the meadow, a creek had developed in the center. Vegetation in both places had the same types of species: California corn lily, (*Veratrum californicum*) and deer grass, (*Muhlenbergia rigens*). Outside of the meadow was surrounded by Jeffery Pines (*Pinus jeffreyi*). Both sites had deer tracks and scat.

Willow Creek 531760/3738235

We continued towards Willow Creek and were well into the burn zone. There were many burnt pine trees scattered among the green ones. I thought that is was strange to see a dead burnt tree standing next to a live, healthy green tree. We made it to Willow Creek and it was flowing well. There were several animal tracks on the edge of the creek that included: deer, bobcat, skunk and raccoon. Vegetation here included: Jeffrey pine, (*Pinus jeffreyi*), white fir, (*Abies concolor*) and scouler's willow, (*Salix scouleriana*).

Patty Andersen, George Raymond and Gordon Fidler

Upper Tahquitz Creek 531062/3736522

After having lunch, we headed back to Skunk Cabbage Meadow and the further on to Tahquitz Creek. When we arrived we found only a small amount of water in the creek and very little flow. The vegetation here included: deer grass, (*Muhlenbergia rigens*) Jeffery Pine (*Pinus jeffreyi*) and white fir, (*Abies concolor*).

Appendix 2C
Status of Riparian Bird Species in the Coachella Valley

Status of Riparian Bird Species in the Coachella Valley

Final Report

December 31, 2014

Prepared For:
University of California, Riverside
and the Coachella Valley Multiple Species Habitat Conservation Plan
Biological Monitoring Program

Prepared By:
San Diego Natural History Museum
1788 El Prado, San Diego, CA 92101
Lori Hargrove, Philip Unitt, Kevin Clark, & Lea Squires

Cowbird chick in Least Bell's Vireo nest, Chino Canyon *(Photo by K. Clark, 15 May, 2014).*

BACKGROUND AND OBJECTIVES

In southern California, riparian habitats are a rare but highly valuable resource, providing critical support to a diverse fauna. Drastic reduction and degradation of riparian habitat has led to the decline of many riparian species (e.g., Brinson et al. 1981, USFWS 2005). The Coachella Valley Multiple Species Habitat Conservation Plan (CVMSHCP 2007) identified five species of riparian birds as targets for conservation, and one species as a potential threat with management concern (Table 1).

Table 1. Riparian bird species identified by the CVMSHCP for conservation monitoring.

Common name	Code	Scientific name	Status
Willow Flycatcher, incl. ssp. Southwestern Willow Flycatcher	WIFL	*Empidonax traillii (Empidonax traillii extimus)*	State Endangered (Federally Endangered)
Least Bell's Vireo	LBVI	*Vireo bellii pusillus*	State Endangered/ Federally Endangered
Yellow Warbler	YEWA	*Setophaga petechia*	State Species of Special Concern
Yellow-breasted Chat	YBCH	*Icteria virens*	State Species of Special Concern
Summer Tanager	SUTA	*Piranga rubra*	State Species of Special Concern
Brown-headed Cowbird	BHCO	*Molothrus ater*	None (potential threat)

From 2002 to 2004, the Center for Conservation Biology conducted baseline surveys for these six bird species and established standardized monitoring survey protocols (Allen et al. 2005). The baseline surveys covered 18 riparian sites in the Coachella Valley with a total of 116 count points. Each of the six target species was observed in the Plan area each year at several of the sites, but at low numbers for all except the cowbird, with breeding suspected or confirmed for Least Bell's Vireo, Yellow-breasted Chat, Summer Tanager, and Brown-headed Cowbird.

Ten years have passed since the initial surveys. Therefore, the San Diego Natural History Museum (SDNHM) proposed a one-year resurvey (2014) to determine the current status of riparian bird species in the Coachella Valley. The study had two major objectives: (1) Using the same protocols, resurvey at a subset of key riparian sites to determine the current distribution and abundance of target bird species relative to the initial surveys, and (2) Assess the current rates of cowbird parasitism. In addition, surveys included territory mapping of target species, point counts for all bird species, and basic/rapid habitat and disturbance assessments following the protocols established in 2002-2004.

METHODS

To maximize detectability of target species, survey efficiency, and comparability to the initial surveys, SDNHM personnel visited each site three times from mid-May to mid-July (when all target species are expected to be present), using single-observer 10-minute point-counts with distance sampling at the points established 2002-2004 (during early mornings and in fair weather). Rather than visit all 18 sites, we revisited 7 key sites (Figure 1, Table 2). These key sites included all sites where target species were suspected or confirmed as breeding 2002-2004, but excluded 4 sites that are managed by the Agua Caliente Band of Cahuilla Indians (Andreas Canyon, Murray Canyon, Palm Canyon, and Tahquitz Canyon). These excluded sites had suspected or confirmed breeding of target bird species 2002-2004, but were surveyed in 2010-2012 as part of the San Jacinto Centennial Resurvey Project (SDNHM) and were thus of lower priority.

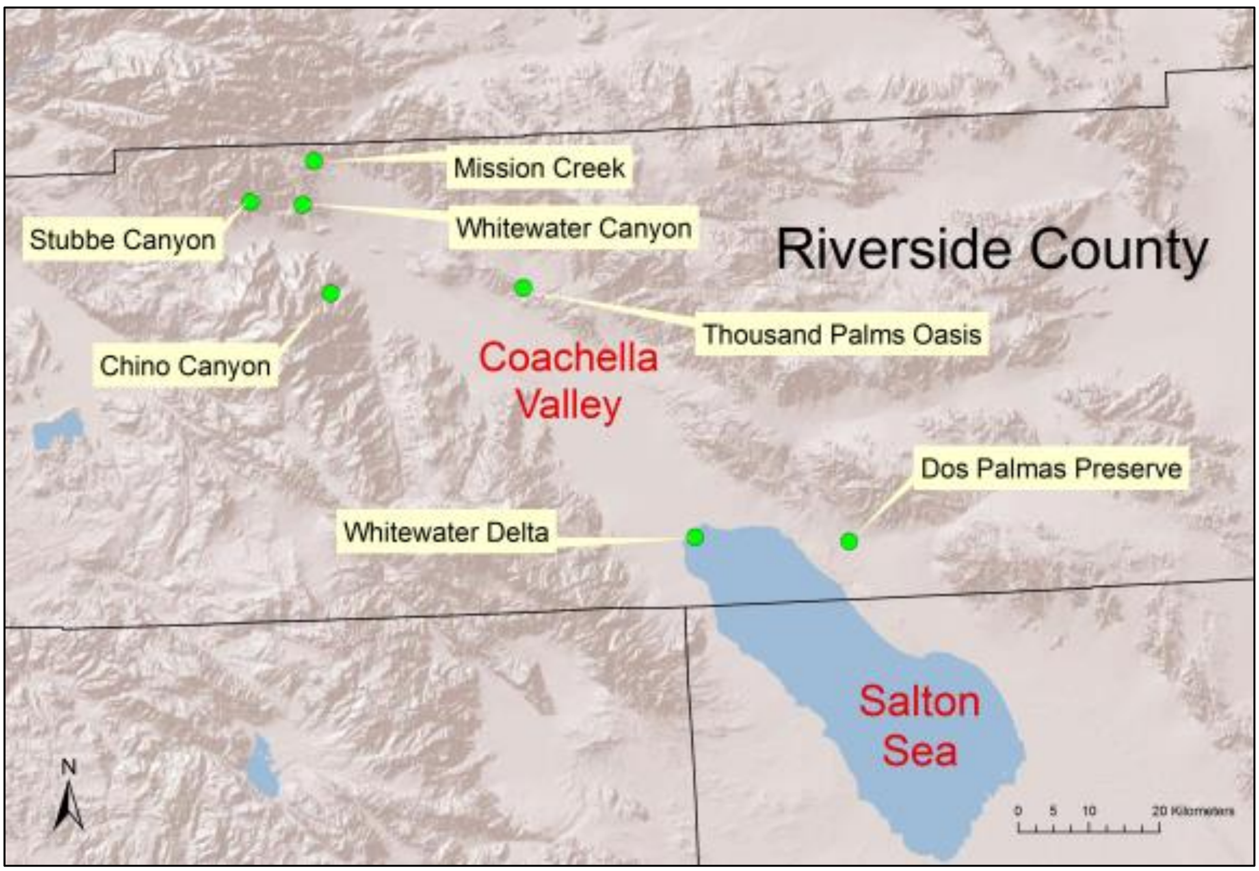


Figure 1. Locations of the 7 riparian study sites, Coachella Valley.

Table 2. Targeted survey sites and number of count points.

Survey site	Code	# Count points
Chino Canyon: Aerial Tram	AT	4
Chino Canyon: Cienaga	CC	6
Dos Palmas Preserve (+ Andreas Oasis)	DP	12
Mission Creek	MCR	3
Stubbe Canyon	SC	12
Thousand Palms Oasis	TPO	6
Whitewater Canyon	WWC	12
Whitewater Delta	WWD	13
Total		68

Three rounds of point count surveys were conducted at each site at a total of 68 points (Appendix 1), with additional mapping and behavioral observations of target species to document territoriality, breeding activity, nest locations, and any interactions with cowbirds (as authorized by USFWS permit TE-117947-3.4). Survey timing was designed to meet established guidelines for Willow Flycatcher survey protocols (Sogge et al. 2010) and we used broadcasted songs and calls of flycatchers after point counts to confirm absence wherever habitat appeared suitable. Nests were checked only to document cowbird parasitism and to remove, with minimal disturbance, cowbird chicks and/or eggs. Locations of all birds detected during point counts were plotted on point-count forms (Appendix 2); target species were additionally plotted on site maps along with observational notes, and all nests were documented on nest-monitoring forms (Appendix 3).

Count points are separated by at least 200 m, and counts were done between sunrise and 3 hours after sunrise, during fair weather only. As the observer approached the point, he or she noted any evasive movement, recording the location where the bird was first detected. We used laser rangefinders to assist with distance estimates, and additionally noted if the detection was by call, song, and/or visual. We recorded the first detection by the following timed periods: 0-3 minutes, 3-5 minutes, 5-7 minutes, or 7-10 minutes. The observer stood at the point coordinates or shifted off the coordinates as needed to aid in confirming any identifications.

At each point we did a rapid habitat assessment once during the season, to include photos in each cardinal direction, densiometer readings in each cardinal direction for tree cover, presence/description of surface water, dominant riparian species with approximate coverage within a 50-meter radius, and various measures of disturbance graded from 0 to 3 (Appendix 4).

Additional areas surveyed that were not covered during the 2002-2004 surveys included one additional point added at Thousand Palms Oasis on the south end (TPO6), and territory-level monitoring at upper Whitewater Canyon 2.5 km above the point-count area (see site descriptions below).

The full three rounds of surveys were not conducted at every site each year during the 2002-2004 period. So for comparisons by year, we used only the sets of counts that were within the same periods (first period mid-May to late-May, second period late-May to mid-June, and third period late-June to late-July). During 2002-2004, 15 minutes were allotted to each point count, so we trimmed the last 5 minutes for comparison to 2014. Two observers conducted each point count during 2002-2004 (twice the number of point counts), so effort during the 2002-2004 period was greater than in 2014, which could lead to greater chances of recording occupancy for a site, but each site received multiple counts at multiple points during each period, reducing the chances for differences in detection of site occupancy, and all density estimates are based on an average per point count.

For estimates of density, we used the function distsamp in package unmarked, program R (Fiske and Chandler 2011), which allows hierarchical modeling of abundance with covariates that may affect both abundance and detection (Royle et al. 2004), based on the use of distance sampling to estimate density (Buckland et al. 2001). Because of limited sample sizes, we tested only relatively simple models that allowed detection to vary by period, and abundance to vary by site and year, with geographic coordinates as the only covariates affecting abundance. We compared models by 3 different detection functions: half-normal, exponential, and hazard-rate, and used model selection to rank models (Burnham and Anderson 2002). Half-normal functions tended to fit best among species and periods, so we used that in all final models for consistency.

SITE DESCRIPTIONS

Chino Canyon

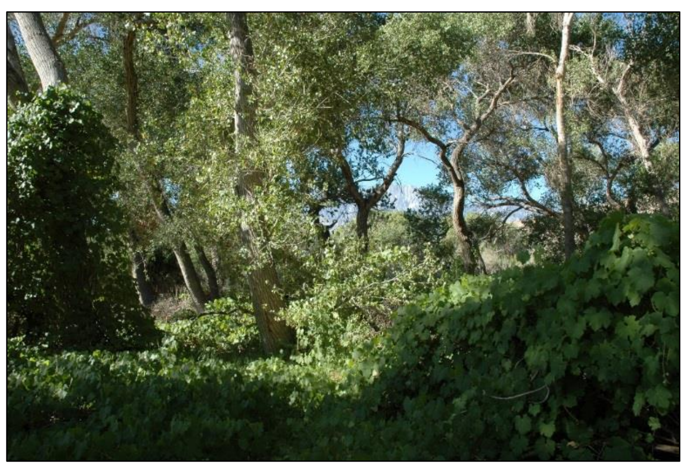
Chino Canyon is the site of the Palm Springs Aerial Tramway, which extends from its base at elevation 800 m up to 2600 m. A year-round stream flows down the steep canyon from the San Jacinto Mountains, becoming intermittent where the canyon widens to the east, but supporting a narrow strip of riparian vegetation within a boulder-strewn desert landscape. Just over 1 km below the tram, is a spring-fed cienaga supporting a broader patch of riparian vegetation approximately 400 m wide. Our coverage area included the cienaga and portions of the stream above and below the cienaga, just under 2 km in length. The riparian habitat of both the stream and cienaga are dominated by sycamore, cottonwood, willow, alder, palms, and baccharis, with grapevine draping many areas, and bordered by mesquite, catclaw, and brittlebush. Large parking lots and a road with heavy traffic are immediately adjacent to the riparian habitat. Several small trails go through and around the cienaga, and there was evidence of tamarisk removal at one edge. Several clumps of fountain grass and a few Russian thistles are adjacent to the stream.

Stubbe Canyon

The private ranch at Stubbe Canyon on the north side of the San Gorgonio Pass is situated at the mouth of the canyon just below a fork of two narrow canyons that drain from the west and north from the San Bernardino Mountains, with a wide bajada below covered by a relatively open desert scrub. The walls of the canyon are steep and rocky with sparsely scattered subshrubs and a few chaparral and coastal sage scrub species (including *Artemisia californica*). Riparian habitat is narrow but extends up both forks and is dominated by cottonwood, alder, sycamore, and willow. Higher up the north fork, the alder becomes more frequent and there is also some canyon live oak. Grapevine drapes much of the riparian habitat in both forks. By the ranch there are numerous eucalyptus trees and oleanders along the stream, and other ornamental trees at the ranch. Below the ranch, the riparian habitat becomes dominated by mulefat, shrubby willows, and oleander. Riparian undergrowth is virtually non-existent in both forks because of feral cattle, which have also trampled the steep slopes, causing significant erosion. The stream was flowing well in both forks and continuing well below the ranch until at least 8 June, then by 29 June it was more intermittent and restricted to the narrow canyons.

Whitewater Canyon

The Whitewater River is the main drainage of the Coachella Valley. At its upper reaches it drains from the San Bernardino Mountains into the north-south Whitewater Canyon. Here, many stretches are flood-scoured, but some stretches support mature cottonwood forest, with patches of willow and alder in wetter areas, and baccharis and mesquite in drier areas. The Whitewater Preserve includes a set of trout ponds around which the habitat has been partly restored. Our main survey area was a 2-km stretch of the river beginning just over 2.5 km below the trout ponds and extending down to the small community of Bonnie Bell, but we also checked the trout pond area for target species. There was intermittent surface water in 2014, with several full trout ponds and flowing water along approximately half of the survey area. The surrounding hills are very dry and barren with some creosote desert scrub



and windmills on higher ridges. Disturbance is due primarily to natural flood-scouring and wind, but there is also old trash and graffiti, cut vegetation, and a few trails behind the small community. A paved road extends along the river channel up to the trout ponds, where there is a picnic area and visitor center. There is evidence of old tamarisk removal, with some fresh tamarisk regrowth and numerous other invasive species sparsely scattered through the canyon including oleander, date palm, tree tobacco, mustards, fountain grass, and Bermuda grass.

Mission Creek

Mission Creek drains from the San Bernardino Mountains and is located at the far north end of the Coachella Valley between Whitewater Canyon and Big Morongo Canyon. The streambed tends to be flood-scoured in its lower reaches and supports little riparian habitat, but within the Mission Creek Preserve is a spring-fed cienaga adjacent to the creek and supporting riparian habitat approximately 300 m wide—the focus of our survey efforts. The riparian vegetation is dominated by several tall cottonwood trees, with dense thickets of shrubby willow, mesquite, and grapevine. This patch is surrounded by low hills of creosote desert scrub. A single lane dirt road behind a locked gate runs adjacent to the riparian habitat. The road has dual purpose as a hiking trail and occasional vehicular access to a reservation-only campground. There are several animal pathways into the vegetation but no designated trails. Most of the patch was dry during the 2014 surveys, with only a few damp areas.

Thousand Palms Oasis

Part of the Coachella Valley Preserve System, the Thousand Palms Oasis lies at the northern edge of the Indio Hills where a year-round spring flowing from the San Andreas fault supports a pond, small creek, and large groves of native palms. Riparian vegetation is limited to a fairly narrow strip approximately 2 km long and varying from 50 to 200 m wide. The vegetation is dominated by palms and shrubby willow (*Salix exigua*), with abundant phragmites, arrow-weed, and some cottonwoods, cat-tails, and mesquite. The surrounding hills are relatively barren, rocky desert scrub. There is a small network of well-maintained trails, visitor center, and several other structures nearby. The area receives numerous visitors, is bordered by a paved road, and is criss-crossed by a few dirt roads.

Dos Palmas Preserve

The Dos Palmas Preserve is on the north-east side of the Salton Sea, just below the Orocopia Mountains and the Coachella Canal. Here, there are numerous springs and seeps that feed into a series of levees and ponds, supporting a large patchwork of riparian vegetation 2 km across, interspersed with the surrounding salt flats. Palm trees are the dominant feature, with large patches of phragmites, cattail, and mesquite. Tamarisk had been fairly recently and extensively cleared before our surveys in 2014. There are a few structures, and although the main road is gated, the entire area is criss-crossed by numerous dirt roads. Our area of focus also included the Andreas Oasis, a somewhat isolated small palm grove just to the west, measuring about 300 × 100 m. Here a few mature cottonwoods are mixed with the palms, crowded over a small amount of surface water.

Whitewater Delta

Below the communities of Palm Springs and Palm Desert, the Whitewater River becomes what is also known as the Coachella Valley Stormwater Channel, gathering agricultural drainage and wastewater. The channel feeds into the Salton Sea at the Whitewater Delta, where riparian vegetation has historically been removed for flood control, but variably supports riparian habitat that is now dominated by tamarisk, but with substantial willow and phragmites. In 2014, the channel had strong flow and there was recent bulldozing immediately adjacent to the narrow strip of riparian habitat. Surrounding habitats are salt flats with variable densities of shrubs including saltbush, suaeda, and arrowweed. Adjacent to the drainage are some constructed duck ponds containing limited cattails and other emergent aquatic plants.

RESULTS

Summary of riparian bird surveys in 2014

From May to July 2014, personnel from the San Diego Natural History Museum (Kevin Clark, Lori Hargrove, Lea Squires, and Phil Unitt) conducted riparian bird surveys at 7 sites in the Coachella Valley (Table 3), completing 3 rounds of point counts at each site, with additional territory mapping and/or nest checks as needed to confirm breeding status of the 5 target riparian species and assess current levels of cowbird parasitism. All data were entered into spreadsheets, which include point-count data for all bird species from a total of 223 counts (2415 point-count records), all other incidental records, habitat data for all 68 points, and observations recorded during each visit to territories and/or nests of the target species.

Table 3. List of site visits and tasks completed by date. (Point-count survey visits included supplemental territory mapping and nest checks.)

