

# Coachella Valley

## Multiple Species Habitat Conservation Plan/ Natural Community Conservation Plan

### 2012 Annual Report



For the Period January 1, 2012 to December 31, 2012

*Submitted by the*

**Coachella Valley Conservation Commission**

May 2013



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

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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 Game (CDFG) 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). The major amendment process to include all of the City of Desert Hot Springs and Mission Springs Water District as Permittees is expected to conclude in 2013.

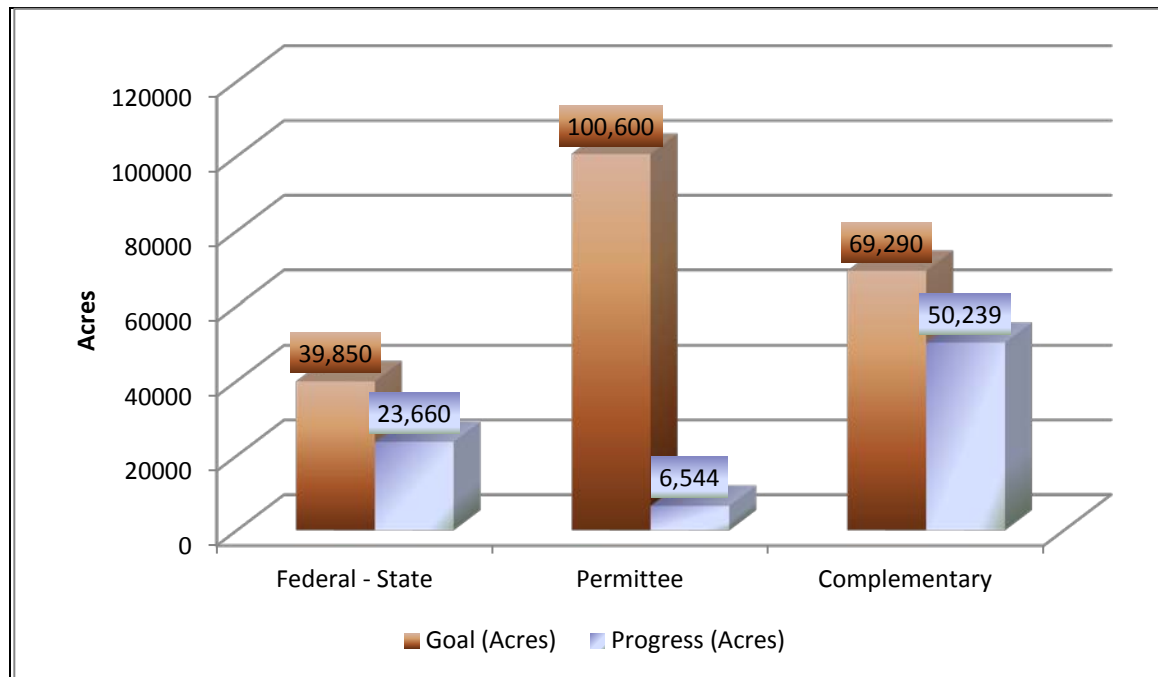
The CVMSHCP involves the establishment of an MSHCP Reserve System to ensure the conservation of the covered species and conserved natural communities in perpetuity. The existing conservation lands managed by local, state, or federal agencies, or non-profit conservation organizations form the backbone 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, 2012 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. Significant progress has been made with over 80,000 acres of conservation lands acquired since 1996.

**Figure 1: CVMSHCP Conservation Progress Toward Goals**



**Table 1: Acres of Conservation Credit**

| Conservation Credit | Total Progress Towards |               |               |              |              |              |
|---------------------|------------------------|---------------|---------------|--------------|--------------|--------------|
|                     | Goal                   | Goal          | 1996-2009     | 2010         | 2011         | 2012         |
| Federal - State     | 39,850                 | 23,660        | 18,938        | 1,594        | 718          | 2,410        |
| Permittee           | 100,600                | 6,544         | 5,511         | 373          | 284          | 376          |
| Complementary       | 69,290                 | 50,239        | 43,814        | 987          | 4,317        | 1,121        |
| <b>Total</b>        | <b>209,740</b>         | <b>80,443</b> | <b>68,263</b> | <b>2,954</b> | <b>5,319</b> | <b>3,907</b> |

#### Reporting Requirements:

This Annual Report describes the activities for the period from January 1, 2012 to the end of the calendar year on December 31, 2012. As required by Section 6.4 of the CVMSHCP, this Annual

Report will be presented at the CVCC meeting of May 9, 2013, where the report will be made available to the public.