Date	Site	Personnel	Tasks
5/15/2014	Whitewater Canyon	KC, LH, LS, PU	scouting
5/16/2014	Chino Canyon	KC, LH, LS, PU	point counts (10/10, 1st round)
5/16/2014	Whitewater Delta	KC, LH, LS, PU	scouting
5/16/2014	Dos Palmas Preserve	KC, LH, LS, PU	scouting
5/17/2014	Dos Palmas Preserve	LH, PU	point counts (12/12, 1st round)
5/17/2014	Whitewater Delta	KC, LS	point counts (13/13, 1st round)
5/20/2014	Chino Canyon	KC, LH	territory/nest checks
5/21/2014	Whitewater Canyon	KC, LH	point counts (12/12, 1st round)
5/21/2014	Stubbe Canyon	KC, LH	scouting
5/21/2014	Mission Creek	KC, LH	scouting
5/22/2014	Stubbe Canyon	KC, LH	point counts (12/12, 1st round)
5/22/2014	Whitewater Canyon	KC, LH	territory/nest checks
5/26/2014	Mission Creek	LH	point counts (3/3, 1st round)
5/26/2014	Chino Canyon	LH	territory/nest checks
5/27/2014	Thousand Palms Oasis	LH	point counts (6/6, 1st round)
5/27/2014	Whitewater Delta	LH	territory/nest checks
5/30/2014 to 5/31/2014	Mission Creek	LS, PU	territory/nest checks (brief visits)
5/30/2014 to 5/31/2014	Whitewater Canyon	LS, PU	territory/nest checks (brief visits)
5/31/2014	Chino Canyon	LS, PU	point counts (10/10, 2nd round)
6/1/2014	Dos Palmas Preserve	LS, PU	point counts (12/12, 2nd round)
6/2/2014	Whitewater Delta	LS, PU	point counts (13/13, 2nd round)

6/7/2014	Whitewater Canyon	LH, LS	point counts (12/12, 2nd round, windy)
6/7/2014	Chino Canyon	LH, LS	territory/nest checks
6/8/2014	Stubbe Canyon	LH, LS	point counts (12/12, 2nd round)
6/14/2014	Mission Creek	LH	point counts (3/3, 2nd round)
6/14/2014	Thousand Palms Oasis	LS	point counts (6/6, 2nd round); habitat
6/15/2014	Whitewater Canyon	LH, LS	brief visit (too windy)
6/15/2014	Dos Palmas Preserve	LH, LS	territory/nest checks; habitat
6/16/2014	Whitewater Canyon	LH, LS	territory/nest checks; habitat (too windy for point counts)
6/22/2014	Whitewater Canyon	KC, LS	point counts (12/12, 2nd round, make-up)
6/22/2014	Chino Canyon	KC, LS	territory/nest checks; habitat
6/23/2014	Whitewater Delta	KC, LS	territory/nest checks
6/27/2014	Mission Creek	LS	point counts (3/3, 3rd round)
6/27/2014	Thousand Palms Oasis	PU	point counts (6/6, 3rd round)
6/28/2014	Whitewater Canyon	LH, PU	point counts (12/12, 3rd round); habitat
6/28/2014	Chino Canyon	LS, PU	territory/nest checks; habitat
6/29/2014	Stubbe Canyon	LS, PU	point counts (12/12, 3rd round); habitat
7/6/2014	Dos Palmas Preserve	KC, LS	point counts (12/12, 3rd round); habitat
7/7/2014	Whitewater Delta	KC, LS	point counts (13/13, 3rd round); habitat
7/13/2014	Chino Canyon	KC, LS	point counts (10/10, 3rd round); habitat
7/14/2014	Whitewater Canyon	KC, LS	territory/nest checks
7/14/2014	Stubbe Canyon	KC, LS	territory/nest checks

During the 2014 study we observed all 5 target riparian bird species (Willow Flycatcher, Least Bell's Vireo, Summer Tanager, Yellow Warbler, and Yellow-breasted Chat), as well as the Brown-headed Cowbird, a potential threat. The Brown-headed Cowbird was most numerous at Whitewater Delta (over 20 per day consistently in May, June, and July, and with fledglings observed 2 June, 23 June, and 7 July), and also numerous at Dos Palmas Preserve (at least 16 observed on 17 May), but was scarce at other sites, with only a few observed at Chino Canyon (though significant parasitism of Least Bell's Vireo was documented there). At least 2 target riparian species were observed at each of the 7 sites, with all 5 observed at both Mission Creek and Whitewater Canyon (Table 4).

Four of the five target riparian species showed evidence of nesting in the Coachella Valley this year (Least Bell's Vireo, Summer Tanager, Yellow Warbler, and Yellow-breasted Chat), while the Willow Flycatcher was only seen as a migrant passing through. Breeding territories of at least 1 target riparian species were confirmed or suspected at 6 of the 7 sites, but territory numbers tended to be low at each site (Table 4).

Table 4. Total number of probable breeding territories in the season (bold) and maximum number of birds observed on any one date, for 6 target species at 7 sites, Coachella Valley, 2014.

Site	WIFL	LBVI	YEWA	YBCH	SUTA	BHCO
CC	**0**	**3**	**0**	**1**	**3-4**	**-**
	(none)	(max 5 on 7/13/14)	(max 4 on 5/16/14)	(max 2 on 5/16/14)	(max 6 on 7/13/14)	(max 2 on 7/13/14)
DP	**0**	**0**	**0**	**0-1**	**0**	**-**
	(max 9 on 6/1/14)	(none)	(max 5 on 5/17/14)	(max 1 on 6/15/14)	(none)	(max 16 on 5/17/14)
MCR	**0**	**1-2**	**1-2**	**0-1**	**1**	**-**
	(max 5 on 5/30/14)	(max 2 on 5/26/14)	(max 6 on 5/30/14)	(max 1 on 6/14/14)	(max 2 on 6/27/14)	(none)
SC	**0**	**0**	**1-2**	**0**	**4-6**	**-**
	(max 1 on 5/22/14)	(none)	(max 2 on 6/29/14)	(none)	(max 8 on 6/29/14)	(none)
TPO	**0**	**0**	**0**	**0**	**0**	**-**
	(max 1 on 5/27/14)	(none)	(max 2 on 5/27/14)	(none)	(none)	(none)
WWC	**0**	**5-6**	**1-2**	**1**	**2**	**-**
	(max 3 on 5/21/14)	(max 6 on 6/7/14)	(max 5 on 5/21/14)	(max 1 on 6/7/14)	(max 3 on 6/28/14)	(none)
WWD	**0**	**0**	**0-1**	**7-10**	**0**	**-**
	(max 19 on 6/2/14	(none)	(max 6 on 5/17/14)	(max 8+? on 6/23/14)	(none)	(max 24 on 6/23/14)
Sum	**0**	**9-11**	**3-7**	**9-14**	**10-13**	**-**
	(up to 19 per day)	(up to 6 per day)	(up to 6 per day)	(up to 8+? per day)	(up to 8 per day)	(up to 24 per day)

Numbers of probable breeding territories of the Yellow-breasted Chat were highest at Whitewater Delta (7 to 10), of the Summer Tanager at Stubbe Canyon (4 to 6) and at Chino Canyon (3 to 4), and of the Least Bell's Vireo at Whitewater Canyon (5 to 6). (See summaries for each species below.)

Although Brown-headed Cowbirds were observed at only 3 of the 7 sites, numbers were very high at 2 of the sites (Whitewater Delta and Dos Palmas Preserve), and parasitism was suspected or confirmed at each of the 3 sites, and suspected or confirmed for 2 of the 5 target species (Least Bell's Vireo and Yellow-breasted Chat, see summaries below). We made a total of 17 observations of Brown-headed Cowbirds suspected or confirmed of attempting or achieving nest parasitism (Table 5).

Table 5. Observations where Brown-headed Cowbirds were suspected or confirmed of attempting or achieving nest parasitism, listed by date and site.

Date	Site	Observation
5/16/2014	CC	Singing male cowbird near singing male Least Bell's Vireo
5/16/2014	CC	Cowbird chick (1-2 days old) removed from Least Bell's Vireo nest, 1 vireo egg remaining (subsequently failed)
5/17/2014	DP	Pair of cowbirds entering shrubs with pair of agitated Song Sparrows nearby
5/27/2014	WWD	Cowbirds in very close proximity to singing Willow Flycatchers
5/31/2014	CC	Female cowbird appears to be watching a Bell's Vireo nest
5/31/2014	CC	Cowbird egg removed from Least Bell's Vireo nest, 4 vireo eggs remaining (subsequently fledged)
6/2/2014	WWD	Cowbird fledgling being fed by pair of Black-tailed Gnatcatchers
6/7/2014	CC	Cowbird egg removed from Least Bell's Vireo nest, 4 vireo eggs remaining (subsequently failed)
6/15/2014	DP	Cowbirds in close proximity to singing Yellow-breasted Chat and calling Willow Flycatchers
6/23/2014	WWD	Cowbird fledgling being fed by a Song Sparrow
6/23/2014	WWD	Cowbird fledgling begging (uncertain host species)
6/23/2014	WWD	Cowbird fledgling being fed by a Black-tailed Gnatcatcher
7/7/2014	WWD	Copulating pair of cowbirds near Yellow-breasted Chat territory
7/7/2014	WWD	Cowbird fledgling begging near a Yellow-breasted Chat
7/13/2014	CC	2 female cowbirds, each near a Least Bell's Vireo nest
7/13/2014	CC	Cowbird chick (2-3 days old) removed from Least Bell's Vireo nest, had been sitting on Least Bell's Vireo chick, barely alive, (unknown outcome)
7/13/2014	CC	2 cowbird eggs removed from Least Bell's Vireo nest, 2 vireo eggs remaining (unknown outcome)

Willow Flycatcher

Migrating Willow Flycatchers were observed at all sites (except Chino Canyon) in May and June, but were gone by late June. Some appeared to act territorial with singing birds on multiple visits, but the latest birds were 14 June at Mission Creek and 15 June at Dos Palmas, a migration schedule typical of the northwestern subspecies *brewsteri*. Numbers were highest at Whitewater Delta (19 on 2 June).

Least Bell's Vireo

Least Bell's Vireos were observed at 3 sites (Chino Canyon, Mission Creek, and Whitewater Canyon), with a total of 9 to 11 territories, and 8 nests located (Table 6). At Mission Creek, on 21 May we observed a singing male that appeared to be moving around a wide area, on 26 May we observed a pair, and on 30 May we heard one singing male (possibly a second). Although we suspected breeding on the basis of repeated observations and a probable pair, no nests were located, and no vireos were detected on a follow-up survey 14 June despite thorough searching and use of recorded calls/songs.

At Chino Canyon we confirmed 2 breeding pairs, and at least 1 additional singing male. We located 5 vireo nests at Chino Canyon, each parasitized by Brown-headed Cowbirds (100%). In each case we removed the cowbird egg(s) or chick (Figure 2). Of the 5 nests, 2 later failed, 1 successfully fledged, and 2 had an unknown outcome (still being active when last checked on 13 July).

Figure 2. Brown-headed Cowbird chick in a Least Bell's Vireo nest (next to a vireo egg), Chino Canyon, 15 May 2014.

At Whitewater Canyon we located up to 6 Least Bell's Vireo territories, 2 in the lower canyon by the point-count route, and 4 in the upper canyon by the new visitor center and picnic area. In the lower canyon, 2 singing males were located on 21 May, 1 behind houses west of point WWC01 and 1 near the road west of point WWC7. These were re-sighted on 22 May, but not found on subsequent visits until a singing male was located 22 June west of WWC01. No pairs or nesting activity were ever confirmed. In the upper canyon, 4 territories were confirmed, 2 above the visitor center and 2 below. Below the visitor center, 2 singing males were observed repeatedly, a pair was observed on 22 May feeding a fledgling, and a male was observed nest-building on 7 June (nest failed, torn or possibly incomplete). Above the visitor center, 2 singing males were observed, 1 incubating a nest on 22 May (failed, presumed depredated), and the other incubating a nest on 16 June, alternating with a female. This latter nest was later found torn with the eggs on the ground below, possibly due to shearing effect from wind. Thus, there was a total of 4 nests confirmed at Whitewater Canyon (1 not located but fledgling observed, and 3 failed: 1 due to probable depredation, 1 due to probable wind, and 1 appeared incomplete and torn). No cowbird parasitism was observed. The vireos continued their nest attempts in Chino Canyon at least through mid-July, but appeared to have ceased by then at Whitewater Canyon, with birds going into molt.

Table 6. Least Bell's Vireo territories, with nest outcomes and locations, listed by site. (See Appendix 1 for site and territory location codes.)

Site	Territory Location	Outcome	Nest substrate	Nest or fledgling coordinates (±10 m)	
				N	W
CC	CC1	Nest 1 Unsuccessful: Nest-building 26 May, incubating 7 June (4 vireo eggs + 1 cowbird egg, removed), 22 June nest abandoned (1 vireo egg missing)	sycamore	33.84299	116.60406
		Nest 2 Unknown: Nest-building 22 June, on 13 July nest contained 2 vireo eggs, 1 vireo chick, and 1 cowbird chick (removed), vireo chick was below the cowbird chick, listless, unknown outcome	willow	33.84328	116.60405
CC	CC2-CC3	Nest 1 Unsuccessful: Active nest found 16 May containing 1 vireo egg and 1 cowbird chick, removed; nest empty and intact on 20 May (presumed depredated)	cottonwood	33.84213	116.60095

Site	Territory Location	Outcome	Nest substrate	Nest or fledgling coordinates (±10 m)	
				N	W
		Nest 2 Successful: Active nest found 26 May appeared complete or near-complete (did not approach), 31 May contained 4 vireo eggs + 1 cowbird egg (removed), 22 June contained 4 vireo nestlings close to fledging, fledgling observed 13 July.	dead sticks	33.84307	116.60041
		Nest 3 Unknown: Active nest found 13 July containing 2 vireo eggs + 2 cowbird eggs (removed), unknown outcome (female incubating and male nearby feeding a fledgling)	grapevine	33.84184	116.60155
CC	SSW, CC4-CC5	Solo male?: At least 1 additional singing male on multiple dates	no nest		
MCR	MCR1-MCR2	Nesting suspected but unconfirmed: Singing male 21 May, pair 26 May, singing male 30 May	no nest		
MCR	SE	Solo male?: Possible second singing male 30 May	no nest		
WWC	WWC01	Solo male?: Singing male 21 May, 22 June	no nest		
WWC	WWC7	Solo male, territory abandoned: Singing male 21-22 May	no nest		
WWC	below picnic area	Successful: Pair feeding fledgling on 22 May, songs/calls heard on subsequent visits	nest not located	33.98729	116.65520
WWC	at/below picnic area	Unsuccessful: nest-building 7 June, on 16 June nest torn/incomplete, singing male observed repeatedly but never saw a female	sugarbush (8 m E of coords)	33.98771	116.65480
WWC	above entrance	Unsuccessful: male incubating 3 vireo eggs 22 May, on 30 May nest empty, intact (presumed depredated)	mulefat	33.98961	116.65620
WWC	further above entrance	Unsuccessful: pair incubating 3 vireo eggs 16 June, on 22 June nest torn, eggs on ground below (cracked)	sycamore	33.99020	116.65701

Yellow Warbler

Yellow Warblers are common in the Coachella Valley as migrants, and were observed at every site, with up to 6 per day. Persistence of singing males into late June, indicating a possible breeding territory, was observed at Mission Creek, Stubbe Canyon, Whitewater Canyon, and Whitewater Delta. However, only 1-2 possible territories were observed at each of these sites. We confirmed nesting at 2 sites, 1 at Mission Creek (nest with chicks near fledging on 14 June), and 1 at Stubbe Canyon (nest-building 29 June, singing male still close to the high concealed nest on 14 July).

Yellow-breasted Chat

We found Yellow-breasted Chats at 5 sites (each site except Stubbe Canyon and Thousand Palms Oasis). These sometimes appeared to be either migrants passing through or temporary territories that were later abandoned at 3 sites (Dos Palmas Preserve 1 singing male on west side 17 May and 1 singing male on south-east side on 15 June, Mission Creek 1 singing male on 14 June, and Whitewater Canyon 1 singing male on 21 May and 7 June). We found persistent territories only at Chino Canyon (1 singing male through 13 July) and at Whitewater Delta (7 to 10 territories with at least 4 singing males through 7 July). We did not find any chat nests, or see any evidence of nest-building, carrying food, or fledglings, but from the number of persistent territories, strongly suspect that nesting was attempted at Whitewater Delta. At Whitewater Delta we also observed a fledgling cowbird begging next to a singing chat, suggesting that nest parasitism had occurred (but unconfirmed).

Summer Tanager

We found Summer Tanagers at 4 sites, and at each of these they were persistently territorial (Chino Canyon 3-4 territories, Mission Creek 1 territory, Stubbe Canyon 4-6 territories, and Whitewater Canyon 2 territories). Nesting was confirmed at all 4 sites, with evidence of nest success at 3 sites. A pair with 2 fledglings was observed in Chino Canyon on 28 June, an adult with at least 1 fledgling was observed in Stubbe Canyon on 14 July, and a pair with at least 1 fledgling was also observed at Whitewater Canyon on 14 July. No evidence of nest parasitism was observed.

Other species

We recorded a total of 2415 point-count detections and documented a total of 116 bird species during our surveys (Appendix 5), including nesting of 34 non-target bird species and fledglings of 23 non-target bird species (Appendix 5). Notable observations included: 1 American Bittern at Whitewater Delta (23 June), 1 Least Bittern at Dos Palmas Preserve (17 May), pair of Crissal Thrashers at Whitewater Delta with possible fledgling (23 June), 1 singing Indigo Bunting at Mission Creek (persisting 26 May, 14 June, and 27 June).

Other notable records that were reported by others in 2014 include 1 Northern Saw-whet Owl at Thousand Palms Oasis (photographed on 15 June), and 1 Yellow-billed Cuckoo at

Whitewater Canyon 8-9 July (reported by Frank Sterrett and Mark Leggett 8 July and by Julie Szabo and Bill Moramarco 9 July via inlandcountybirds and ebird). Our subsequent survey at this area on 14 July revealed no cuckoos.

Other animals we observed during surveys in 2014 were the following: American Bullfrog (*Lithobates catesbeianus*) at Dos Palmas Preserve and Whitewater Delta; Rio Grande Leopard Frog (*Lithobates berlandieri*) at Dos Palmas Preserve; Side-blotched Lizard (*Uta stansburiana*) at Whitewater Canyon and Thousand Palms Oasis; Western Whiptail (*Aspidoscelis tigris*) at Dos Palmas Preserve, Whitewater Canyon, Thousand Palms Oasis, Chino Canyon, and Stubbe Canyon; Desert Spiny Lizard (*Sceloporus magister*) at Thousand Palms Oasis and Chino Canyon; Western Fence Lizard (*Aspidoscelis tigris*) at Stubbe Canyon; Common Kingsnake (*Lampropeltis getula*) at Whitewater Canyon and Thousand Palms Oasis; Speckled Rattlesnake (*Crotalus mitchellii*) at Stubbe Canyon; Sidewinder (*Crotalus cerastes*) at Andreas Oasis; bobcat (*Lynx rufus*) at Whitewater Delta; coyote (*Canis latrans*) at Dos Palmas Preserve; gray fox (*Urocyon cinereoargentus*) at Stubbe Canyon, striped skunk (*Mephitis mephitis*) at Stubbe Canyon, raccoon (*Procyon lotor*) at Dos Palmas Preserve; mule deer (*Odocoileus hemionus*) at Dos Palmas Preserve, Whitewater Canyon, and Stubbe Canyon; bighorn sheep (*Ovis canadensis*) possible scat at Andreas Oasis; round-tailed ground squirrel (*Spermophilus tereticaudus*) at Andreas Oasis; California ground squirrel (*Spermophilus beecheyi*) at Whitewater Canyon; and desert cottontail (*Sylvilagus audubonii*) at Mission Creek, Whitewater Canyon, and Thousand Palms Oasis.

Changes in abundance and distribution for target species over the past 10 years

Because territories were not mapped from 2002 to 2004, the number of territories we documented cannot be compared to that in previous years, but we can look at density estimates based on comparable point counts. Because of variation in survey effort and timing from year to year, any comparisons should be interpreted with caution. However, we can also use the 4 years of data to show which sites have had any target species documented at the site, and relative consistency by year (Table 7). The Willow Flycatcher has been documented at each of the 7 sites, most consistently at Mission Creek and Whitewater Canyon, where it was observed all 4 years. (However, Whitewater Delta was visited only during July from 2002 to 2004, when migrants are not expected to be present.) The Least Bell's Vireo has been documented at each site except Dos Palmas Preserve and Stubbe Canyon and has occurred most consistently at Chino Canyon and Mission Creek (all 4 years). The Yellow Warbler has shown greater variability due to survey timing but has been documented at every site. The Yellow-breasted Chat has been observed at every site except Stubbe Canyon but has been inconsistent from year to year. The Summer Tanager has been documented at only 4 sites, most consistently at Chino Canyon over 4 years, but also both years at Stubbe Canyon. Brown-headed Cowbirds have been documented at each site, with absences only in 2014.

Table 7. Documented occurrence by year for each target bird species ('X' present, 'O' absent). Note that survey effort and timing varied among years and sites. Blank indicates no surveys (Stubbe Canyon in 2002-2003), or surveys only during July when presence of the target species is not expected (Willow Flycatcher at Whitewater Delta 2002-2004).

Willow Flycatcher	2002	2003	2004	2014
Chino Canyon	X	0	0	0
Dos Palmas Preserve	0	X	X	X
Mission Creek	X	X	X	X
Stubbe Canyon			0	X
Thousand Palms	0	X	X	X
Whitewater Canyon	X	X	X	X
Whitewater Delta				X
Least Bell's Vireo	2002	2003	2004	2014
Chino Canyon	X	X	X	X
Dos Palmas Preserve	0	0	0	0
Mission Creek	X	X	X	X
Stubbe Canyon			0	0
Thousand Palms	0	X	0	0
Whitewater Canyon	0	0	0	X
Whitewater Delta	X	X	0	0
Yellow Warbler	2002	2003	2004	2014
Chino Canyon	X	X	X	X
Dos Palmas Preserve	0	X	X	X
Mission Creek	X	0	X	X
Stubbe Canyon			0	X
Thousand Palms	0	X	X	X
Whitewater Canyon	0	X	X	X
Whitewater Delta	X	0	0	X
Yellow-breasted Chat	2002	2003	2004	2014
Chino Canyon	0	0	X	X
Dos Palmas Preserve	0	X	X	X
Mission Creek	X	X	0	X
Stubbe Canyon			0	0
Thousand Palms	X	0	X	0
Whitewater Canyon	X	0	X	X
Whitewater Delta	0	0	0	X
Summer Tanager	2002	2003	2004	2014
Chino Canyon	X	X	X	X
Dos Palmas Preserve	0	0	0	0
Mission Creek	X	0	0	X

Stubbe Canyon			X	X
Thousand Palms	0	0	0	0
Whitewater Canyon	0	X	X	X
Whitewater Delta	0	0	0	0
Brown-headed Cowbird	2002	2003	2004	2014
Chino Canyon	X	X	X	X
Dos Palmas Preserve	X	X	X	X
Mission Creek	X	X	X	0
Stubbe Canyon			X	0
Thousand Palms	X	X	X	0
Whitewater Canyon	X	X	X	0
Whitewater Delta	X	X	X	X

In a comparison of density across years on the basis of point counts, 2004 and 2014 had the most congruence between survey dates and coverage. So we performed two separate analyses, trimming the data to comparable points and survey periods: (1) 2004 vs. 2014 (based on a total of 66 points and 453 point counts), and (2) Comparison of all 4 years (based on a total of 35 points and 245 point counts). Because during the 2002-2003 surveys observation distances were limited to 3 bins (<25 m, 25-50 m, and >50 m), for the 4-year comparison we restricted all observations to 3 bins: 0-25 m, 25-50 m, and 50-300 m. During both 2004 and 2014, however, exact distances were recorded, so in the 2-year comparison we allowed binning to vary by species. Because of habitat and occupancy differences we also split the Chino Canyon data into two sub-sites: aerial tram (AT) and cienaga (CC).

On the basis of the combined 2004 and 2014 data, distance sampling revealed that probability of detection varied strongly by species (Figure 3), with the effective radius of detection being highest for the Yellow-breasted Chat (nearly 120 m), and lowest for the Yellow Warbler (32 m). To extrapolate our density estimates (birds per hectare) to an approximate population size for the study site, we used the area of a circle of radius 120 m for each point times the number of points at the study site (summed across all sites for the 4-year comparison). Thus, this is a density estimate for just the area that was surveyed by point counts.

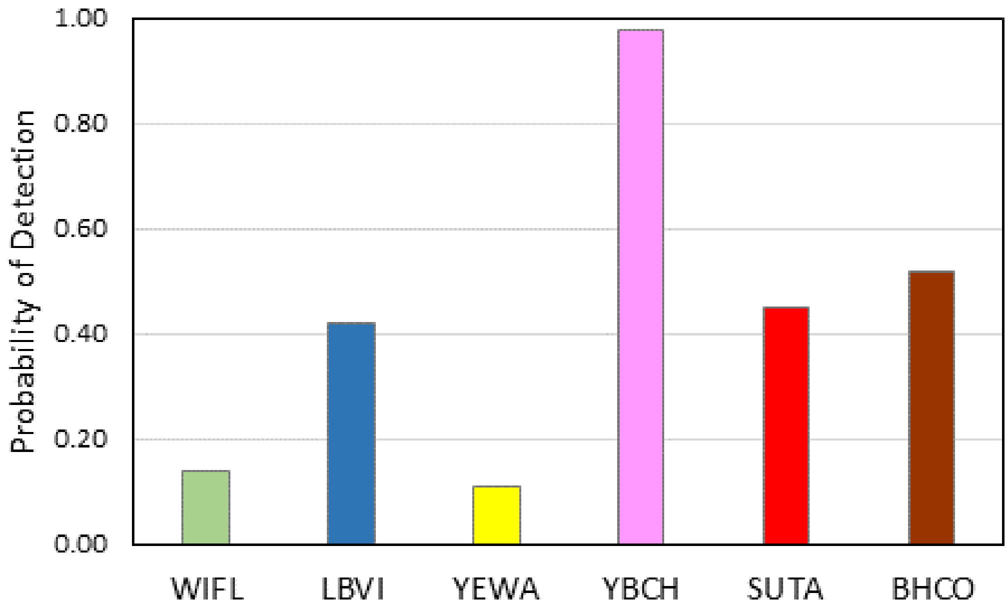
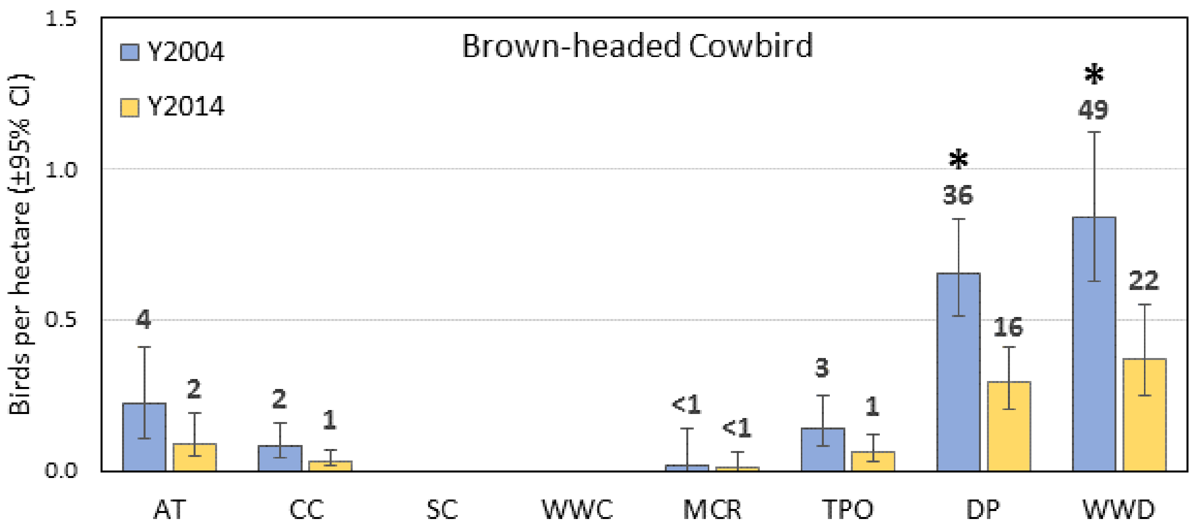


Figure 3. Relative probability of detection of 6 target species (for a 10-minute point count with radius 120 m, based on data from 2004 and 2014).

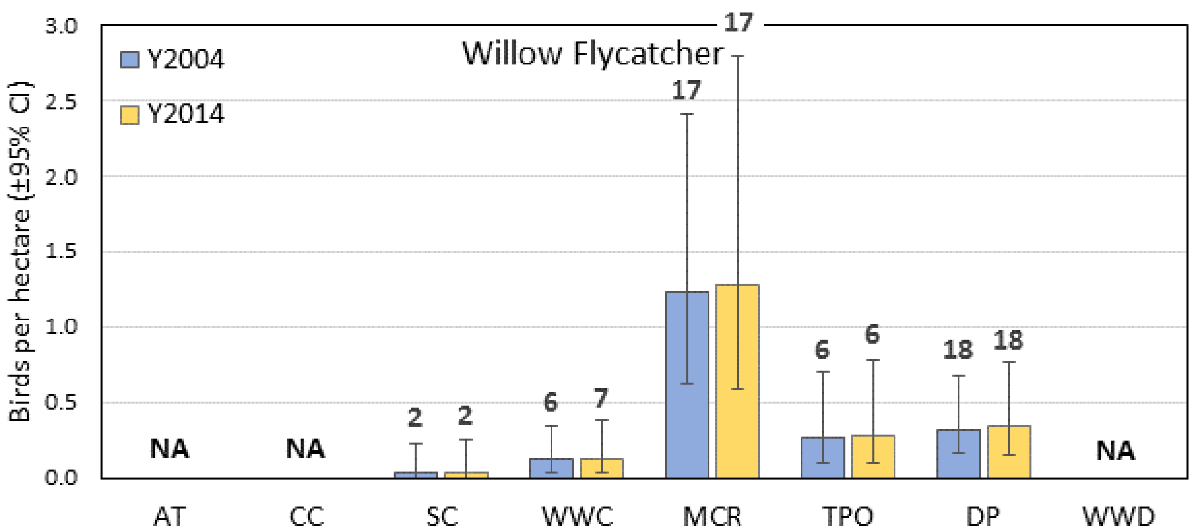
Comparing density and abundance across sites in 2004 vs. 2014 for the 5 target riparian species and Brown-headed Cowbird, we found strong differences among sites but very little difference between the two years. The strongest differences were for the Brown-headed Cowbird, which declined at Dos Palmas Preserve and Whitewater Delta (Figure 4.A.), and the Yellow-breasted Chat, which declined at Dos Palmas Preserve but increased at Whitewater Delta (Figure 4.E.). Other slight differences for other species were overwhelmed by wide confidence intervals because of low sample sizes.

In the comparison between all 4 years (Figure 5. A-F), sample sizes were necessarily reduced even further, because fewer points were repeated all 4 years within a similar time period. There was a suggestion of numbers of the Brown-headed Cowbird (Figure 5.A.), Willow Flycatcher (Figure 5.B.), and Yellow-breasted Chat (Figure 5.E.), increasing during the first 3 survey years and dropping in 2014, but none of these trends reached statistical significance at the 95% level. No difference was discernible for the Least Bell's Vireo or Summer Tanager, and data were insufficient to fit any model for the Yellow Warbler.

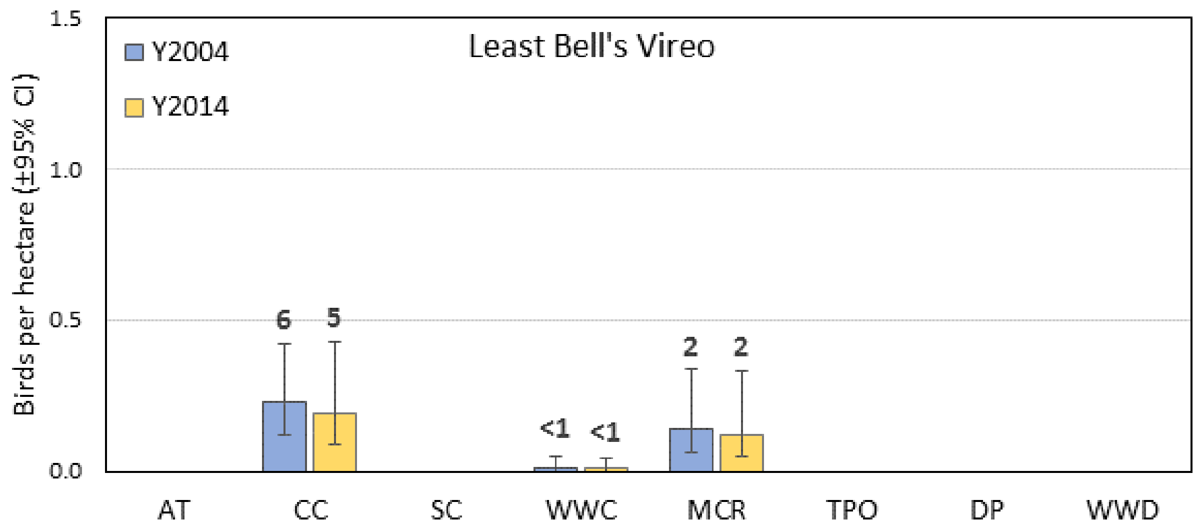
(A)


Brown-headed Cowbird
Y2004
Y2014
Birds per hectare (±95% CI)
1.5
1.0
0.5
0.0
4
2
2
1
<1
<1
3
1
*
36
16
*
49
22
AT
CC
SC
WWC
MCR
TPO
DP
WWD

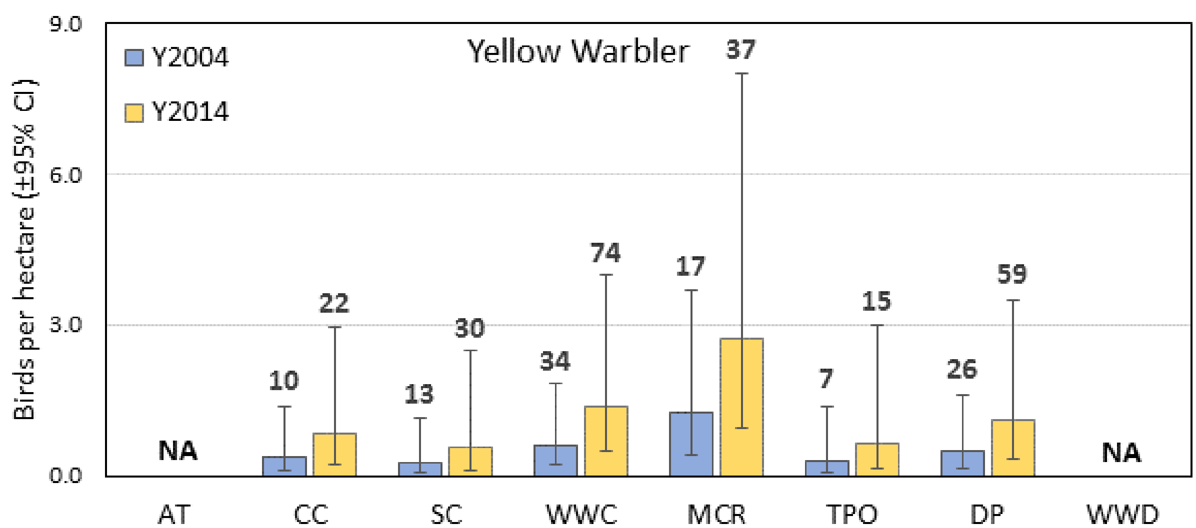
(B)


Willow Flycatcher
Y2004
Y2014
Birds per hectare (±95% CI)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
NA
NA
2
2
6
7
17
17
6
6
18
18
NA
AT
CC
SC
WWC
MCR
TPO
DP
WWD

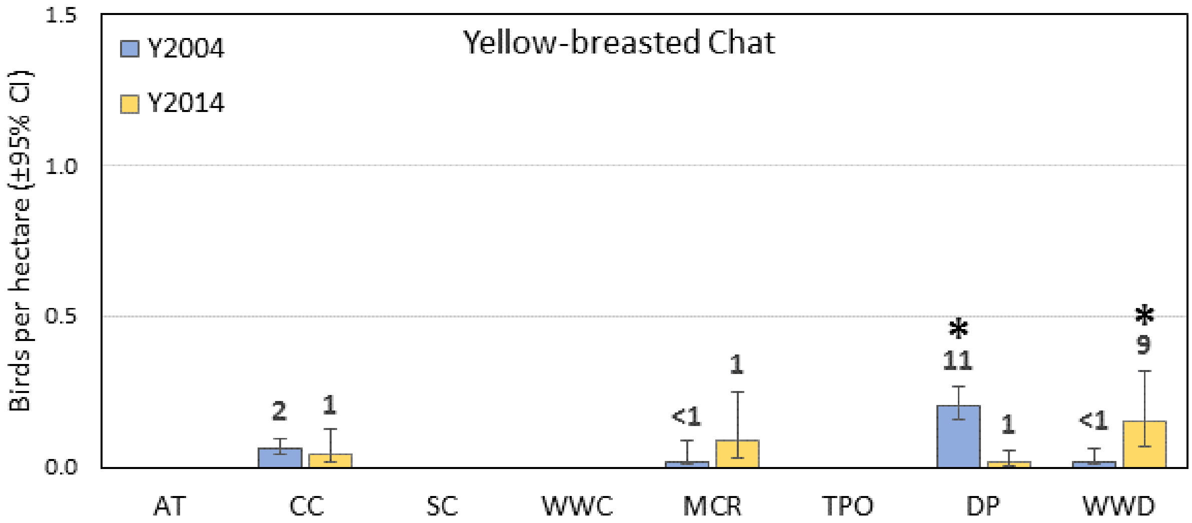
(C)


Least Bell's Vireo
Y2004
Y2014
Birds per hectare (±95% CI)
1.5
1.0
0.5
0.0
6
5
<1
<1
2
2
AT
CC
SC
WWC
MCR
TPO
DP
WWD

(D)


Yellow Warbler
Y2004
Y2014
Birds per hectare (±95% CI)
9.0
6.0
3.0
0.0
NA
10
22
13
30
34
74
17
37
7
15
26
59
NA
AT
CC
SC
WWC
MCR
TPO
DP
WWD

(E)



(F)

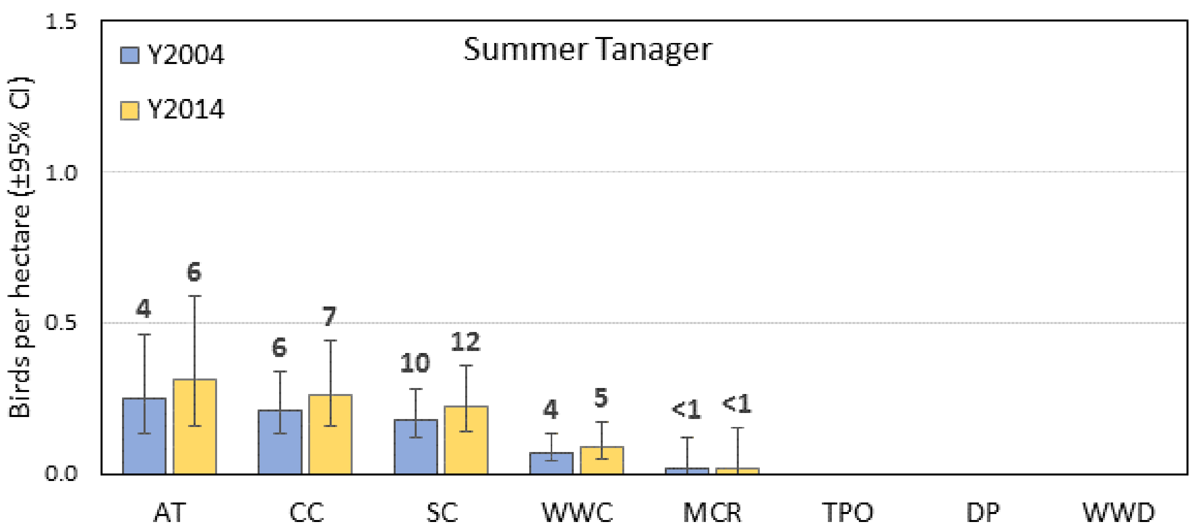
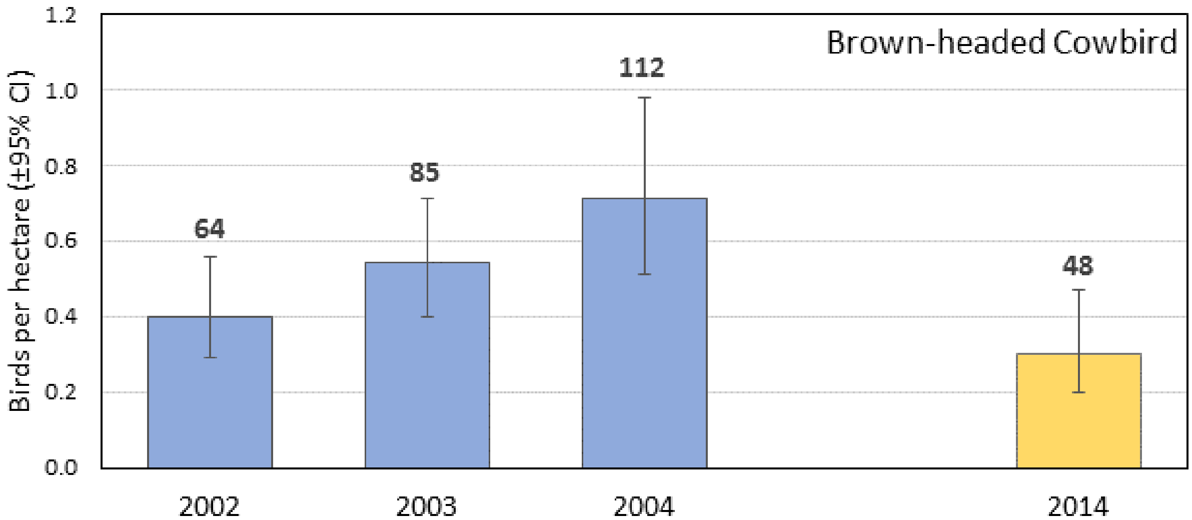
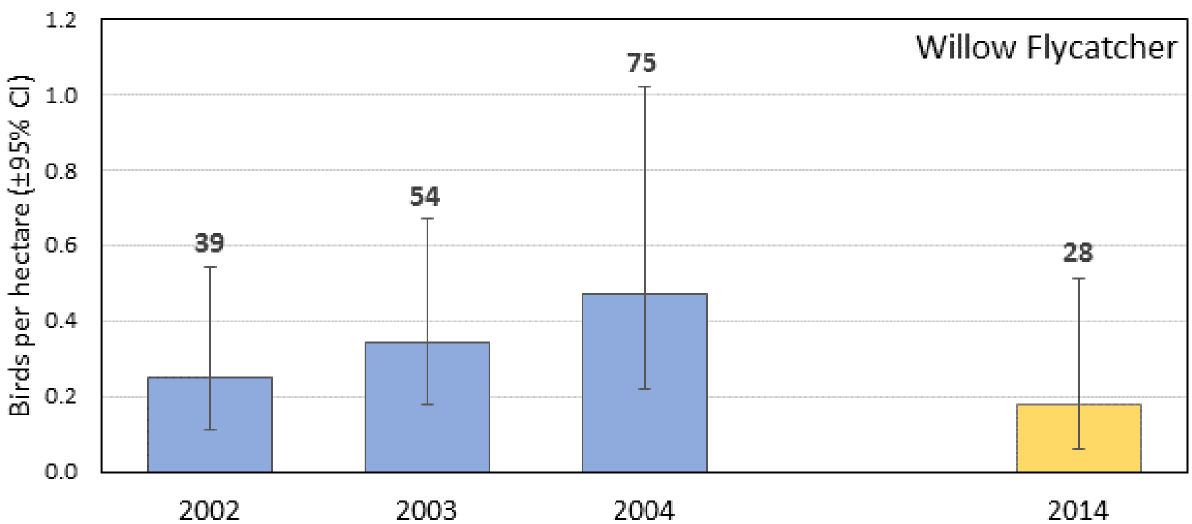


Figure 4 (A-F). 10-year comparisons of density and abundance across 8 sites for 6 target species, based on counts at 66 points. Bars represent the estimated mean density (±95% confidence interval) for year 2004 (blue) vs. 2014 (orange). The number above each bar represents the estimated mean population size, assuming the site area is roughly equal to the area of 1 circle of radius 120 m times the number of count points at the site (see Table 2 for site codes and number of points). Asterisks represent a statistically significant difference where the 95% confidence intervals are not overlapping.