## **II. Status of Conservation Areas: Conservation and Authorized Disturbance**

The CVMSHCP identifies both qualitative 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, 2012.

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, 2012 and December 31, 2012.

Table 2 provides a summary of the amount of conservation and the acres of disturbance authorized within Conservation Areas in 2012. Authorized disturbance results from development projects in the Conservation Areas. In 2012, 29 and 16 acres of authorized disturbance were recorded in the Thousand Palms and Stubbe and Cottonwood Canyons Conservation Areas , respectively.

**Table 2: Conservation and Authorized Disturbance Within Conservation Areas**

| Conservation Area                               | Conservation Goal | Conserved in 2012 | Conserved Since 1996 | Allowed Authorized Disturbance | Authorized Disturbance in 2012 | 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            | 806               | 3,259                | 5,150                          | 0                              | 0                                       |
| Dos Palmas                                      | 12,870            | 0                 | 2,164                | 1,430                          | 0                              | 0                                       |
| East Indio Hills                                | 2,790             | 0                 | 109                  | 310                            | 0                              | 0                                       |
| Edom Hill                                       | 3,060             | 0                 | 2,039                | 340                            | 0                              | 1                                       |
| Highway 111 / I-10                              | 350               | 4                 | 51                   | 40                             | 0                              | 0                                       |
| Indio Hills Palms                               | 2,290             | 0                 | 1,039                | 250                            | 0                              | 0                                       |
| Indio Hills / Joshua Tree National Park Linkage | 10,530            | 0                 | 8,822                | 1,170                          | 0                              | 5                                       |
| Joshua Tree National Park                       | 35,600            | 0                 | 12,376               | 1,600                          | 0                              | 0                                       |
| Long Canyon                                     | 0                 | 0                 | 0                    | 0                              | 0                              | 0                                       |
| Mecca Hills / Orocopia Mountains                | 23,670            | 401               | 5,283                | 2,630                          | 0                              | 0                                       |
| Santa Rosa and San Jacinto Mountains            | 55,890            | 1,286             | 29,496               | 5,110                          | 0                              | 9                                       |
| Snow Creek / Windy Point                        | 2,340             | 0                 | 1,109                | 260                            | 0                              | 0                                       |
| Stubbe and Cottonwood Canyons                   | 2,430             | 5                 | 838                  | 270                            | 29                             | 29                                      |
| Thousand Palms                                  | 8,040             | 492               | 3,623                | 920                            | 16                             | 28                                      |
| Upper Mission Creek / Big Morongo Canyon        | 10,810            | 350               | 5,580                | 990                            | 0                              | 21                                      |
| West Deception Canyon                           | 1,063             | 238               | 984                  | 100                            | 0                              | 0                                       |
| Whitewater Canyon                               | 1,440             | 0                 | 956                  | 160                            | 0                              | 0                                       |
| Whitewater Floodplain                           | 4,140             | 10                | 569                  | 460                            | 0                              | 10                                      |
| Willow Hole                                     | 4,920             | 314               | 2,146                | 540                            | 0                              | 3                                       |
| <b>Total</b>                                    | <b>234,793</b>    | <b>3,907</b>      | <b>80,443</b>        | <b>22,420</b>                  | <b>0</b>                       | <b>111</b>                              |

### III. Biological Monitoring Program

In 2012, CVCC transitioned from a consultant providing services for the Monitoring Program Administrator to a full-time staff position, with responsibilities for coordination of the Monitoring and Management Programs. The Habitat Conservation Management Analyst joined the CVAG/CVCC team in August 2012. Since coming on board, this staffmember has been developing a program administrative tracking system, managing monitoring program contracts,



assisting the monitoring program's science team with logistics and information gathering, and coordinating meetings of the Reserve Management Unit Committees and Reserve Management Oversight Committee. During this year, a Request for Proposals was distributed for the Monitoring Program. Through a selection committee process, a recommendation was made to the CVCC for a contract with UC Riverside (UCR) - Center for Conservation Biology for monitoring and science advisory services. The contract was approved at the June 14, 2012 CVCC meeting and spans the period from July 1, 2012 to June 30, 2013. At the same meeting, the CVCC rejected a proposed contract with the Bighorn Institute for monitoring of the Peninsular bighorn sheep.