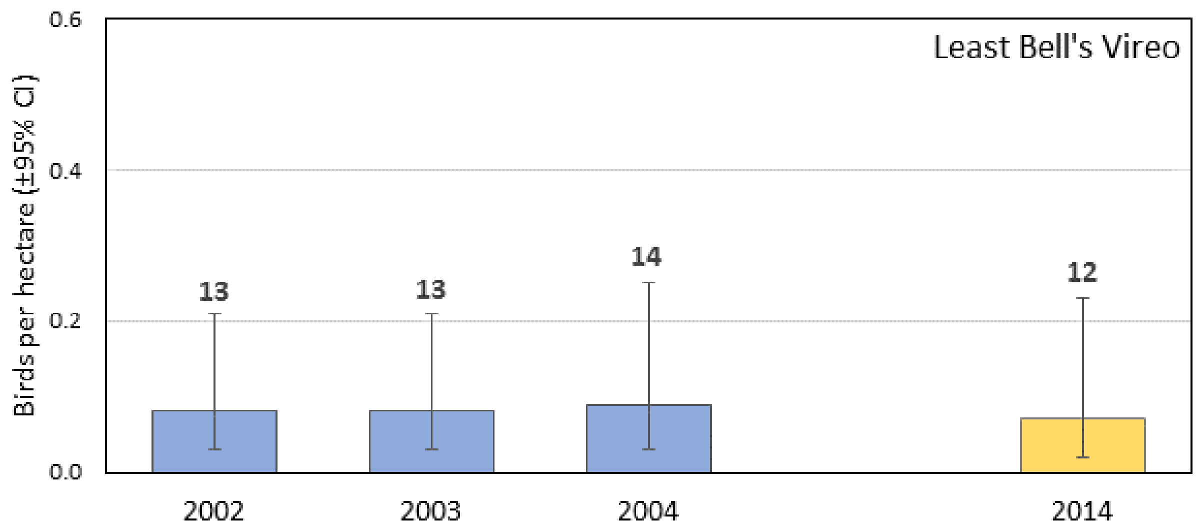
(A)


Brown-headed Cowbird
Birds per hectare (±95% CI)
1.2
1.0
0.8
0.6
0.4
0.2
0.0
64
85
112
48
2002
2003
2004
2014

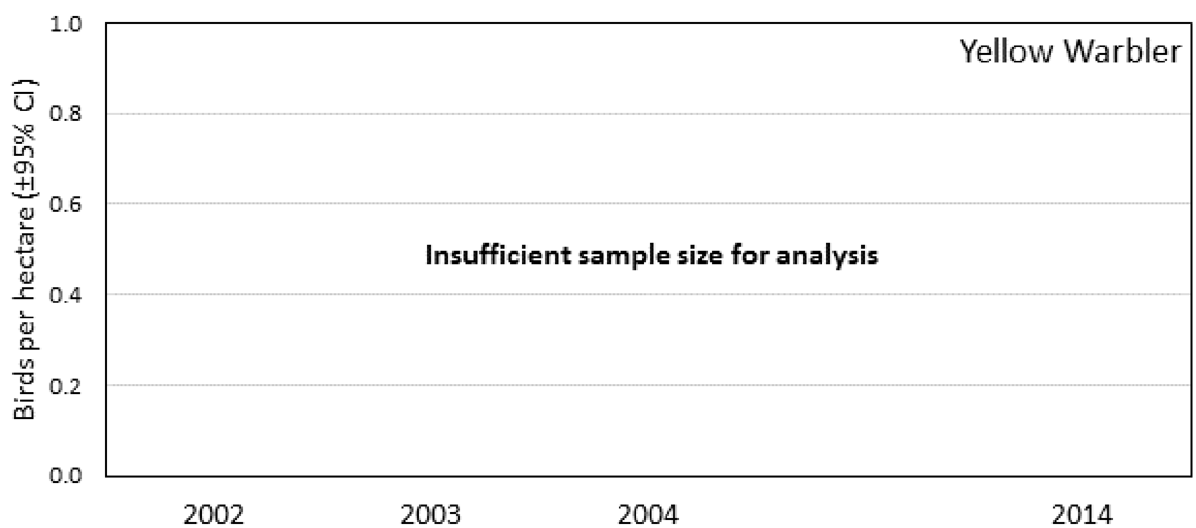
(B)


Willow Flycatcher
Birds per hectare (±95% CI)
1.2
1.0
0.8
0.6
0.4
0.2
0.0
39
54
75
28
2002
2003
2004
2014

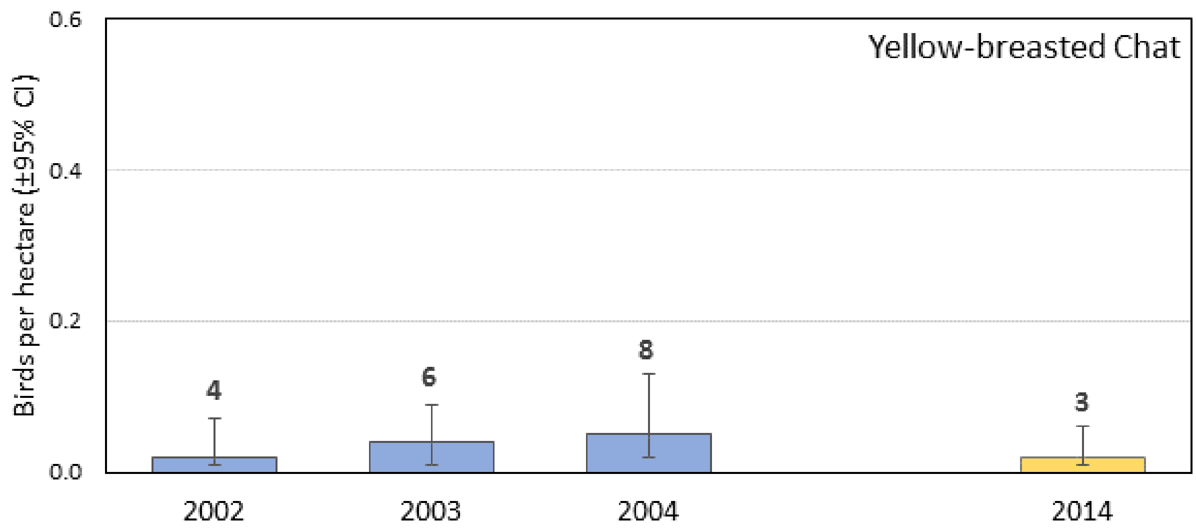
(C)


Least Bell's Vireo
Birds per hectare (±95% CI)
0.0
0.2
0.4
0.6
13
13
14
12
2002
2003
2004
2014

(D)


Yellow Warbler
Birds per hectare (±95% CI)
0.0
0.2
0.4
0.6
0.8
1.0
Insufficient sample size for analysis
2002
2003
2004
2014

(E)



(F)

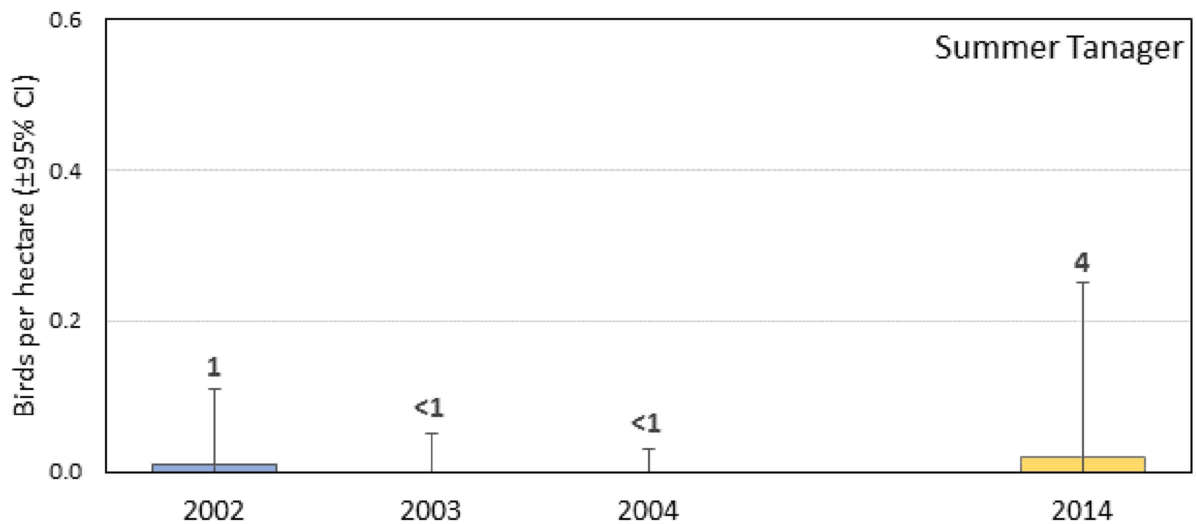


Figure 5 (A-F). Comparisons of density and abundance across 4 years for 6 target species. Bars represent the estimated mean density (±95% confidence interval) for years 2002, 2003, and 2004 (blue) vs. 2014 (orange). The number above each bar represents the estimated mean population size, assuming the study area is roughly equal to the area of 1 point count station of radius 120 m times the total number of count points used in the analysis (*N* = 35).

Changes in riparian bird distribution and abundance over the past 10 years vs. changes in habitat and disturbance

Changes in habitat and disturbance levels were strongest at Stubbe Canyon, Dos Palmas Preserve, and Whitewater Delta. At Stubbe Canyon, disturbance from cattle increased greatly, leading to significant erosion and elimination of nearly all undergrowth (Figure 6). Although this had no apparent negative effect on the target species that we documented nesting at the site (Summer Tanager and Yellow Warbler), which both nest in the canopy, it has very likely degraded the habitat quality of this rare perennial stream, and has rendered the habitat unsuitable for the Least Bell's Vireo and Yellow-breasted Chat, which require dense riparian shrubs and undergrowth. These two species were absent from Stubbe Canyon in both 2004 and 2014, but could occur at this site if it were less disturbed.

Figure 6. Disturbance from cattle at Stubbe Canyon in 2014, causing erosion of the river banks and reduction of undergrowth within the streambed.

Dos Palmas Preserve also had reduced shrub cover, with evidence of recent efforts to extensively remove tamarisk (Figure 7). This disturbance and lack of shrub cover has an apparent correlation with the drop in Yellow-breasted Chat density at this site. We also noted some vegetation clearing and trail maintenance at upper Whitewater Canyon and Thousand Palms Oasis, while Mission Creek appeared the least disturbed. Mission Creek also had the greatest species diversity over the smallest amount of area.

Figure 7. Evidence of recent clearing of tamarisk at Dos Palmas Preserve, with piles of dead tamarisk and wide areas of disturbed open ground.

Whitewater Delta had the strongest increases in shrub and tree cover, as it had been extensively cleared before the surveys in 2004. The clearing in 2004 appeared to be correlated with the disappearance of Least Bell's Vireos. The increase in shrub and tree cover in 2014 has an apparent correlation with the increase in Yellow-breasted Chat density, although the Least Bell's Vireo has not recolonized. However, recent bulldozing was evident along both sides of the relatively narrow strip of riparian vegetation (Figure 8), and this site continues to have a very high abundance of cowbirds.

Figure 8. Evidence of recent bulldozing at Whitewater Delta, adjacent to riparian habitat that has increased since the 2004 surveys, but remains a narrow strip (large willow tree in the background, tamarisk in the foreground).

DISCUSSION

Status of the target riparian bird species in the Coachella Valley

The Coachella Valley has a great variety of riparian habitat, with heterogeneous sites that range from isolated palm oases to wooded canyon streams to the unique Salton Sea, each supporting a different suite of species. A feature shared among all riparian sites is their critical support of a diverse fauna, not only riparian species directly dependent upon them for nesting, but other desert and upland species in the region and also migrating species that all depend on riparian habitat for shelter, foraging, and water, especially during the hot summer months and droughts.

We found that the five target riparian species all persist in the Coachella Valley, but at very low numbers, with population sizes of breeding birds at most of the sites unlikely to be sustainable without frequent recolonization from other regions. In 2014 as in 2002-2004, no Willow Flycatchers were found to be nesting in the Coachella Valley, and all observations were consistent with the northern subspecies (*brewsteri*) passing through in migration. Least Bell's Vireos persisted at 3 sites, but with only 3 territories in Chino Canyon where each of 5 nests found had been parasitized by cowbirds, 1-2 territories at Mission Creek, and 1-2 in lower Whitewater Canyon. The vireo had not been documented at Whitewater Canyon in 2002-2004, and we also surveyed a new area at upper Whitewater Canyon where we found an additional 4 territories. As this site also had no evidence of cowbird parasitism and at least 1 successful vireo nest, it may have good potential for a sustainable population, especially if the extent of riparian habitat increases. The vireo has also been documented at Thousand Palms Oasis and Whitewater Delta, but has not been detected at those sites since 2003. Yellow Warblers have been documented at each site during migration, and only first confirmed nesting at 2 sites during 2014, but with only 1-2 territories at most per site. Yellow-breasted Chats have been documented at each site except Stubbe Canyon, but usually with 1-2 territories at most. Only Dos Palmas Preserve and Whitewater Delta have had larger populations of chats, but that at Dos Palmas Preserve dropped significantly in 2014, possibly because of disturbance and clearing of tamarisk, but also possibly because of the high numbers of Brown-headed Cowbirds. We found a significantly higher number of chats at Whitewater Delta in 2014, but the very high number of cowbirds there is likely preventing successful reproduction. Summer Tanagers appeared to have the most promise for sustainable populations at Stubbe Canyon and Chino Canyon, where at least a few territories have persisted (4-6 at Stubbe Canyon), and we documented nest success at these two sites as well as at Whitewater Canyon.

Brown-headed Cowbirds and other potential threats

It is difficult to gauge the magnitude of effect cowbirds may have had on riparian bird populations in the Coachella Valley since they first spread into the region about 1915. There was an apparent decline in cowbirds in 2014 from 2002-2004, and cowbird numbers vary widely from site to site, with largest numbers at Whitewater Delta and Dos Palmas Preserve. Although no cowbirds were observed at some sites during 2014, they likely occur irregularly at these sites, and the few observed at Chino Canyon were having a very large effect (100% of Least Bell's Vireo nests parasitized). It takes only one female cowbird to have a significant effect on a riparian bird population, and these target species are all susceptible to brood parasitism by the cowbird. The high numbers of cowbirds at Whitewater Delta and Dos Palmas Preserve most likely prevent sufficient reproduction by most riparian birds, and cowbird trapping is likely to be very helpful at those sites for many riparian species. Morrison and Averill-Murray (2002) found a fourfold increase in Bell's Vireo nest success and an increase of 2 - 2.5 times in Yellow-breasted Chat nesting success after cowbird trapping was implemented at sites in Arizona. The differences in cowbird pressure between sites in the Coachella Valley is an interesting factor that warrants further study at the landscape scale. Some of the northerly sites may be farther from cowbird foraging areas, although cowbirds commonly commute 11-18 km daily, as has been recorded by radio-tracking in other regions (Rothstein et al. 1984, Curson et al. 2000). It may also be possible that cowbird pressure varies strongly by year at least at some sites, possibly dipping in years of drought.

Grinnell and Miller (1944) noted the decline in the Least Bell's Vireo beginning about 1930, coinciding with the cowbird's population explosion in California. Trapping of the Brown-headed Cowbird has been an effective method for the recovery of the Least Bell's Vireo in other parts of southern California (Kus 1999, 2002), and is largely responsible for the huge increases in Least Bell's Vireo populations at Anza-Borrego Desert State Park, a region the most comparable to the Coachella Valley. In the last 3 years at ABDSP, total count of male Least Bell's Vireos has continued to rise from 137 in 2012 (at 8 of 13 sites surveyed), to 162 in 2013 (at 10 of 15 sites surveyed), to 176 in 2014 (at 11 of 15 sites surveyed), while the number of cowbirds trapped has varied with effort, but 729 were trapped in 2012, 1079 in 2013, and 99 in 2014 (McDonald and Thériault 2012, Thériault 2014a, Thériault 2014b). Looking at a single site with high comparability, Vallecito Creek near Campbell Grade (Appendix 6), numbers of Least Bell's Vireo territories have risen from 9 in 1998-2001 (Unitt 2004) to 15 in 2012, to 17 in 2013, to 20 in 2014 (McDonald and Thériault 2012, Thériault 2014a, b). Cowbird control is often used as an effective mitigation measure to improve the short-term productivity of endangered host species, and trapping is recommended if baseline studies show that local parasitism rates exceed 20-30% for two or more years (Rothstein et al. 2003, Rothstein and Peer 2005). However, even low rates of nest parasitism can hinder population growth (Uyehara et al. 2000). In areas where cowbirds occur at lower densities, other targeted control measures, such as cowbird egg removal and shooting the few cowbirds that may be resident or regular in the area may be more cost-effective than trapping (Haas and Nordby 2008), and relatively simple because cowbirds are very responsive to broadcasted calls.

The target riparian species are all riparian obligates for nesting in this region, so extent of riparian habitat is a critical limiting factor. Each species also has differing habitat requirements in terms of habitat structure, extent, vegetation composition, and amount of surface water, and each has differing sensitivity to disturbance. Sharp and Kus (2006) compared vegetation structure of various scales around parasitized and unparasitized nests of the Least Bell's Vireo. They found that nests that were unparasitized had significantly higher vegetative cover within 5 meters of the nest location. They recommended maximizing vegetative cover within the riparian understory to limit the ability of cowbirds to find nests. As Yellow-breasted Chats also nest in the riparian understory, maximizing dense riparian understory would help these and other species escape discovery by cowbirds.

Levels of human disturbance at these study sites have been fairly low, but direct effects from traffic, hiking, etc, are not well known. Nest predation is often the primary cause of reproductive failure in birds (Ricklefs 1969, Martin 1993), and may lead to population declines especially when habitat has been fragmented or human activity has led to an increase in predators (Heske et al. 2001). These riparian sites are all fairly well-protected from direct human disturbance, but have a high potential for predator enhancement due to picnicking, and/or from nearby urban areas (corvids, cats, squirrels, ants, variety of small-medium mammals such as fox, coyote, raccoon). Brown-headed Cowbirds may also contribute to nest depredation, either directly through destruction of eggs or nestlings (e.g., Arcese et al. 1995, Hoover and Robinson 2007, Conkling et al. 2012), or indirectly by attracting predators to nests (e.g., Stumpf et al. 2011). Although predator control could pose a management challenge greater than cowbird control, it can be very effective if local predators are identified and either removed or otherwise controlled (Hartway and Mills 2012). Nest cameras can be an effective way to identify nest predators and other threats, even if nests are difficult to locate and monitor (e.g., Hargrove and Unitt 2014). We noted at least 2 Least Bell's Vireo nests that were apparently depredated and observed a pair of Summer Tanagers scolding a Western Scrub-Jay near their nest in Stubbe Canyon, which later appeared to have failed.

Longer-term and larger-scale perspectives

While the Summer Tanager is a relatively new colonist in the Coachella Valley, having spread west of the Colorado River since the 1960s (Unitt 2008), the other target riparian species have all declined in the region steeply. Although historic data from the Coachella Valley are scarce, declines from the broader region are well-documented (Shuford and Gardali 2008), leading to these species being listed by the state of California as species of special concern. Even for the Summer Tanager, large populations have declined precipitously, especially along the Colorado River, with the total known California population now “little if any over 100 pairs” (Unitt 2008). The recent San Jacinto Centennial Resurvey Project (SDNHM 2014) is providing additional insight into local declines over the past 100 years by resurveying 20 sites in and around the San Jacinto Mountains that were first thoroughly surveyed in 1908 (Grinnell and Swarth 1913). Unfortunately, only 4 of the sites visited during the 1908 surveys occur within the CVMSCHP boundaries (Cabazon along the San Gorgonio River at and below Twin Pines Creek, Snow Creek, Palm Canyon at its mouth plus a brief visit to Andreas Canyon, and Palm Canyon at middle elevations near Little Paradise between elevations 2400-3000’), but the resurveys of these sites plus other sites from the wider region provide the best available historic comparisons. During spring migration in 1908, Willow Flycatchers were observed on 23 of 68 field days (33%), whereas during the same interval 2008-2014 we observed it on only 5 of 40 field days (13%). The Least Bell’s Vireo has declined at or is absent from 5 of 5 sites where it was formerly common (including Cabazon, Palm Canyon, and Little Paradise). The Bell’s Vireo was so common in 1908 that Taylor called it “our old standby,” and at Cabazon, where it is now absent, he wrote that its “abundance seems remarkable”. At the mouth of Palm Canyon Grinnell and Swarth described the vireo as “common” with “several pair” noted at Little Paradise. At each of these two Palm Canyon sites we found only a single singing male, not present each year. Four specimens collected in 1918 and 1919 at or near Palm Springs (DMNH, LACM) attest to the species’ former occurrence at the mouth of Tahquitz Canyon as well, where it was not found during our resurveys there in June 2011. It also occurred at Mecca where Taylor noted it over the course of several days “Least Vireos were singing in the brush near the brooks south of town” (17 April 1908, Walter P. Taylor field notes http://bscit.berkeley.edu/mvz/volumes.html). The Yellow Warbler has declined as both a migrant and a breeding species, now being absent from 5 to 7 sites where it formerly bred (including Cabazon). The Yellow-breasted Chat is absent from 2 of 2 sites where it formerly bred (Cabazon and Andreas Canyon).