The CVMSHCP presents a unique, 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, if deemed necessary, 3) conducting adaptive management efforts whereby the scientific method is employed to develop best management practices. CVCC has contracted with UCR to serve as the science advisor to provide support consistent with the scientific foundation underlying the monitoring program. 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 2012 Annual Monitoring Report submitted by UCR can be found in Appendix 1.

## **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 held regular quarterly meetings on January 25, April 25, July 25, and October 31, 2012. Each RMOC meeting included a report regarding the Monitoring Program and the Land Management Program. A special RMOC meeting was held on May 16, 2012 at the Santa Rosa and San Jacinto Mountains National Monument Visitor Center. This special meeting was scheduled to review the Reserve Management and Monitoring work plans and priority activities as well as to finalize recommendations from the RMOC to the CVCC for the 2012/2013 budget. The recommendations from the RMOC were incorporated into the CVCC budget for FY 2012/13 and presented to the CVCC at their June 2012 meeting.

All but one of the Reserve Management Unit Plans (RMUPs) were finalized and adopted as of December 2012. CVCC staff is working with Joshua Tree National Park to complete the RMUP for that Conservation Area. The schedule for timely completion of the RMUPs was developed in coordination with the RMUCs and RMOC. The RMUP development process also included coordination with the Monitoring Program team 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. During the year, various meetings were held to review the Reserve Management Unit Plans. The full RMUC met only once, on October 22, 2012. The committees convened to visit the Big Morongo Wash to discuss the location of a proposed trailhead, to visit the Indio Hills area to discuss management needs as determined by California State Parks, and to review and discuss the status of the biological monitoring program. Additional activities of these committees are described below:

Unit 1. Valley Floor Reserve Management Unit. The Valley Floor Reserve Management Unit Committee met with the full body of the RMUCs on October 22, 2012. The Valley Floor RMUP was approved by the CVCC on January 12, 2012.

Unit 2. Joshua Tree National Park Reserve Management Unit. This RMUC includes the National Park Service and the CVCC Land Manager. No meetings of this RMUC have been held yet. They will be scheduled as needed in coordination with the National Park Service.

Unit 3. Desert Tortoise and Linkage, and Mecca Hills/Orocopia Mountains Reserve Management Unit. A meeting of land owning agencies within this Conservation Area was held on March 1, 2012 to discuss the RMUP. The RMUP for this Reserve Management Unit was completed and approved by the CVCC on June 14, 2012.

Unit 4. Dos Palmas Reserve Management Unit. A meeting regarding water issues at Dos Palmas was held in 2012.

Unit 5. Coachella Valley Stormwater Channel and Delta Reserve Management Unit. The RMUP for this Reserve Management Unit was completed and approved by the CVCC on May 10, 2012.

Unit 6. Santa Rosa and San Jacinto Mountains Reserve Management Unit. A meeting of the RMUC for this Conservation Area was held on June 28, 2012. The RMUP for this Reserve Management Unit was adopted by the CVCC on January 12, 2012.

## **Trails Management Subcommittee**

The Trails Management Subcommittee meetings were held in January, March, May, June, September, and November 2012. During 2012, the Trails Management Subcommittee continued with the working groups established in 2009. The Subcommittee continued working with jurisdictions on existing ordinances that relate to trail use, including ordinances related to dogs on trails. On September 13, 2012 the CVCC appointed Bruce Maughn as a new member to the committee to fill a vacancy. The Subcommittee also continued work on the bighorn sheep and trails research program, recommended approval of a trailhead at Big Morongo Canyon, and initiated revisions to the Trails Management Plan. Revisions and updates to the Trails Plan to were the focus of the Subcommittee's efforts beginning in the spring of 2012. Due to the number of comments and extent of revisions required, the Subcommittee appointed a working group in the fall of 2012 to complete the project, and work continued into 2013.