Thus, each of the target riparian bird species have declined in California, and each except the Summer Tanager has declined in the Coachella Valley, with strongest declines documented for the Least Bell’s Vireo. At neighboring Anza-Borrego Desert State Park where Least Bell’s Vireo numbers have greatly increased in conjunction with cowbird trapping, we roughly estimate an average territory density of 0.19 males per acre (based on survey data from the sites Middle Willows, Lower Willows, Upper San Felipe, Lower San Felipe, Vallecito Campbell Grade, and Vallecito Cienaga mapped during 2013; Thériault 2014a). Using the same estimation procedure for Chino Canyon in 2014 (and excluding available habitat above the tram and below the cienaga), Least Bell's Vireo territory density was approximately 0.08 males per acre (Appendix 6)—the highest density we found. This suggests that, with the introduction of cowbird control, Least Bell's Vireo territory density could potentially at least double in the Coachella Valley, even without any increase in available riparian habitat. Elsewhere, Least Bell's Vireo territory density can be even greater, as much as 2.8 territories per ha [1.1 males per acre] along portions of the San Luis Rey River (Kus 1988, Kus 2002).

Although these target species clearly warrant focused study and management, it is important to consider the importance of riparian habitat to other riparian, non-riparian, and migratory species in the region. Even in the absence of the target species, which could decline because of larger-scale factors outside of the Coachella Valley, the quality and extent of riparian habitat need to be monitored, and other riparian species that are more common, such as the Song Sparrow and Common Yellowthroat, and the avian community as a whole, may serve as indicators of high-quality riparian habitat. Riparian habitat also offers potential for colonization by other sensitive species. A Yellow-billed Cuckoo was at Whitewater Canyon 8-9 July (reported by Frank Sterrett and Mark Leggett 8 July and by Julie Szabo and Bill Moramarco 9 July via inlandcountybirds and ebird). Although rare, this observation falls within the period of sightings typical for southern California (Clark et al. 2014). The cuckoos formerly bred commonly in riparian habitats in southern California, including the Santa Ana River at Colton, but now are restricted to two known nesting sites: the Lower Colorado River and South Fork of the Kern River. Nearest areas with cuckoo sightings since 2000 include 4 sightings at Big Morongo Canyon Preserve, 7 sightings along the New River in Imperial County, and 11 sightings along San Felipe Creek in San Diego County.

Monitoring strategies

Analysis of changes in the abundance and distribution of the target riparian species over 12 years was limited by the scarcity of the birds. Thus territory-level monitoring is essential, for tracking numbers of birds, for identifying threats to reproductive success, and for monitoring the effectiveness of any management. Territory mapping and monitoring can be done with little effort additional to the point-count surveys and/or in a targeted approach in conjunction with management.

Point-count surveys are most useful for tracking the abundance of common species and assemblages of species and are thus of high value for long-term riparian monitoring. Laser rangefinders are helpful in estimating distances, so that distance categories can be binned as appropriate for each species. Advances in distance sampling analysis are now allowing for complex modeling of covariates that may affect both the abundance (such as critical habitat features) and the probability of detection of birds (such as observer, weather, habitat structure), even in the face of open populations that may vary with repeated surveys (Chandler et al. 2011). The surveys' timing, however, should be carefully controlled for better comparisons between years and sites. Timing of the arrival and nesting of breeding populations vs. timing of migratory populations of the target species are highly heterogeneous (Figure 9). To allow for 3 repeat surveys within a season, discrimination between breeding and migratory populations, and comparison to previous years, ideal survey windows are late May, early to mid-June, and late June to mid-July.

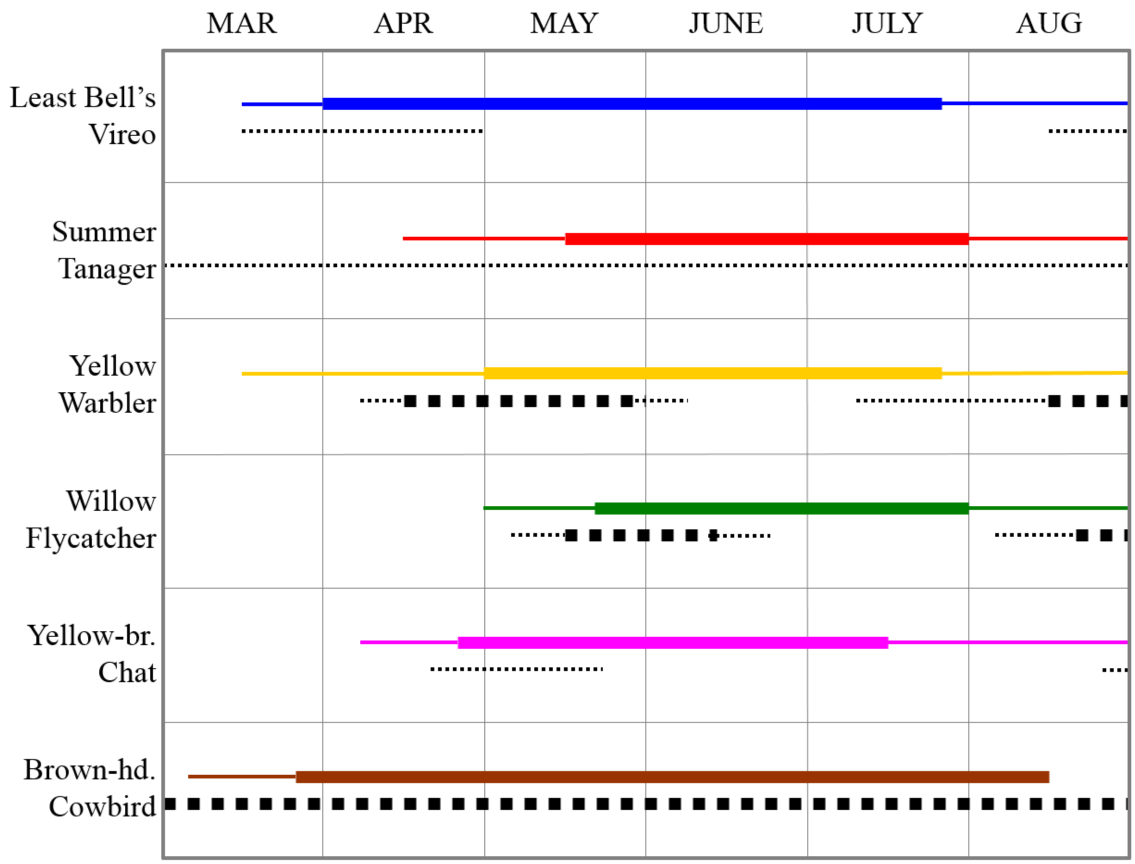


Figure 9. Expected timing of breeding and migrating populations of the target species within the region (Patten et al. 2003, Unitt 2004). Thin colored lines represent earliest arrival and departure, thick colored lines first egg-laying to latest fledging, thin dotted black lines rare migrants, and thick dotted black lines common migrants.

Even with controlled surveys and improved modeling techniques, density estimates should probably always be viewed as an index of abundance, as it is difficult to control for the heterogeneity of riparian habitat, differences in detectability by species, and the variability of migration. Although use of double observers increases detections, there is always a limit to power when there are simply too few birds present. Any extra effort with additional team members is better spent on territory/nest monitoring and/or coverage of additional sites. Other riparian sites in the Coachella Valley such as Snow Creek and the Indian Canyons are important to include in long-term monitoring, especially given the heterogeneity of riparian sites. Haas and Nordby (2008) surveyed the Indian Canyons in 2005-2006, and found Least Bell's Vireos nesting most consistently at Andreas Canyon (2-3 territories) where 8 of 14 nests were parasitized by cowbirds over the 2 years.

Conclusion

In comparison to their historic levels, very few target riparian birds persist in the Coachella Valley, but given that these are rare species that have undergone significant declines due to habitat loss and other human-influenced causes, the small populations within the Coachella Valley represent an important component of their California populations. These species face many threats in the Coachella Valley currently, but despite these threats, they appear to have persisted over the past 10 years. However, it is unknown to what extent these are persisting, self-sustaining populations, or, more likely, recolonizations from other regions. In nearby regions, some populations have increased to sustainable levels thanks to management, suggesting that the Coachella Valley also has the potential to support much larger populations of riparian birds. Given constraints in riparian extent and quality, however, it is difficult to estimate the capacity to which larger population sizes and densities may be supported. Some increases in territory density are very likely with cowbird management, and some sites have the potential for wider riparian habitat and thicker undergrowth. A greater extent and quality of riparian habitat will benefit not only the target species but ***all*** species in the Coachella Valley, especially through the hot summers and drought years. Although it is difficult to test the effectiveness of management given the scale and complexity of the system, there are several approaches that lead to direct and obvious benefits or have been demonstrated successful in other regions. First and foremost is the reversal of riparian habitat loss and degradation, which includes the reduction of groundwater pumping and diversion, and prevention of large-scale removal of riparian habitat. Second is the identification and reduction of any major stressors, especially human-influenced stressors that can be relatively easily managed. We have identified the Brown-headed Cowbird as likely having a major negative impact on riparian bird species in the Coachella Valley, especially at the south end at Whitewater Delta and Dos Palmas Preserve, but also likely at any other riparian sites that are within the range of the cowbird’s long flights to its foraging sites. These riparian sites include Chino Canyon, where we saw very few cowbirds but documented 100% nest parasitism of its few Least Bell’s Vireos. Thus cowbird control is likely to have ample benefits to riparian species at all sites. Even if the boost from management is temporary, larger populations have greater chances to adapt to their changing environments, and can colonize and occupy a wider variety of sites. With greater awareness of the value of riparian habitat, and increasing conservation and restoration efforts, targeted management can prove highly beneficial and cost-effective, allowing riparian species and habitat to thrive in the Coachella Valley.

Management recommendations

Target goals will need to be set, given careful consideration of the constraints of available riparian habitat and restoration capacity. At a minimum, we believe that cowbird management alone could easily double the number of Least Bell’s Vireo territories and increase other riparian bird populations, and any efforts to expand the area of available riparian habitat and/or allow thicker undergrowth would increase the capacity for larger population sizes. Although expansion of riparian habitat may be constrained by the repeated burning of watersheds, lowered water tables, drought, and conflicting management needs, any efforts toward conservation and expansion of riparian habitat and/or undergrowth will likely benefit multiple species. Efforts may be most fruitful at Stubbe Canyon (through cattle removal), Whitewater Canyon (through continued protection and trail improvements in the upper canyon), and Whitewater Delta (through widening of the channel). The Least Bell's Vireo serves as a good indicator species, because its nests are relatively easy to find and it is both prone to cowbird parasitism and responsive to cowbird control. (Or other proxy species may be used.) The following management recommendations would greatly benefit multiple species.

1. Urgent cowbird control is needed in conjunction with intensive monitoring over the near short-term. We recommend a combination of three approaches:

    (A) trapping at sites where there is a high abundance of cowbirds (Whitewater Delta and Dos Palmas Preserve)—Short-term goal: over 3 years, reduce parasitism rates to half of baseline level in the general bird community.

    - Cowbird trapping strategy: Minimally 2 traps at Whitewater Delta, 1 at the gate and 1 next to the levee halfway to the sea. At Dos Palmas Preserve, 1 trap near the southern end might be sufficient because cowbirds appear to commute from the south. At least 3 consecutive years of trapping with monitoring to estimate changes in reproductive success. (Although this is difficult for the Yellow-breasted Chat because its nests are difficult to find, the number of cowbird fledglings can easily be monitored, and other species such as the Black-tailed Gnatcatcher which were heavily parasitized can serve as a proxy.) Over 3 years there should be a steep drop in parasitism rates. For recolonization of the Least Bell's Vireo, it would require a vastly reduced cowbird presence and nest monitoring with removal of cowbird eggs.

    (B) targeted control at sites with fewer cowbirds as needed (minimally, egg-removal at Chino Canyon, consider shooting cowbirds)—Short-term goal: over 3 years, reduce parasitism rates to half of baseline level for Least Bell's Vireo.

    (C) territory-level monitoring in conjunction with cowbird control—Short-term goal: over 3 years, increased reproductive success of Least Bell's Vireos.

2. Monitor the quality and extent of riparian habitat for conservation through more detailed vegetation measurements and GIS, and surface water surveillance.

3. Efforts to improve/restore riparian habitat tailored by site:
    - Chino Canyon: targeted cowbird control, continued restricted access to the cienaga, preference for parking lots that allow a buffer between the parking lot and the riparian zone.
    - Stubbe Canyon: urgent need for cattle removal, gradual efforts to reduce invasive species over the longer-term, narrowness of the canyon favors the prevention or limitation of any trails or roads.

- Whitewater Canyon: protect riparian habitat through better trail maintenance (allowing access restricted to trails, designated picnic areas, etc). As vireo nests were directly adjacent to trails where they could be disturbed by the public, annual monitoring of vireo nest locations would identify areas where trails should be re-routed or temporarily closed.
- Mission Creek: avoid any trails in the existing riparian habitat due to its limited extent and high diversity, encourage riparian growth along the stream with access limited to trails.
- Thousand Palms Oasis: continued efforts toward improved trails with access restricted to trails and designated picnic areas; also encourage riparian growth in protected areas.
- Dos Palmas Preserve: alternate tamarisk removal efforts (e.g., one-third of preserve every third year), and encourage growth of riparian habitat in protected areas. Additional cottonwood and willow would favor recolonization by chats, and possible colonization by the Yellow Warbler and Least Bell's Vireo.
- Whitewater Delta: Limit the removal of riparian vegetation and instead allow widening of the riparian corridor. This would be very beneficial not only to the riparian habitat and birds but can be designed to improve flood protection and water infiltration (potentially helping with water recharge and avoiding salt leaching into ground water). Other successful river restorations are underway in urban areas, with high public support when combined with improved access (hiking/biking trails). Denser and wider riparian scrub would provide greater opportunities for riparian birds to avoid parasitism by cowbirds (which favor edges) and would also expand suitable habitat for the Crissal Thrasher.

4. Riparian bird monitoring over longer-term (at least once every 5 years) —continue with established methods, but additionally:

    (A) territory mapping and nest monitoring for target species—Long-term goal (10 years): double the number of territories of Least Bell's Vireo, and maintain or increase the number of territories of Yellow Warbler, Yellow-breasted Chat, and Summer Tanager.

    (B) include non-target species in point counts—Long-term goal (10 years): Positive trend in riparian bird community.

    (C) include other riparian sites if possible, such as Snow Creek and the Indian Canyons (this increases the available sample size and allows more power to analyze differences in habitat, landscape factors, management effects, etc).

5. Future research needed:
    - Wind mills: Extent of avian mortality due to wind mills, research to identify most heavily used corridors, better designs.
    - Annual and spatial variation in cowbirds, landscape factors.

- Movements of riparian birds between sites and possible source/sink dynamics (e.g., Least Bell's Vireos at Chino Canyon vs. Whitewater Canyon, extent of recolonization). Although such studies are not currently feasible because of low population sizes, if population sizes increase, they may reach a level making color-banding and other studies worthwhile.
- Riparian bird use of urban areas and golf courses vs. riparian preserves.
- Better understanding of subspecies in the region and contact zones for long-term promotion of evolutionary potential and diversity (e.g., Bell's Vireo, Song Sparrow, Common Yellowthroat, Ladder-backed/Nuttall's Woodpecker, Abert's/California Towhee, California/Gambel's Quail).

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Appendix 1. List of all 68 bird-count points, each of which was surveyed 3 times during 2014.

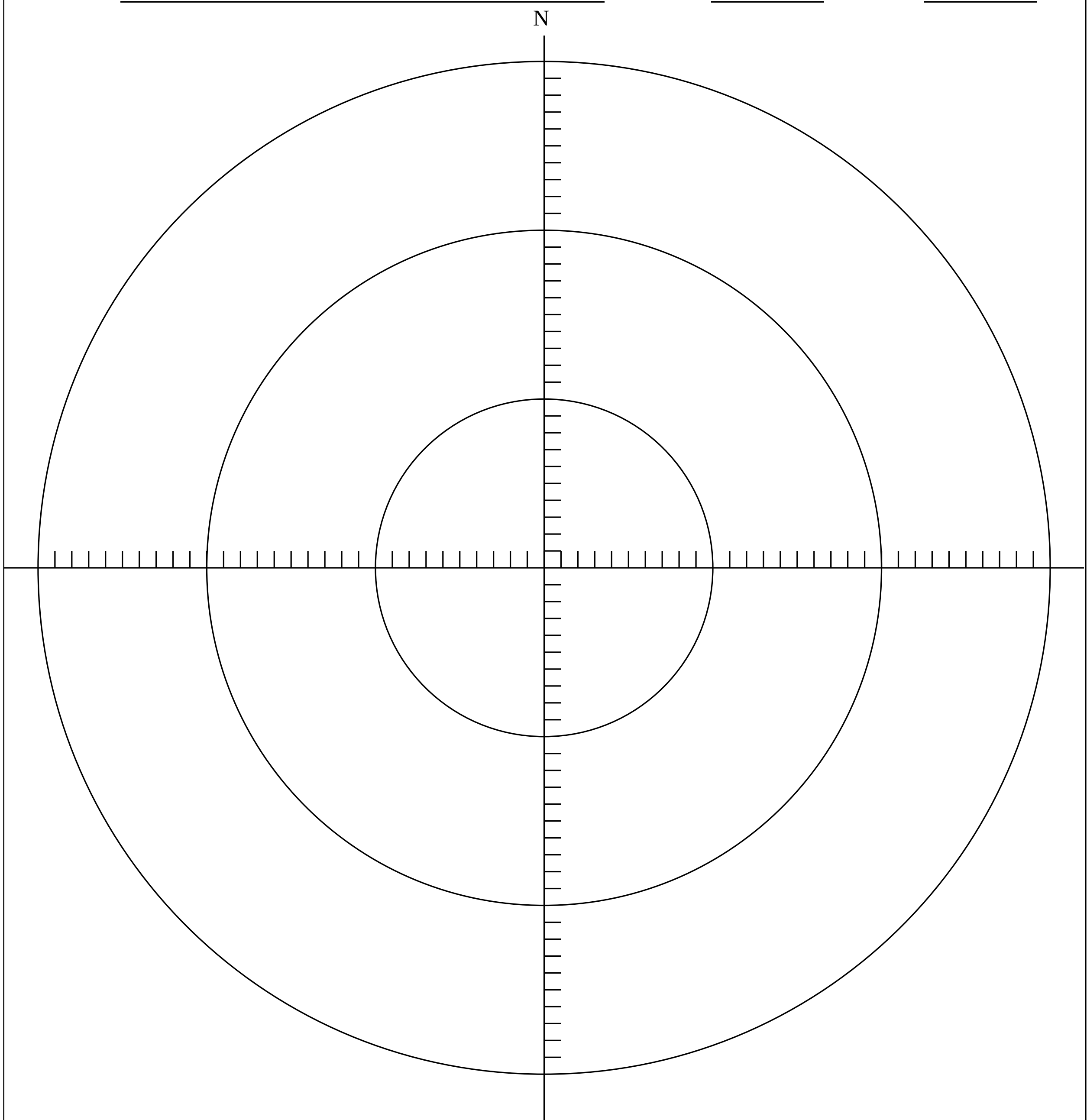
Site	Point	N	W
Chino Canyon: Aerial Tram	AT1	33.83957	-116.61346
	AT2	33.84107	-116.61228
	AT3	33.84223	-116.61058
	AT4	33.84311	-116.60847
Chino Canyon: Cienaga	CC1	33.84253	-116.60375
	CC2	33.84176	-116.60179
	CC3	33.84307	-116.60041
	CC4	33.84418	-116.60235
	CC5	33.84380	-116.60492
	CC6	33.84401	-116.59756
Dos Palmas Spring (and Andreas Oasis)	DP1	33.50736	-115.82591
	DP2	33.50199	-115.83004
	DP3	33.49635	-115.83034
	DP4	33.49595	-115.82824
	DP5	33.50146	-115.82729
	DP6	33.49958	-115.82594
	DP7	33.50417	-115.82586
	DP8	33.50904	-115.82768
	DP9	33.50527	-115.83030
	DP10	33.50008	-115.82995
	AO1	33.49371	-115.84908
	AO2	33.49631	-115.85074
Mission Creek	MCR1	34.01217	-116.62514
	MCR2	34.01152	-116.62306
	MCR3	34.00978	-116.62458
Stubbe Canyon	SC1	33.96137	-116.72287
	SC2	33.96378	-116.72388
	SC3	33.96560	-116.72296
	SC4	33.96742	-116.72228
	SC5	33.96855	-116.72012
	SC6	33.97006	-116.72145
	SC7	33.95887	-116.72191
	SC8	33.95921	-116.72404
	SC9	33.95973	-116.72634
	SC10	33.95726	-116.72286
	SC11	33.95551	-116.72336
	SC12	33.96126	-116.72795
Thousand Palms Oasis	TPO1	33.83586	-116.31073

Site	Point	N	W
	TPO2	33.83756	-116.31024
	TPO3	33.83942	-116.31103
	TPO4	33.84116	-116.31167
	TPO5	33.84737	-116.31314
	TPO6	33.83406	-116.31116
Whitewater Canyon	WWC01	33.94775	-116.64057
	WWC02	33.94946	-116.64122
	WWC1	33.95158	-116.64170
	WWC2	33.95314	-116.64107
	WWC3	33.95385	-116.64313
	WWC4	33.95527	-116.64180
	WWC5	33.95680	-116.64291
	WWC6	33.95785	-116.64419
	WWC7	33.95932	-116.64573
	WWC8	33.96072	-116.64666
	WWC9	33.96240	-116.64758
	WWC10	33.96397	-116.64849
Whitewater Delta	WWD1	33.50779	-116.05729
	WWD2	33.51069	-116.06094
	WWD3	33.51325	-116.06414
	WWD4	33.51598	-116.06737
	WWD5	33.51848	-116.07052
	WWD6	33.52100	-116.07355
	WWD7	33.50643	-116.05523
	WWD8	33.50925	-116.05914
	WWD9	33.51197	-116.06256
	WWD10	33.51463	-116.06577
	WWD11	33.51724	-116.06894
	WWD12	33.51975	-116.07202
	WWD13	33.52222	-116.07520

Appendix 2. Point count form used during the 2014 surveys.