## **Land Improvement: Acquisition Cleanups**

In 2012 the CVCC Acquisitions Manager performed pre-acquisition site inspections on 67 parcels and 33 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 reinspected to certify that cleanups meet the requirements, and if they are found lacking, the seller is notified if additional work will be necessary. This year, CVCC was directly responsible for removing an estimated 33.14 tons of refuse from the Coachella Valley, covering more than 2,600 acres and generating over \$64,622.00 in contractor revenue from sellers' property sales. The following photographs provide some examples of the improvement in these properties.

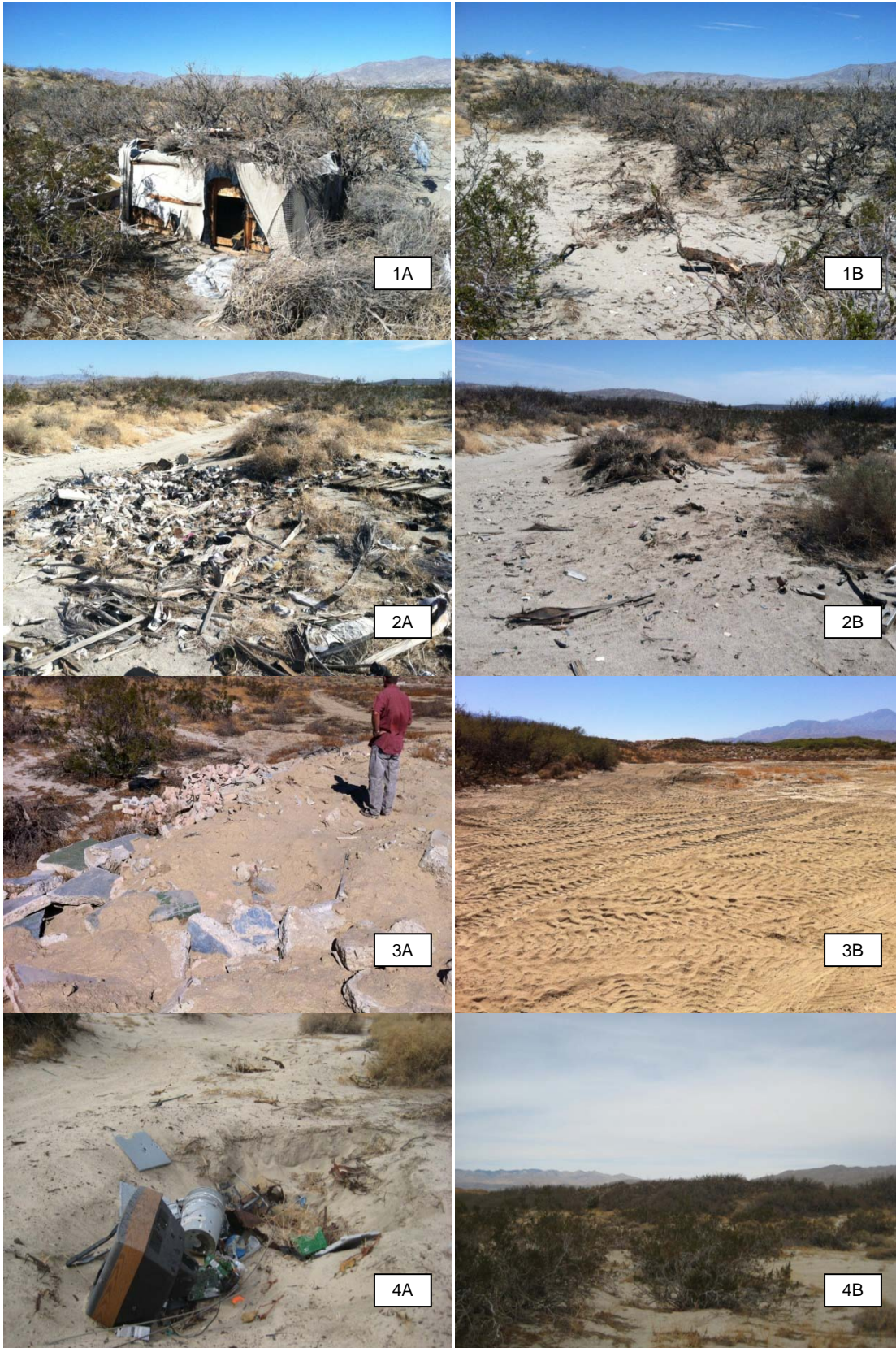
### **Upper Mission Creek Properties: Clean-up and Improvement**