Point Count Mapping Form

Site ________________________________ Date ______________ Observer _______________________
Weather ____
Point ID ____ Time Start _________ Time End _________



Notes: ____
____

Super: V=visual, S=song, C=call
Sub: B=before, 1=0-3 min, 2=3-5 min, 3=5-7 min, 4=7-10 min, A=after.
Tick=5m. Rings=50,100,150m.

Appendix 3. Nest monitoring form used during the 2014 surveys.

NEST MONITORING FORM

NEST ID ______ DATE ______ SITE ______

SPECIES ______ METHOD ______

SUBSTR ______ APX NEST HEIGHT ______ APX SUBST HEIGHT ______

DIRECTIONS/NOTES

SKETCH

Rem to note: apx distance and direction of nest from flagging, flagging height and substrate, coordinates of flagging, nest visibility, how flagging should be approached, draw arrow to nest in sketch, only note contents if known, always note if adult on nest, flushed, etc.

DATE	TIME	INITS	TTL EGGS	CB	TTL NESTL	CB	ACTIONS, OBSERVATIONS, and NOTES (OK to use multiple lines)

Especially note all evidence of possible depredation or fledging: nest damage, fragments below nest, tracks, distance of FL to nest, #, age of and adult behavior. Also note description/age of nestlings. CB=# cowbird eggs or nestlings out of total. Note if photographs taken.

Appendix 4. Rapid habitat assessment form used during the 2014 surveys.

RIPARIAN HABITAT RAPID ASSESSMENT FORM

Point ID:_________________________ Date:__________ Observer: __________

SURFACE WATER	grade (0-3)	Description (distance from point; amount; flowing/standing/surface moisture)

	N	S	E	W
DENSIOMETER READINGS AT POINT (record points NOT occupied by veg); OR PHOTO				

DOMINANT RIPARIAN SPECIES (trees, shrubs >20%)	% total coverage in riparian habitat	Avg. height (m)	Notes/other species:
1)			
2)			
3)			
4)			

DESCRIPTION OF RIPARIAN HABITAT	Apx. total width	Apx. total length	% of 50m circle

HUMAN ACTIVITY	grade (0-3)	Description (recent/old activity; extent; in/near habitat)
trash/litter		
damaged/removed vegetation		
vehicle tracks/presence		
paved roads/structures		
human footprints/presence		
other (describe)		

OTHER DISTURBANCES	grade (0-3)	Description (recent/old damage; extent; in/near habitat)
cattle tracks/presence		
flood damage		
fire damage		
other (describe)		

INVASIVE NON-NATIVES	grade (0-3)	Description (species; extent; in/near habitat)
tamarisk		
arundo		
fountain grass		
other shrubs and trees		
other grasses and herbs		

LANDSCAPE (other habitat types <50m; known habitat types and disturbances 50m-1km; description):

OTHER NOTES:

(grades: 0=absent, 1=low significance or small amount, 2=moderate significance or amount, 3=large significance or amount)

Appendix 5. List of all bird species observed at 7 sites with notes including breeding confirmations, 2014.

Scientific Name	Common Name	CC	DP	MCR	SC	TPO	WWC	WWD	Notes
Podilymbus podiceps	Pied-billed Grebe		X				X	X	
Phalacrocorax auritus	Double-crested Cormorant							X	nests (WWD)
Pelecanus erythrorhynchos	American White Pelican							X	
Pelecanus occidentalis	Brown Pelican							X	
Ardea herodias	Great Blue Heron		X					X	
Ardea alba	Great Egret		X					X	
Egretta thula	Snowy Egret							X	
Butorides virescens	Green Heron							X	
Nycticorax nycticorax	Black-crowned Night-Heron							X	
Botaurus lentiginosus	American Bittern							X	
Ixobrychus exilis	Least Bittern		X						
Cathartes aura	Turkey Vulture		X			X		X	
Anas platyrhynchos	Mallard							X	
Anas cyanoptera	Cinnamon Teal		X						
Pandion haliaetus	Osprey		X						
Circus cyaneus	Northern Harrier							X	
Accipiter cooperii	Cooper's Hawk			X	X		X		fledgling MCR (6/14/14)
Buteo lineatus	Red-shouldered Hawk	X					X		
Buteo jamaicensis	Red-tailed Hawk		X	X	X	X	X		juvenile WWC (6/28/14), harassed by Common Raven at TPO (6/27/14)
Falco sparverius	American Kestrel	X	X	X	X	X	X		
Falco peregrinus	Peregrine Falcon						X	X	
Callipepla californica	California Quail	X			X		X		fledglings WWC (5/21/14)

Scientific Name	Common Name	CC	DP	MCR	SC	TPO	WWC	WWD	Notes
Callipepla gambelii	Gambel's Quail		X	X		X		X	fledglings MCR (5/21/14), TPO (5/27/14, 6/27/14)
Fulica americana	American Coot		X					X	
Tringa melanoleuca	Greater Yellowlegs		X						
Actitis macularius	Spotted Sandpiper						X		
Numenius americanus	Long-billed Curlew							X	
Charadrius vociferus	Killdeer		X				X	X	
Hydroprogne caspia	Caspian Tern							X	
Columba livia	Rock Pigeon		X					X	
Patagioenas fasciata	Band-tailed Pigeon				X				
Streptopelia decaocto	Eurasian Collared-Dove		X		X	X	X	X	
Zenaida macroura	Mourning Dove	X	X	X	X	X	X	X	distraction display SC (6/29/14)
Zenaida asiatica	White-winged Dove		X	X		X	X	X	
Columbina passerina	Common Ground Dove							X	
Geococcyx californianus	Greater Roadrunner		X	X	X		X	X	
Bubo virginianus	Great Horned Owl	X			X			X	
Chordeiles acutipennis	Lesser Nighthawk		X	X		X	X	X	
Aeronautes saxatalis	White-throated Swift	X	X	X	X	X	X		
Archilochus alexandri	Black-chinned Hummingbird	X	X						
Calypte anna	Anna's Hummingbird				X		X		
Calypte costae	Costa's Hummingbird	X	X	X	X	X	X		
Picoides nuttallii	Nuttall's Woodpecker	X		X	X		X		fledgling CC (5/16/14)
Picoides scalaris	Ladder-backed Woodpecker		X	X		X			

Scientific Name	Common Name	CC	DP	MCR	SC	TPO	WWC	WWD	Notes
Colaptes auratus	Northern Flicker				X		X		
Contopus cooperi	Olive-sided Flycatcher		X	X			X		
Contopus sordidulus	Western Wood-Pewee	X	X		X		X	X	
Empidonax traillii	Willow Flycatcher		X	X	X	X	X	X	see detailed notes in report
Empidonax hammondii	Hammond's Flycatcher	X							
Empidonax difficilis	Pacific-slope Flycatcher	X	X	X	X		X	X	
Sayornis saya	Say's Phoebe		X			X		X	
Sayornis nigricans	Black Phoebe	X	X		X	X	X		
Myiarchus cinerascens	Ash-throated Flycatcher	X	X	X	X		X	X	
Myiarchus tyrannulus	Brown-crested Flycatcher		X	X			X		pair MCR (5/30/14)
Tyrannus vociferans	Cassin's Kingbird			X					
Tyrannus verticalis	Western Kingbird	X	X		X			X	fledglings WWD (7/7/14)
Lanius ludovicianus	Loggerhead Shrike	X	X	X		X	X	X	
Vireo bellii	Bell's Vireo	X		X			X		see detailed notes in report
Vireo huttoni	Hutton's Vireo	X			X				
Vireo gilvus	Warbling Vireo	X	X	X	X			X	
Aphelocoma californica	Western Scrub-Jay			X	X		X		
Corvus corax	Common Raven	X	X	X	X	X	X	X	harassing Red-tailed Hawk TPO (6/27/14)

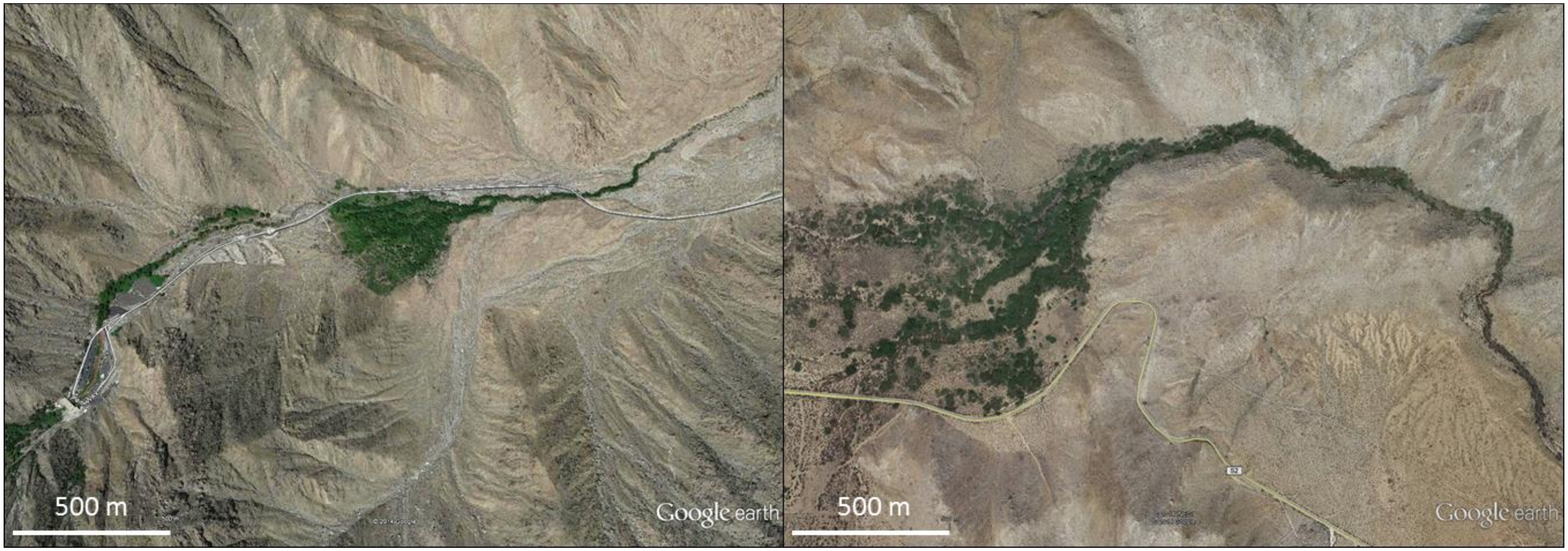
Scientific Name	Common Name	CC	DP	MCR	SC	TPO	WWC	WWD	Notes
Phainopepla nitens	Phainopepla	X	X	X	X	X	X		"100s" MCR (5/21/14); nest with nestlings CC (5/16/14); fledglings CC (5/26/14), SC (6/8/14)
Sialia mexicana	Western Bluebird				X				occupied nest SC (5/22/14)
Catharus ustulatus	Swainson's Thrush	X	X	X	X		X		
Catharus guttatus	Hermit Thrush				X		X		
Mimus polyglottos	Northern Mockingbird		X	X			X	X	
Toxostoma redivivum	California Thrasher			X	X		X		
Toxostoma crissale	Crissal Thrasher							X	pair with possible fledgling WWD (6/23/14)
Campylorhynchus brunneicapillus	Cactus Wren		X	X	X	X			nest-building TPO (6/14/14); carrying food TPO (6/27/14); nest SC (5/21/14)
Salpinctes obsoletus	Rock Wren	X		X	X		X		fledglings SC (6/8/14)
Catherpes mexicanus	Canyon Wren				X				fledglings SC (6/29/14)
Cistothorus palustris	Marsh Wren		X					X	fledglings DP (7/6/14)
Thryomanes bewickii	Bewick's Wren	X	X	X	X	X	X	X	
Troglodytes aedon	House Wren	X		X	X		X	X	nest with nestlings SC (5/22/14)
Auriparus flaviceps	Verdin	X	X	X	X	X	X	X	fledglings WWD (6/23/14, 7/7/14), juvenile TPO (6/27/14)
Polioptila caerulea	Blue-gray Gnatcatcher	X							

Scientific Name	Common Name	CC	DP	MCR	SC	TPO	WWC	WWD	Notes
Polioptila melanura	Black-tailed Gnatcatcher	X	X	X		X		X	fledglings DP (7/6/14), WWD (6/23/14), MCR (5/21/14), TPO (6/27/14); feeding cowbird fledgling WWD (6/2/14, 6/23/14)
Baeolophus inornatus	Oak Titmouse				X				
Psaltriparus minimus	Bushtit	X		X	X	X	X		
Stelgidopteryx serripennis	Northern Rough-winged Swallow		X		X	X	X	X	
Hirundo rustica	Barn Swallow		X						
Petrochelidon pyrrhonota	Cliff Swallow		X					X	
Chamaea fasciata	Wrentit	X		X	X		X		
Spinus psaltria	Lesser Goldfinch	X	X	X	X		X		nest building SC (5/22/14); nest with eggs SC (5/22/14); nest with nestlings WWC (5/21/14); fledglings CC (6/22/14), SC (6/8/14)
Spinus lawrencei	Lawrence's Goldfinch	X		X	X		X		fledglings SC (6/8/14)
Haemorhous mexicanus	House Finch	X	X	X	X	X	X	X	nest building SC (5/22/14); occupied nest SC (5/22/14); nest with nestlings SC (5/22/14); fledglings CC (5/16/14, 6/22/14), SC (5/22/14)
Melospiza melodia	Song Sparrow	X	X	X			X	X	fledglings CC (6/22/14)

Scientific Name	Common Name	CC	DP	MCR	SC	TPO	WWC	WWD	Notes
Spizella atrogularis	Black-chinned Sparrow	X					X		fledglings CC (5/31/14, 6/7/14)
Chondestes grammacus	Lark Sparrow				X		X		
Amphispiza bilineata	Black-throated Sparrow	X	X		X	X	X		fledglings WWC (6/16/14), CC (6/22/14), juveniles CC (7/13/14)
Aimophila ruficeps	Rufous-crowned Sparrow	X			X				
Pipilo chlorurus	Green-tailed Towhee						X		
Pipilo maculatus	Spotted Towhee	X		X	X		X		
Melozone crissalis	California Towhee	X		X	X		X		carrying food CC (5/16/14)
Melozone aberti	Abert's Towhee		X					X	fledglings DP (7/6/14)
Oreothlypis celata	Orange-crowned Warbler			X					
Setophaga petechia	Yellow Warbler	X	X	X	X	X	X	X	see detailed notes in report
Setophaga townsendi	Townsend's Warbler		X				X		
Geothlypis tolmiei	Macgillivray's Warbler		X	X					
Geothlypis trichas	Common Yellowthroat	X	X	X		X	X	X	fledglings DP (6/1/14, 7/6/14), WWD (6/23/14)
Cardellina pusilla	Wilson's Warbler	X	X		X	X	X	X	
Icteria virens	Yellow-breasted Chat	X	X	X			X	X	see detailed notes in report
Piranga rubra	Summer Tanager	X		X	X		X		see detailed notes in report
Piranga ludoviciana	Western Tanager	X	X	X	X		X		

Scientific Name	Common Name	CC	DP	MCR	SC	TPO	WWC	WWD	Notes
Pheucticus melanocephalus	Black-headed Grosbeak	X	X	X	X		X		
Passerina caerulea	Blue Grosbeak	X			X		X	X	carrying food WWC (6/28/14)
Passerina amoena	Lazuli Bunting	X			X		X		
Passerina cyanea	Indigo Bunting			X					singing male MCR (5/26/14, 6/14/14, 6/27/14)
Icterus cucullatus	Hooded Oriole	X			X	X	X	X	fledglings WWC (6/16/14), carrying food CC (5/15/14)
Icterus bullockii	Bullock's Oriole	X	X		X		X	X	nest building SC (6/8/14); fledglings WWD (7/7/14)
Icterus parisorum	Scott's Oriole	X							
Xanthocephalus xanthocephalus	Yellow-headed Blackbird		X					X	
Agelaius phoeniceus	Red-winged Blackbird		X				X	X	fledglings WWC (6/16/14)
Quiscalus mexicanus	Great-tailed Grackle		X			X	X	X	
Molothrus ater	Brown-headed Cowbird	X	X					X	see detailed notes in report
Total # bird species		**52**	**64**	**50**	**56**	**30**	**66**	**59**	

Appendix 6. Comparison of Chino Canyon (left) to Vallecito Creek near Campbell Grade, San Diego County (right). These two sites have some similarity in geography and riparian habitat. Numbers of Least Bell's Vireo territories at Campbell Grade have risen in recent years, from 9 in 1998-2001 (Unitt 2004) to 15 in 2012, to 17 in 2013, to 20 in 2014 (McDonald and Thériault 2012, Thériault 2014a, b). Numbers at Chino Canyon remained static from 2002 to 2014 (Figure 4C). Based on mapped territories, we roughly estimate a territory density of 0.19 males per acre at Vallecito Creek near Campbell Grade in 2013, compared to 0.08 males per acre at Chino Canyon in 2014.



Appendix 3
Table of Acquisitions for Conservation in 2014

Conservation Area	Acquisition Made By	Total Acres
Dos Palmas	**Friends of the Desert Mountains**	**1158**
	731050002	42
	731050005	55
	731050008	156
	731050012	12
	731080001	310
	733210003	159
	733230002	241
	733230003	81
	733230005	101
	Coachella Valley Conservation Commission	**31**
	733080005	20
	733260004	11
Dos Palmas Total		**1188**

Conservation Area	Acquisition Made By	Total Acres
Desert Tortoise and Linkage	**Coachella Valley Conservation Commission**	**123**
	709370006	123
Desert Tortoise and Linkage Total		**123**

Conservation Area	Acquisition Made By	Total Acres
Edom Hill	**Friends of the Desert Mountains**	**29**
	659160002	5
	659160006	5
	659160007	5
	659170001	5
	659170002	5
	659170003	5
Edom Hill Total		**29**

Conservation Area	Acquisition Made By	Total Acres
Highway 111/I-10	**Coachella Valley Conservation Commission**	**1**
	522080005	1
Highway 111/I-10 Total		**1**

Conservation Area	Acquisition Made By	Total Acres
Indio Hills/Joshua Tree National Park Linkage	**Friends of the Desert Mountains**	**65**
	647190002	40
	741110004	5
	741110005	5
	741110007	5
	741110010	5
	741110011	5
Indio Hills/Joshua Tree National Park Linkage Total		**65**

Conservation Area	Acquisition Made By	Total Acres
Joshua Tree National Park	**Friends of the Desert Mountains**	**309**
	707180001	153
	707190001	100
	707190008	56
Joshua Tree National Park Total		**309**

Conservation Area	Acquisition Made By	Total Acres
Mecca Hills/Orocopia Mountains	**Friends of the Desert Mountains**	**263**
	709420012	10
	709540011	40
	717120007	10
	717170002	40
	719090045	10
	721050003	40
	721050005	20
	721050006	10
	721050008	41
	721060007	41
	Coachella Valley Conservation Commission	**5**
	719090070	5
Mecca Hills/Orocopia Mountains Total		**268**

Conservation Area	Acquisition Made By	Total Acres
Stubbe and Cottonwood Canyons	**Friends of the Desert Mountains**	**13**
	520030010	5
	520060014	3
	520060016	5
Stubbe and Cottonwood Canyons Total		**13**

Conservation Area	Acquisition Made By	Total Acres
Santa Rosa and San Jacinto Mountains	**Friends of the Desert Mountains**	**486**
	635030011	163
	636091006	1
	636091007	1
	636091014	1
	755050007	80
	755050009	160
	755050011	80
	Friends of the Palm Springs Mountains	209
	505020029	153
	505020030	35
	505020031	20
Santa Rosa and San Jacinto Mountains Total		**694**

Conservation Area	Acquisition Made By	Total Acres
Thousand Palms	**Coachella Valley Conservation Commission**	**50**
	648170005	5
	648180019	5
	648220023	5
	651040006	10
	651040007	11
	651140030	5
	695120003	10
Thousand Palms Total		**50**

Conservation Area	Acquisition Made By	Total Acres
Upper Mission Creek/Big Morongo Canyon	**Coachella Valley Conservation Commission**	**5**
	516120047	5
Upper Mission Creek/Big Morongo Canyon Total		**5**

Conservation Area	Acquisition Made By	Total Acres
West Deception Canyon	**Friends of the Desert Mountains**	**80**
	645350010	40
	645350012	40
West Deception Canyon Total		**80**

Conservation Area	Acquisition Made By	Total Acres
Willow Hole	**Coachella Valley Conservation Commission**	**63**
	659250009	5
	665190012	3
	669120002	10
	669120006	5
	669140001	20
	669140002	20
Willow Hole Total		**63**

Appendix 4
Status of Conservation Objectives by Conservation Area

CVMSHCP Annual Report 2014 - Conservation Objectives by Conservation Area

	Total Acres in Conservation Area	Acres of Disturbance Authorized (1996)	Remaining Acres To Be Conserved (1996)	Acres Conserved Since 1996	Acres Conserved in 2014	Percentage of Required Conservation Acquired	Acres of Permitted Disturbance	Acres of Rough Step
Cabazon Conservation Area - Riverside County								
Peninsular Bighorn Sheep - Essential Habitat	264	181	83	0	0	0%	0	18
Mesquite hummocks	13	1	12	0	0	0%	0	0
Southern sycamore-alder riparian woodland	9	1	9	0	0	0%	0	0
Sand Source	7,683	181	1,629	0	0	0%	0	18
Sand Transport	4,538	0	0	0	0	0%	0	0
Fornat Wash Corridor	641	10	631	0	0	0%	0	1
Coachella Valley Stormwater Channel and Delta Conservation Area - Riverside County								
Desert Pupfish - Core Habitat	25	0	25	0	0	0%	0	0
Crissal Thrasher - Core Habitat	896	87	781	0	0	0%	5	4
California Black Rail - Other Conserved Habitat	62	6	52	0	0	0%	0	1
Yuma Clapper Rail - Other Conserved Habitat	62	6	52	0	0	0%	0	1
Le Conte's Thrasher - Other Conserved Habitat	784	78	706	0	0	0%	5	3
Mesquite hummocks	74	7	67	0	0	0%	0	1
Coastal and valley freshwater marsh	61	6	63	0	0	0%	0	1
Desert sink scrub	1,349	114	1,026	0	0	0%	0	11
Desert saltbush scrub	792	79	713	0	0	0%	5	3

	Total Acres in Conservation Area	Acres of Disturbance Authorized (1996)	Remaining Acres To Be Conserved (1996)	Acres Conserved Since 1996	Acres Conserved in 2014	Percentage of Required Conservation Acquired	Acres of Permitted Disturbance	Acres of Rough Step
Desert Tortoise and Linkage Conservation Area - Coachella								
Desert Tortoise - Core Habitat	300	30	270	0	0	0%	0	3
Le Conte's Thrasher - Other Conserved Habitat	300	30	270	0	0	0%	0	3
Desert dry wash woodland	121	12	109	0	0	0%	0	1
Desert Tortoise and Linkage Conservation Area - Riverside County								
Desert Tortoise - Core Habitat	88,878	4,998	44,978	3,551	432	8%	0	855
Orocopia Sage - Core Habitat	779	44	398	0	0	0%	0	4
Mecca Aster - Core Habitat	4,731	206	1,852	200	0	11%	0	41
Le Conte's Thrasher - Other Conserved Habitat	49,114	2,813	25,319	1,174	16	5%	0	399
Desert dry wash woodland	13,443	752	6,771	535	0	8%	0	129
Desert Tortoise and Linkage Corridor	26,122	1,572	14,144	819	0	6%	0	239

	Total Acres in Conservation Area	Acres of Disturbance Authorized (1996)	Remaining Acres To Be Conserved (1996)	Acres Conserved Since 1996	Acres Conserved in 2014	Percentage of Required Conservation Acquired	Acres of Permitted Disturbance	Acres of Rough Step
Dos Palmas Conservation Area - Riverside County								
Crissal Thrasher - Core Habitat	536	38	343	152	7	44%	0	19
Desert Pupfish - Refugia Locations	0	0	0	0	0	0%	0	0
California Black Rail - Other Conserved Habitat	597	37	334	271	1	81%	0	31
Le Conte's Thrasher - Other Conserved Habitat	14,882	743	6,689	2,075	1,004	31%	0	282
Yuma Clapper Rail - Other Conserved Habitat	682	42	374	292	1	78%	0	34
Predicted Flat-tailed Horned Lizard - Other Conserved Habitat	5,537	403	3,631	560	7	15%	0	96
Desert fan palm oasis woodland	125	6	50	29	0	58%	0	4
Arrowweed scrub	277	13	121	0	0	0%	0	1
Mesquite bosque	482	36	320	138	7	43%	0	18
Desert sink scrub	7,195	487	4,381	1,014	177	23%	0	150
Desert dry wash woodland	1,856	83	746	228	58	31%	0	31
Cismontane alkali marsh	321	23	205	200	0	98%	0	22
Mesquite hummocks	55	3	23	10	0	43%	0	1
East Indio Hills Conservation Area - Coachella								
Le Conte's Thrasher - Other Conserved Habitat	62	6	56	0	0	0%	0	1
Palm Springs Pocket Mouse - Other Conserved Habitat	8	1	7	0	0	0%	0	0
Coachella Valley Round-tailed Ground Squirrel - Other Conserved Habitat	6	1	5	0	0	0%	0	0
Predicted Flat-tailed Horned Lizard - Other Conserved Habitat	6	1	5	0	0	0%	0	0

	Total Acres in Conservation Area	Acres of Disturbance Authorized (1996)	Remaining Acres To Be Conserved (1996)	Acres Conserved Since 1996	Acres Conserved in 2014	Percentage of Required Conservation Acquired	Acres of Permitted Disturbance	Acres of Rough Step
East Indio Hills Conservation Area - Indio								
Le Conte's Thrasher - Other Conserved Habitat	120	12	105	0	0	0%	0	1
Palm Springs Pocket Mouse - Other Conserved Habitat	117	11	1,031	0	0	0%	0	1
Coachella Valley Round-tailed Ground Squirrel - Other Conserved Habitat	117	11	103	0	0	0%	0	1
Predicted Flat-tailed Horned Lizard - Other Conserved Habitat	114	11	100	0	0	0%	0	1
Mesquite hummocks	2	0	2	0	0	0%	0	0
Stabilized shielded sand fields	114	11	1,001	0	0	0%	0	1
East Indio Hills Conservation Area - Riverside County								
Le Conte's Thrasher - Other Conserved Habitat	1,960	139	1,253	38	0	3%	0	18
Mecca Aster - Core Habitat	1,594	116	1,045	48	0	5%	0	16
Coachella Valley Round-tailed Ground Squirrel - Other Conserved Habitat	1,353	100	896	21	0	2%	0	12
Predicted Flat-tailed Horned Lizard - Other Conserved Habitat	525	46	415	0	0	0%	0	5
Palm Springs Pocket Mouse - Other Conserved Habitat	1,526	105	944	21	0	2%	0	13
Active desert dunes	5	1	5	0	0	0%	0	0
Desert saltbush scrub	8	1	7	0	0	0%	0	0
Stabilized desert sand fields	331	33	295	0	0	0%	0	3
Mesquite hummocks	43	4	39	0	0	0%	0	0
Stabilized shielded sand fields	401	28	256	7	0	3%	0	3

	Total Acres in Conservation Area	Acres of Disturbance Authorized (1996)	Remaining Acres To Be Conserved (1996)	Acres Conserved Since 1996	Acres Conserved in 2014	Percentage of Required Conservation Acquired	Acres of Permitted Disturbance	Acres of Rough Step
Edom Hill Conservation Area - Cathedral City								
Coachella Valley Round-tailed Ground Squirrel - Other Conserved Habitat	134	13	121	102	0	84%	0	11
Coachella Valley Milkvetch - Other Conserved Habitat	151	15	136	102	0	75%	0	12
Palm Springs Pocket Mouse - Other Conserved Habitat	114	11	103	87	0	84%	0	9
Le Conte's Thrasher - Other Conserved Habitat	344	34	310	224	0	72%	0	26
Sand Source	345	34	310	224	0	72%	0	26
Edom Hill Conservation Area - Riverside County								
Coachella Valley Giant Sand-treader Cricket - Other Conserved Habitat	103	5	40	43	0	100%	0	5
Coachella Valley Milkvetch - Other Conserved Habitat	1,637	134	1,205	1,029	8	85%	0	116
Coachella Valley Fringe-toed Lizard - Other Conserved Habitat	103	5	40	43	0	100%	0	5
Coachella Valley Round-tailed Ground Squirrel - Other Conserved Habitat	1,701	145	1,302	1,115	8	86%	0	126
Palm Springs Pocket Mouse - Other Conserved Habitat	1,228	104	935	794	3	85%	0	90
Le Conte's Thrasher - Other Conserved Habitat	2,238	194	1,745	1,334	11	76%	1	152
Active sand fields	73	4	37	41	0	100%	0	4
Stabilized desert sand fields	29	1	3	2	0	67%	0	1
Sand Source	2,665	197	1,770	1,450	0	82%	0	165
Sand Transport	628	63	565	366	0	65%	1	42

	Total Acres in Conservation Area	Acres of Disturbance Authorized (1996)	Remaining Acres To Be Conserved (1996)	Acres Conserved Since 1996	Acres Conserved in 2014	Percentage of Required Conservation Acquired	Acres of Permitted Disturbance	Acres of Rough Step
Highway 111/I-10 Conservation Area - Riverside County								
Coachella Valley Round-tailed Ground Squirrel - Other Conserved Habitat	389	39	350	54	1	15%	0	9
Coachella Valley Jerusalem Cricket - Other Conserved Habitat	372	37	335	51	1	15%	0	9
Le Conte's Thrasher - Other Conserved Habitat	389	39	350	54	1	15%	0	9
Coachella Valley Milkvetch - Other Conserved Habitat	372	37	335	51	1	15%	0	9
Palm Springs Pocket Mouse - Other Conserved Habitat	389	39	350	54	1	15%	0	9
Indio Hills Palms Conservation Area - Riverside County								
Mecca Aster - Core Habitat	6,091	255	2,290	1,039	0	45%	0	130
Le Conte's Thrasher - Other Conserved Habitat	106	1	7	0	0	0%	0	0
Desert fan palm oasis woodland	93	5	42	7	0	17%	0	1
Desert dry wash woodland	79	4	33	36	0	100%	0	4
Mesquite hummocks	3	1	1	0	0	0%	0	0
Indio Hills/Joshua Tree National Park Linkage Conservation Area - Riverside County								
Desert Tortoise - Core Habitat	10,308	859	7,735	6,546	65	85%	0	740
Le Conte's Thrasher - Other Conserved Habitat	6,396	606	5,457	5,450	25	100%	0	605
Sand Transport	7,304	681	6,132	5,747	0	94%	5	638
Sand Source	5,823	460	4,135	3,164	0	77%	0	363
Indio Hills / Joshua Tree National Park Corridor	13,127	1,141	10,267	8,910	0	87%	5	1,000

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Joshua Tree National Park Conservation Area - Riverside County								
Gray Vireo - Other Conserved Habitat	30,653	134	1,208	1,822	0	100%	0	195
Le Conte's Thrasher - Other Conserved Habitat	4,330	25	222	76	0	34%	0	10
Desert Tortoise - Core Habitat	127,161	1,708	15,367	11,986	0	78%	0	1,370
Desert dry wash woodland	2,195	13	119	192	0	100%	0	20
Mojave mixed woody scrub	57,099	800	7,195	5,772	0	80%	0	658
Desert fan palm oasis woodland	5	0	0	0	0	0%	0	0
Mojavean pinyon & juniper woodland	30,653	134	1,208	1,822	0	100%	0	195
Mecca Hills/Orocopia Mountains Conservation Area - Riverside County								
Desert Tortoise - Core Habitat	112,575	2,624	23,617	6,033	268	26%	0	866
Le Conte's Thrasher - Other Conserved Habitat	17,467	652	5,866	1,571	0	27%	0	222
Orocopia Sage - Core Habitat	66,180	1,803	16,227	4,086	178	25%	0	589
Mecca Aster - Core Habitat	31,655	465	4,181	651	202	16%	0	112
Desert fan palm oasis woodland	1	0	0	0	0	0%	0	0
Desert dry wash woodland	9,317	318	2,861	1,045	27	37%	0	136
Santa Rosa and San Jacinto Mountains Conservation Area - Cathedral City								
Desert Tortoise - Other Conserved Habitat	107	11	95	4	0	4%	0	2
Le Conte's Thrasher - Other Conserved Habitat	13	1	11	4	0	36%	0	0
Peninsular Bighorn Sheep - Rec Zone 2 - Essential Habitat	112	11	97	4	0	4%	0	2
Desert dry wash woodland	20	2	18	2	0	11%	0	0

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Santa Rosa and San Jacinto Mountains Conservation Area - Indian Wells								
Desert Tortoise - Other Conserved Habitat	4,375	111	999	0	0	0%	0	11
Le Conte's Thrasher - Other Conserved Habitat	419	23	206	0	0	0%	0	2
Peninsular Bighorn Sheep - Rec Zone 3 - Essential Habitat	4,617	114	1,158	0	0	0%	0	11
Desert dry wash woodland	128	7	66	0	0	0%	0	1
Santa Rosa and San Jacinto Mountains Conservation Area - La Quinta								
Desert Tortoise - Other Conserved Habitat	5,936	157	1,409	362	0	26%	0	52
Le Conte's Thrasher - Other Conserved Habitat	683	43	387	112	0	29%	0	16
Peninsular Bighorn Sheep - Rec Zone 3 - Essential Habitat	6,185	159	2,545	376	0	15%	0	37
Desert dry wash woodland	147	8	76	15	0	20%	0	2
Santa Rosa and San Jacinto Mountains Conservation Area - Palm Desert								
Le Conte's Thrasher - Other Conserved Habitat	43	4	33	0	0	0%	0	0
Desert Tortoise - Other Conserved Habitat	581	48	436	784	0	100%	0	82
Peninsular Bighorn Sheep - Rec Zone 3 - Essential Habitat	78	7	65	0	0	0%	0	1
Peninsular Bighorn Sheep - Rec Zone 2 - Essential Habitat	492	7	65	762	0	100%	0	75
Desert dry wash woodland	38	3	29	1	0	3%	0	0

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Santa Rosa and San Jacinto Mountains Conservation Area - Palm Springs								
Le Conte's Thrasher - Other Conserved Habitat	793	103	560	467	3	83%	0	88
Peninsular Bighorn Sheep - Rec Zone 1 - Essential Habitat	9,195	226	2,511	2,004	195	80%	0	185
Desert Tortoise - Other Conserved Habitat	22,571	1,317	8,856	4,405	195	50%	0	721
Peninsular Bighorn Sheep - Rec Zone 2 - Essential Habitat	18,426	866	4,700	3,491	0	74%	0	666
Gray Vireo - Other Conserved Habitat	8,416	431	3,883	1,837	0	47%	0	227
Desert dry wash woodland	40	4	36	39	0	100%	0	4
Peninsular juniper woodland & scrub	7,682	353	3,177	1,837	0	58%	0	219
Semi-desert chaparral	733	51	571	0	0	0%	0	5
Southern sycamore-alder riparian woodland	30	2	24	0	0	0%	0	0
Sonoran cottonwood-willow riparian forest	58	0	58	1	1	2%	0	0
Desert fan palm oasis woodland	218	9	76	52	0	68%	0	6
Southern arroyo willow riparian forest	16	0	0	0	0	0%	0	0
Santa Rosa and San Jacinto Mountains Conservation Area - Rancho Mirage								
Desert Tortoise - Other Conserved Habitat	5,249	147	1,326	1,206	0	91%	0	135
Le Conte's Thrasher - Other Conserved Habitat	19	2	17	0	0	0%	0	0
Peninsular Bighorn Sheep - Rec Zone 2 - Essential Habitat	5,262	42	450	1,209	0	100%	0	106
Desert dry wash woodland	19	1	9	4	0	44%	0	1

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Santa Rosa and San Jacinto Mountains Conservation Area - Riverside County								
Peninsular Bighorn Sheep - Rec Zone 2 - Essential Habitat	14,558	647	4,269	3,095	163	72%	0	487
Le Conte's Thrasher - Other Conserved Habitat	9,123	911	5,508	5,546	0	100%	0	917
Triple-ribbed Milkvetch - Known Locations	0	0	0	0	0	0%	0	0
Peninsular Bighorn Sheep - Rec Zone 1 - Essential Habitat	24,840	830	7,252	1,267	0	17%	0	214
Gray Vireo - Other Conserved Habitat	58,985	881	7,930	5,365	57	68%	0	625
Peninsular Bighorn Sheep - Rec Zone 3 - Essential Habitat	50,972	683	5,359	4,657	0	87%	0	602
Desert Tortoise - Other Conserved Habitat	86,875	2,950	23,856	15,574	163	65%	7	2,021
Peninsular Bighorn Sheep - Rec Zone 4 - Essential Habitat	34,597	258	2,325	7,516	320	100%	0	776
Southern sycamore-alder riparian woodland	518	12	117	5	0	4%	0	2
Red shank chaparral	12,514	253	2,274	1,806	3	79%	0	206
Semi-desert chaparral	16,869	233	2,093	928	0	44%	0	116
Peninsular juniper woodland & scrub	29,547	418	2,899	3,360	54	100%	0	478
Southern arroyo willow riparian forest	16	2	15	0	0	0%	0	0
Desert dry wash woodland	3,566	298	1,244	1,245	0	100%	0	298
Desert fan palm oasis woodland	716	45	404	0	0	0%	0	5

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Snow Creek/Windy Point Conservation Area - Palm Springs								
Coachella Valley Milkvetch - Core Habitat	910	91	816	256	0	31%	0	35
Peninsular Bighorn Sheep - Essential Habitat	180	16	144	0	0	0%	0	2
Coachella Valley Round-tailed Ground Squirrel - Core Habitat	934	93	838	260	0	31%	0	35
Coachella Valley Fringe-toed Lizard - Core Habitat	749	75	672	249	0	37%	0	33
Coachella Valley Giant Sand-treader Cricket - Core Habitat	749	75	672	249	0	37%	0	33
Coachella Valley Jerusalem Cricket - Core Habitat	908	90	815	255	0	31%	0	34
Palm Springs Pocket Mouse - Core Habitat	934	93	838	260	0	31%	0	35
Le Conte's Thrasher - Other Conserved Habitat	864	86	775	218	0	28%	0	30
Ephemeral sand fields	680	68	610	207	0	34%	0	28
Active desert dunes	69	7	62	42	0	68%	0	5
Highway 111 - Whitewater River Biological Corridor	276	27	247	0	0	0%	0	3

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Snow Creek/Windy Point Conservation Area - Riverside County								
Coachella Valley Milkvetch - Core Habitat	1,700	134	1,210	633	0	52%	0	76
Coachella Valley Round-tailed Ground Squirrel - Core Habitat	1,880	152	1,371	802	0	58%	0	95
Coachella Valley Fringe-toed Lizard - Core Habitat	625	55	502	335	0	67%	0	39
Peninsular Bighorn Sheep - Essential Habitat	525	49	443	0	0	0%	0	5
Coachella Valley Giant Sand-treader Cricket - Core Habitat	625	56	501	335	0	67%	0	39
Le Conte's Thrasher - Other Conserved Habitat	1,924	162	1,453	848	0	58%	0	101
Coachella Valley Jerusalem Cricket - Core Habitat	782	60	538	349	0	65%	0	41
Ephemeral sand fields	468	45	409	335	0	82%	0	38
Stabilized shielded sand fields	157	10	93	0	0	0%	0	1
Highway 111 - Whitewater River Biological Corridor	474	46	415	0	0	0%	0	5
Stubbe and Cottonwood Canyons Conservation Area - Riverside County								
Desert Tortoise - Core Habitat	5,735	253	2,276	848	13	37%	29	81
Le Conte's Thrasher - Other Conserved Habitat	1,265	123	1,111	645	10	58%	0	77
Desert dry wash woodland	289	26	229	112	0	49%	0	14
Sonoran cottonwood-willow riparian forest	267	3	25	0	0	0%	0	0
Sand Transport	1,375	125	1,129	639	0	57%	0	76
Stubbe Canyon Wash Corridor	1,181	117	1,058	680	0	64%	0	79

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Thousand Palms Conservation Area - Riverside County								
Coachella Valley Round-tailed Ground Squirrel - Core Habitat	8,513	468	2,974	1,605	42	54%	39	235
Coachella Valley Milkvetch - Core Habitat	4,403	111	1,001	748	15	75%	5	81
Desert Pupfish - Refugia Locations	0	0	0	0	0	0%	0	0
Coachella Valley Fringe-toed Lizard - Core Habitat	3,962	93	834	667	0	80%	0	76
Le Conte's Thrasher - Other Conserved Habitat	11,058	552	3,879	2,028	49	52%	31	284
Predicted Flat-tailed Horned Lizard - Core Habitat	4,148	97	877	713	15	81%	1	80
Mecca Aster - Core Habitat	11,745	297	2,676	951	0	36%	5	120
Coachella Valley Giant Sand-treader Cricket - Core Habitat	3,962	93	834	682	15	82%	0	78
Palm Springs Pocket Mouse - Core Habitat	11,707	518	3,588	1,998	47	56%	37	274
Desert dry wash woodland	748	4	34	0	0	0%	0	0
Active sand fields	3,543	91	820	677	13	83%	0	77
Active desert dunes	421	2	14	7	1	50%	0	1
Desert fan palm oasis woodland	137	0	0	0	0	0%	0	0
Sonoran cottonwood-willow riparian forest	4	0	0	0	0	0%	0	0
Mesquite hummocks	58	0	0	0	0	0%	0	0
Sand Transport	12,550	573	4,100	1,995	0	49%	49	259
Sand Source	13,056	412	3,712	1,635	0	44%	5	200
Thousand Palms Linkage	25,607	983	7,816	3,630	0	46%	54	455

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Upper Mission Creek/Big Morongo Canyon Conservation Area - Desert Hot Springs								
Coachella Valley Jerusalem Cricket - Other Conserved Habitat	49	0	49	33	0	67%	1	-1
Le Conte's Thrasher - Other Conserved Habitat	1,832	288	1,409	712	0	51%	2	158
Palm Springs Pocket Mouse - Core Habitat	1,748	270	1,403	700	0	50%	2	146
Little San Bernardino Mountains Linanthus - Core Habitat	1,020	53	967	389	0	40%	0	24
Desert dry wash woodland	135	6	58	0	0	0%	0	1
Sand Transport	1,869	286	1,399	719	0	51%	2	159
Sand Source	343	0	6	0	0	0%	0	0
Highway 62 Corridor	73	7	66	0	0	0%	0	1
Upper Mission Creek/Big Morongo Canyon Conservation Area - Palm Springs								
Le Conte's Thrasher - Other Conserved Habitat	24	2	22	0	0	0%	1	-1
Palm Springs Pocket Mouse - Other Conserved Habitat	24	2	22	0	0	0%	1	-1

	Total Acres in Conservation Area	Acres of Disturbance Authorized (1996)	Remaining Acres To Be Conserved (1996)	Acres Conserved Since 1996	Acres Conserved in 2014	Percentage of Required Conservation Acquired	Acres of Permitted Disturbance	Acres of Rough Step
Upper Mission Creek/Big Morongo Canyon Conservation Area - Riverside County								
Desert Tortoise - Core Habitat	24,122	887	7,984	4,976	5	62%	21	565
Triple-ribbed Milkvetch - Core Habitat	819	47	426	420	0	99%	0	46
Coachella Valley Jerusalem Cricket - Other Conserved Habitat	666	52	460	48	5	10%	10	0
Le Conte's Thrasher - Other Conserved Habitat	1,871	146	1,323	725	0	55%	0	87
Palm Springs Pocket Mouse - Core Habitat	1,937	151	1,363	747	0	55%	0	90
Little San Bernardino Mountains Linanthus - Core Habitat	1,390	122	1,100	735	0	67%	0	86
Southern sycamore-alder riparian woodland	104	6	52	60	0	100%	0	7
Desert dry wash woodland	125	8	76	55	0	72%	0	6
Sonoran cottonwood-willow riparian forest	100	8	76	78	0	100%	0	8
Sand Transport	2,279	168	1,509	899	0	60%	0	107
Sand Source	19,789	721	6,488	4,476	0	69%	21	499
Highway 62 Corridor	907	79	715	308	0	43%	0	39
West Deception Canyon Conservation Area - Riverside County								
Sand Source	1,302	118	1,063	789	0	74%	0	91
Whitewater Canyon Conservation Area - Desert Hot Springs								
Desert Tortoise - Core Habitat	56	0	0	0	0	0%	0	0
Sand Source	56	0	0	0	0	0%	0	0

	Total Acres in Conservation Area	Acres of Disturbance Authorized (1996)	Remaining Acres To Be Conserved (1996)	Acres Conserved Since 1996	Acres Conserved in 2014	Percentage of Required Conservation Acquired	Acres of Permitted Disturbance	Acres of Rough Step
Whitewater Canyon Conservation Area - Riverside County								
Desert Tortoise - Core Habitat	4,438	120	1,084	742	0	68%	1	85
Arroyo Toad - Core Habitat	2,082	78	706	676	0	96%	0	75
Little San Bernardino Mountains Linanthus - Other Conserved Habitat	579	39	348	277	0	80%	0	32
Triple-ribbed Milkvetch - Core Habitat	1,295	41	368	277	0	75%	0	32
Desert fan palm oasis woodland	1	0	0	0	0	0%	0	0
Sonoran cottonwood-willow riparian forest	166	11	107	105	0	98%	0	11
Sand Transport	1,392	48	435	338	0	78%	0	38
Sand Source	12,616	94	850	618	0	73%	1	70
Whitewater Canyon Corridor	223	22	201	0	0	0%	1	1
Whitewater Floodplain Conservation Area - Cathedral City								
Coachella Valley Milkvetch - Core Habitat	107	7	61	0	0	0%	0	1
Coachella Valley Round-tailed Ground Squirrel - Core Habitat	105	7	59	0	0	0%	0	1
Coachella Valley Fringe-toed Lizard - Core Habitat	107	7	61	0	0	0%	0	1
Le Conte's Thrasher - Other Conserved Habitat	107	7	61	0	0	0%	0	1
Palm Springs Pocket Mouse - Core Habitat	107	7	61	0	0	0%	0	1
Coachella Valley Giant Sand-treader Cricket - Core Habitat	107	7	61	0	0	0%	0	1
Active sand fields	49	5	43	0	0	0%	0	1
Whitewater River Corridor	28	2	18	0	0	0%	0	0

	Total Acres in Conservation Area	Acres of Disturbance Authorized (1996)	Remaining Acres To Be Conserved (1996)	Acres Conserved Since 1996	Acres Conserved in 2014	Percentage of Required Conservation Acquired	Acres of Permitted Disturbance	Acres of Rough Step
Whitewater Floodplain Conservation Area - Palm Springs								
Coachella Valley Round-tailed Ground Squirrel - Core Habitat	5,825	328	2,955	538	0	18%	37	50
Coachella Valley Milkvetch - Core Habitat	5,432	297	2,671	514	0	19%	37	44
Palm Springs Pocket Mouse - Core Habitat	6,173	347	3,122	555	0	18%	40	50
Coachella Valley Fringe-toed Lizard - Core Habitat	5,418	295	2,659	514	0	19%	37	44
Coachella Valley Giant Sand-treader Cricket - Core Habitat	5,418	295	2,659	514	0	19%	37	44
Le Conte's Thrasher - Other Conserved Habitat	6,495	381	3,433	569	0	17%	40	55
Ephemeral sand fields	2,873	132	1,185	213	0	18%	9	26
Stabilized desert sand fields	577	44	394	0	0	0%	0	4
Active sand fields	436	44	392	296	0	76%	0	34
Whitewater River Corridor	1,183	90	809	50	0	6%	3	11

	Total Acres in Conservation Area	Acres of Disturbance Authorized (1996)	Remaining Acres To Be Conserved (1996)	Acres Conserved Since 1996	Acres Conserved in 2014	Percentage of Required Conservation Acquired	Acres of Permitted Disturbance	Acres of Rough Step
Whitewater Floodplain Conservation Area - Riverside County								
Coachella Valley Milkvetch - Core Habitat	96	6	58	0	0	0%	0	1
Coachella Valley Round-tailed Ground Squirrel - Core Habitat	185	11	100	0	0	0%	0	1
Coachella Valley Giant Sand-treader Cricket - Core Habitat	92	6	57	0	0	0%	0	1
Coachella Valley Fringe-toed Lizard - Core Habitat	92	6	57	0	0	0%	0	1
Palm Springs Pocket Mouse - Core Habitat	701	53	477	0	0	0%	10	-5
Le Conte's Thrasher - Other Conserved Habitat	706	53	480	0	0	0%	10	-5
Ephemeral sand fields	86	6	52	0	0	0%	0	1
Stabilized desert sand fields	5	1	4	0	0	0%	0	0
Whitewater River Corridor	701	53	475	0	0	0%	10	-5

	Total Acres in Conservation Area	Acres of Disturbance Authorized (1996)	Remaining Acres To Be Conserved (1996)	Acres Conserved Since 1996	Acres Conserved in 2014	Percentage of Required Conservation Acquired	Acres of Permitted Disturbance	Acres of Rough Step
Willow Hole Conservation Area - Cathedral City								
Coachella Valley Round-tailed Ground Squirrel - Core Habitat	1,485	140	1,256	600	4	48%	0	74
Coachella Valley Milkvetch - Core Habitat	938	87	782	177	4	23%	0	26
Coachella Valley Fringe-toed Lizard - Core Habitat	264	24	212	113	0	53%	0	14
Palm Springs Pocket Mouse - Core Habitat	1,147	107	959	596	0	62%	0	71
Le Conte's Thrasher - Other Conserved Habitat	1,795	167	1,505	614	5	41%	0	78
Ephemeral sand fields	227	20	178	91	0	51%	0	11
Active sand fields	37	4	33	22	0	67%	0	3
Stabilized desert sand fields	57	6	51	0	0	0%	0	1
Stabilized desert dunes	1	0	1	0	0	0%	0	0
Sand Transport	966	89	798	581	0	73%	0	67
Sand Source	833	79	710	28	0	4%	0	11

	Total Acres in Conservation Area	Acres of Disturbance Authorized (1996)	Remaining Acres To Be Conserved (1996)	Acres Conserved Since 1996	Acres Conserved in 2014	Percentage of Required Conservation Acquired	Acres of Permitted Disturbance	Acres of Rough Step
Willow Hole Conservation Area - Riverside County								
Coachella Valley Fringe-toed Lizard - Core Habitat	633	50	454	385	0	85%	6	37
Coachella Valley Milkvetch - Core Habitat	2,228	195	1,751	1,190	0	68%	6	133
Palm Springs Pocket Mouse - Core Habitat	3,465	298	2,684	1,585	0	59%	6	182
Le Conte's Thrasher - Other Conserved Habitat	3,601	298	2,677	1,570	0	59%	6	181
Desert saltbush scrub	169	17	152	137	0	90%	0	15
Mesquite hummocks	125	11	98	94	0	96%	0	11
Desert fan palm oasis woodland	1	0	0	0	0	0%	0	0
Stabilized desert sand fields	144	14	128	70	0	55%	2	6
Stabilized desert dunes	383	35	319	249	0	78%	4	24
Ephemeral sand fields	906	81	728	236	0	32%	0	32
Sand Transport	3,500	304	2,734	1,585	0	58%	6	183
Sand Source	186	2	17	8	0	47%	0	1
Mission Creek / Willow Wash Biological Corridor	509	44	397	11	0	3%	0	5

Appendix 5
Covered Activity Impact Outside Conservation Areas

CVMSHCP Annual Report 2014 - Covered Activity Impact Outside Conservation Areas

Conservation Objective / Jurisdiction	Estimated Acres Disturbed Outside Conservation Areas
Arroyo Toad	
Riverside County	0
Arroyo Toad Total	**0**
California Black Rail	
Coachella	0
Indio	0
Riverside County	0
California Black Rail Total	**0**
Coachella Valley Fringe-toed Lizard	
Cathedral City	568
Coachella	9
Indian Wells	589
Indio	960
La Quinta	542
Palm Desert	874
Palm Springs	1362
Rancho Mirage	936
Riverside County	580
Coachella Valley Fringe-toed Lizard Total	**6420**
Coachella Valley Giant Sand-treader Cricket	
Cathedral City	568
Coachella	9
Indian Wells	589
Indio	960
La Quinta	542
Palm Desert	874
Palm Springs	1362
Rancho Mirage	936
Riverside County	580
Coachella Valley Giant Sand-treader Cricket Total	**6420**

Conservation Objective / Jurisdiction	Estimated Acres Disturbed Outside Conservation Areas
Coachella Valley Jerusalem Cricket	
Cathedral City	577
Desert Hot Springs	5
Palm Desert	6
Palm Springs	1368
Rancho Mirage	887
Riverside County	107
Coachella Valley Jerusalem Cricket Total	**2950**
Coachella Valley Milkvetch	
Cathedral City	499
Desert Hot Springs	8
Indian Wells	493
La Quinta	1
Palm Desert	862
Palm Springs	956
Rancho Mirage	936
Riverside County	329
Coachella Valley Milkvetch Total	**4084**
Coachella Valley Round-tailed Ground Squirrel	
Cathedral City	804
Coachella	23
Desert Hot Springs	494
Indian Wells	918
Indio	1475
La Quinta	1409
Palm Desert	1218
Palm Springs	1646
Rancho Mirage	1089
Riverside County	1999
Coachella Valley Round-tailed Ground Squirrel Total	**11076**

Conservation Objective / Jurisdiction	Estimated Acres Disturbed Outside Conservation Areas
Crissal Thrasher	
Cathedral City	0
Coachella	35
Desert Hot Springs	0
Indian Wells	21
Indio	236
La Quinta	670
Riverside County	253
Crissal Thrasher Total	**1215**
Desert Pupfish	
Indian Wells	0
NULL	0
Desert Pupfish Total	**0**
Desert Tortoise	
Cathedral City	15
Coachella	0
Desert Hot Springs	488
Indian Wells	220
Indio	0
La Quinta	438
Palm Desert	458
Palm Springs	32
Rancho Mirage	169
Riverside County	576
Desert Tortoise Total	**2396**
Gray Vireo	
Palm Springs	0
Riverside County	29
Gray Vireo Total	**29**

Conservation Objective / Jurisdiction	Estimated Acres Disturbed Outside Conservation Areas
Le Conte's Thrasher	
Cathedral City	943
Coachella	45
Desert Hot Springs	1053
Indian Wells	1176
Indio	1476
La Quinta	1767
Palm Desert	1828
Palm Springs	1601
Rancho Mirage	1179
Riverside County	3189
Le Conte's Thrasher Total	**14257**
Least Bell's Vireo - Breeding Habitat	
Cathedral City	0
Coachella	2
Desert Hot Springs	0
Indian Wells	21
Indio	30
La Quinta	30
Palm Springs	0
Rancho Mirage	0
Riverside County	3
Least Bell's Vireo - Breeding Habitat Total	**86**
Least Bell's Vireo - Migratory Habitat	
Cathedral City	0
Coachella	4
Desert Hot Springs	0
Indian Wells	187
Indio	173
La Quinta	55
Palm Desert	167
Palm Springs	0
Rancho Mirage	45
Riverside County	201
Least Bell's Vireo - Migratory Habitat Total	**832**

Conservation Objective / Jurisdiction	Estimated Acres Disturbed Outside Conservation Areas
Little San Bernardino Mountains Linanthus	
Desert Hot Springs	1
Riverside County	0
Little San Bernardino Mountains Linanthus Total	**1**
Mecca Aster	
Indio	1
Riverside County	0
Mecca Aster Total	**1**
Orocopia Sage	
Riverside County	7
Orocopia Sage Total	**7**
Palm Springs Pocket Mouse	
Cathedral City	809
Coachella	15
Desert Hot Springs	515
Indian Wells	937
Indio	1367
La Quinta	1268
Palm Desert	1292
Palm Springs	1682
Rancho Mirage	1136
Riverside County	2109
Palm Springs Pocket Mouse Total	**11129**
Peninsular Bighorn Sheep	
Cathedral City	4
Indian Wells	2
La Quinta	126
Palm Desert	209
Palm Springs	5
Rancho Mirage	5
Riverside County	23
Peninsular Bighorn Sheep Total	**375**

Conservation Objective / Jurisdiction	Estimated Acres Disturbed Outside Conservation Areas
Potential Flat-tailed Horned Lizard	
Cathedral City	0
Desert Hot Springs	0
Palm Springs	12
Riverside County	7
Potential Flat-tailed Horned Lizard Total	**19**
Predicted Flat-tailed Horned Lizard	
Cathedral City	538
Coachella	3
Indian Wells	2
Indio	589
La Quinta	842
Palm Desert	545
Palm Springs	874
Rancho Mirage	1360
Riverside County	924
Predicted Flat-tailed Horned Lizard Total	**6452**
Southern Yellow Bat	
Cathedral City	0
Desert Hot Springs	1
Palm Springs	0
Rancho Mirage	0
Riverside County	0
Southern Yellow Bat Total	**1**
Southwestern Willow Flycatcher - Breeding Habitat	
Cathedral City	0
Coachella	0
Desert Hot Springs	0
Indio	0
Palm Springs	0
Rancho Mirage	0
Riverside County	0
Southwestern Willow Flycatcher - Breeding Habitat Total	**0**

Conservation Objective / Jurisdiction	Estimated Acres Disturbed Outside Conservation Areas
Southwestern Willow Flycatcher - Migratory Habitat	
Cathedral City	5
Coachella	35
Desert Hot Springs	2
Indian Wells	209
Indio	236
La Quinta	731
Palm Desert	194
Palm Springs	7
Rancho Mirage	46
Riverside County	253
Southwestern Willow Flycatcher - Migratory Habitat Total	**1717**
Summer Tanager - Breeding Habitat	
Cathedral City	0
Coachella	0
Desert Hot Springs	0
Indio	0
Palm Springs	0
Rancho Mirage	0
Riverside County	0
Summer Tanager - Breeding Habitat Total	**0**
Summer Tanager - Migratory Habitat	
Cathedral City	5
Coachella	35
Desert Hot Springs	2
Indian Wells	209
Indio	236
La Quinta	731
Palm Desert	194
Palm Springs	7
Rancho Mirage	46
Riverside County	253
Summer Tanager - Migratory Habitat Total	**1717**

Conservation Objective / Jurisdiction	Estimated Acres Disturbed Outside Conservation Areas
Triple-ribbed Milkvetch	
Palm Springs	0
Riverside County	0
Triple-ribbed Milkvetch Total	**0**
Yellow Warbler - Breeding Habitat	
Cathedral City	0
Coachella	0
Desert Hot Springs	0
Indio	0
Palm Springs	0
Rancho Mirage	0
Riverside County	0
Yellow Warbler - Breeding Habitat Total	**0**
Yellow Warbler - Migratory Habitat	
Cathedral City	5
Coachella	35
Desert Hot Springs	2
Indian Wells	209
Indio	238
La Quinta	731
Palm Desert	194
Palm Springs	7
Rancho Mirage	46
Riverside County	253
Yellow Warbler - Migratory Habitat Total	**1720**
Yellow-breasted Chat - Breeding Habitat	
Cathedral City	0
Coachella	0
Desert Hot Springs	0
Indio	0
Palm Springs	0
Rancho Mirage	0
Riverside County	0
Yellow-breasted Chat - Breeding Habitat Total	**0**

Conservation Objective / Jurisdiction	Estimated Acres Disturbed Outside Conservation Areas
Yellow-breasted Chat - Migratory Habitat	
Cathedral City	5
Coachella	35
Desert Hot Springs	2
Indian Wells	209
Indio	236
La Quinta	731
Palm Desert	194
Palm Springs	7
Rancho Mirage	46
Riverside County	253
Yellow-breasted Chat - Migratory Habitat Total	**1717**
Yuma Clapper Rail	
Coachella	0
Indio	0
Riverside County	0
Yuma Clapper Rail Total	**0**
Active desert dunes	
Palm Springs	0
Riverside County	2
Active desert dunes Total	**2**
Active sand fields	
Cathedral City	0
Palm Springs	0
Riverside County	256
Active sand fields Total	**256**
Arrowweed scrub	
Riverside County	0
Arrowweed scrub Total	**0**
Chamise chaparral	
Riverside County	0
Chamise chaparral Total	**0**
Cismontane alkali marsh	
Riverside County	0
Cismontane alkali marsh Total	**0**

Conservation Objective / Jurisdiction	Estimated Acres Disturbed Outside Conservation Areas
Coastal and valley freshwater marsh	
Coachella	0
Indio	0
Riverside County	0
Coastal and valley freshwater marsh Total	**0**
Desert dry wash woodland	
Cathedral City	0
Coachella	0
Desert Hot Springs	2
Indian Wells	187
Indio	0
La Quinta	55
Palm Desert	167
Palm Springs	0
Rancho Mirage	45
Riverside County	268
Desert dry wash woodland Total	**724**
Desert fan palm oasis woodland	
Cathedral City	0
Desert Hot Springs	0
Palm Springs	0
Rancho Mirage	0
Riverside County	0
Desert fan palm oasis woodland Total	**0**
Desert saltbush scrub	
Coachella	4
Indio	173
La Quinta	0
Riverside County	52
Desert saltbush scrub Total	**229**
Desert sink scrub	
Riverside County	60
Desert sink scrub Total	**60**

Conservation Objective / Jurisdiction	Estimated Acres Disturbed Outside Conservation Areas
Ephemeral sand fields	
Cathedral City	0
Palm Springs	72
Riverside County	7
Ephemeral sand fields Total	**79**
Interior live oak chaparral	
Palm Springs	0
Riverside County	0
Interior live oak chaparral Total	**0**
Mesquite bosque	
Riverside County	0
Mesquite bosque Total	**0**
Mesquite hummocks	
Cathedral City	0
Coachella	2
Desert Hot Springs	0
Indian Wells	21
Indio	568
La Quinta	30
Riverside County	3
Mesquite hummocks Total	**624**
Mojave mixed woody scrub	
Desert Hot Springs	0
Riverside County	0
Mojave mixed woody scrub Total	**0**
Mojavean pinyon & juniper woodland	
Riverside County	0
Mojavean pinyon & juniper woodland Total	**0**
Peninsular juniper woodland & scrub	
Palm Springs	0
Riverside County	0
Peninsular juniper woodland & scrub Total	**0**

Conservation Objective / Jurisdiction	Estimated Acres Disturbed Outside Conservation Areas
Red shank chaparral	
Riverside County	0
Red shank chaparral Total	**0**
Semi-desert chaparral	
Palm Springs	0
Riverside County	0
Semi-desert chaparral Total	**0**
Sonoran cottonwood-willow riparian forest	
Coachella	0
Indio	0
Palm Springs	0
Riverside County	0
Sonoran cottonwood-willow riparian forest Total	**0**
Sonoran creosote bush scrub	
Cathedral City	0
Coachella	47
Desert Hot Springs	0
Indian Wells	24
Indio	243
La Quinta	172
Palm Desert	183
Palm Springs	2
Rancho Mirage	20
Riverside County	524
Sonoran creosote bush scrub Total	**1215**

Conservation Objective / Jurisdiction	Estimated Acres Disturbed Outside Conservation Areas
Sonoran mixed woody & succulent scrub	
Cathedral City	9
Desert Hot Springs	0
Indian Wells	0
Indio	1
La Quinta	7
Palm Desert	0
Palm Springs	242
Rancho Mirage	0
Riverside County	413
Sonoran mixed woody & succulent scrub Total	**672**
Southern arroyo willow riparian forest	
Palm Springs	0
Riverside County	0
Southern arroyo willow riparian forest Total	**0**
Southern sycamore-alder riparian woodland	
Palm Springs	0
Riverside County	0
Southern sycamore-alder riparian woodland Total	**0**
Stabilized desert dunes	
Cathedral City	0
Riverside County	0
Stabilized desert dunes Total	**0**
Stabilized desert sand fields	
Cathedral City	0
Indio	0
Palm Springs	0
Riverside County	0
Stabilized desert sand fields Total	**0**

Conservation Objective / Jurisdiction	Estimated Acres Disturbed Outside Conservation Areas
Stabilized shielded sand fields	
Cathedral City	356
Coachella	0
Indian Wells	589
Indio	358
La Quinta	402
Palm Desert	315
Palm Springs	260
Rancho Mirage	534
Riverside County	67
Stabilized shielded sand fields Total	**2881**