Photos: 1A – The remains of a homeless encampment on a property of interest. 1B - A contractor's truck filled with encampment debris, ready to head to the landfill. 1C- The property post-cleanup, with only natural features remaining. 2A – Tires are a listed hazardous waste material and were identified on a property of interest in Upper Mission Creek. 2B – After cleanup and proper disposal of tires, the property is restored.



## Willow Hole Properties



Photos: 1A - Precleanup debris left behind. 1B - Post-cleanup, after removal of human trash. 2A - A pile of shoes and other debris at a property of interest in Willow Hole. 2B - Post-cleanup, a return to the natural state. 3A - A trash removal contractor inspecting a job. 3B - After a cleanup in an area near to previous. 4A - Household debris left on a property considered for CVCC acquisition. 4B - Post-cleanup, in vicinity nearby to 4A.



## Native & Exotic Species Identified During Property Inspections



Photos: 1 – A burrowing owl (and it's burrow) were discovered in Upper Mission Creek; 2 – CV Milkvetch growing in Willow Hole; 3 - A happy Ocotillo in the Santa Rosas; 4 – A dense infestation of invasive Fountain Grass in Upper Mission Creek; 5 – Sahara Mustard growing in a dense thicket in Thousand Palms; 6 – Tamarisk growing in Willow Hole.

### Management & Monitoring

The CVCC has been diligently monitoring the status of its conservation properties. Regular site visits and patrols are conducted on Monday and Friday mornings for a total of approximately eight (8) hours per week. As a result of regular site visits staff was able to identify and remove four vehicles left on CVCC properties located in Desert Hot Springs and the Willow Hole Conservation Area. The regular visits are also assisting with the development of a fencing and signage plan. Reserve property signs have been installed in the Stubbe and Cottonwood Canyons, Upper Mission Creek/Big Morongo Canyon, and Edom Hill Conservation Areas.



Friends of the Desert Mountains “Weed Warriors” program, led by Jennifer Prado. Left: Volunteers pose after a productive day removing fountaingrass from Deep Canyon. Right: Volunteers battling tamarisk in Devil’s Canyon.



Jennifer Prado, Friends of the Desert Mountains staff, celebrates after installing signs on property owned by CVCC in the fall of 2012.

A cooperative approach to land management is being developed with the Coachella Valley Mountains Conservancy (CVMC) and the Friends of the Desert Mountains (FODM). There have been discussions about using shared equipment such as a four-wheel drive vehicle and the use of mobile applications for GIS maps and spatial referencing in the field. Cooperative management Memorandums of Understanding (MOUs) have also been signed between CVCC and California Department of Fish and Wildlife for the management of Desert Ranch property, as well as between the CVCC and California State Parks for the interim management of the Indio Trails property by State Parks. In both cases, CVCC holds title to the lands with cooperative management provided by these state agencies.

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

In 2012, CVCC completed 33 transactions acquiring 52 parcels totaling 3,264 acres at a cost of \$2.9 million in CVCC funds, \$2.4 million in state grant funds and \$8 million in federal grant funds. Of this total, 376 acres were purchased with CVCC funds and credit to the Local Permittees, 484 acres were purchased with EEM and Proposition 84 grants and the remaining 2,404 acres were purchased with Section 6 grants. These acquisitions are listed in Table 3. These parcels were acquired at an average cost per acre of \$4,080. A table of acquisitions and/or otherwise conserved lands recorded during the period from January 1, 2012 to December 31, 2012 can be found in Appendix 2. Parcels acquired are listed by Assessor Parcel Number (APN).

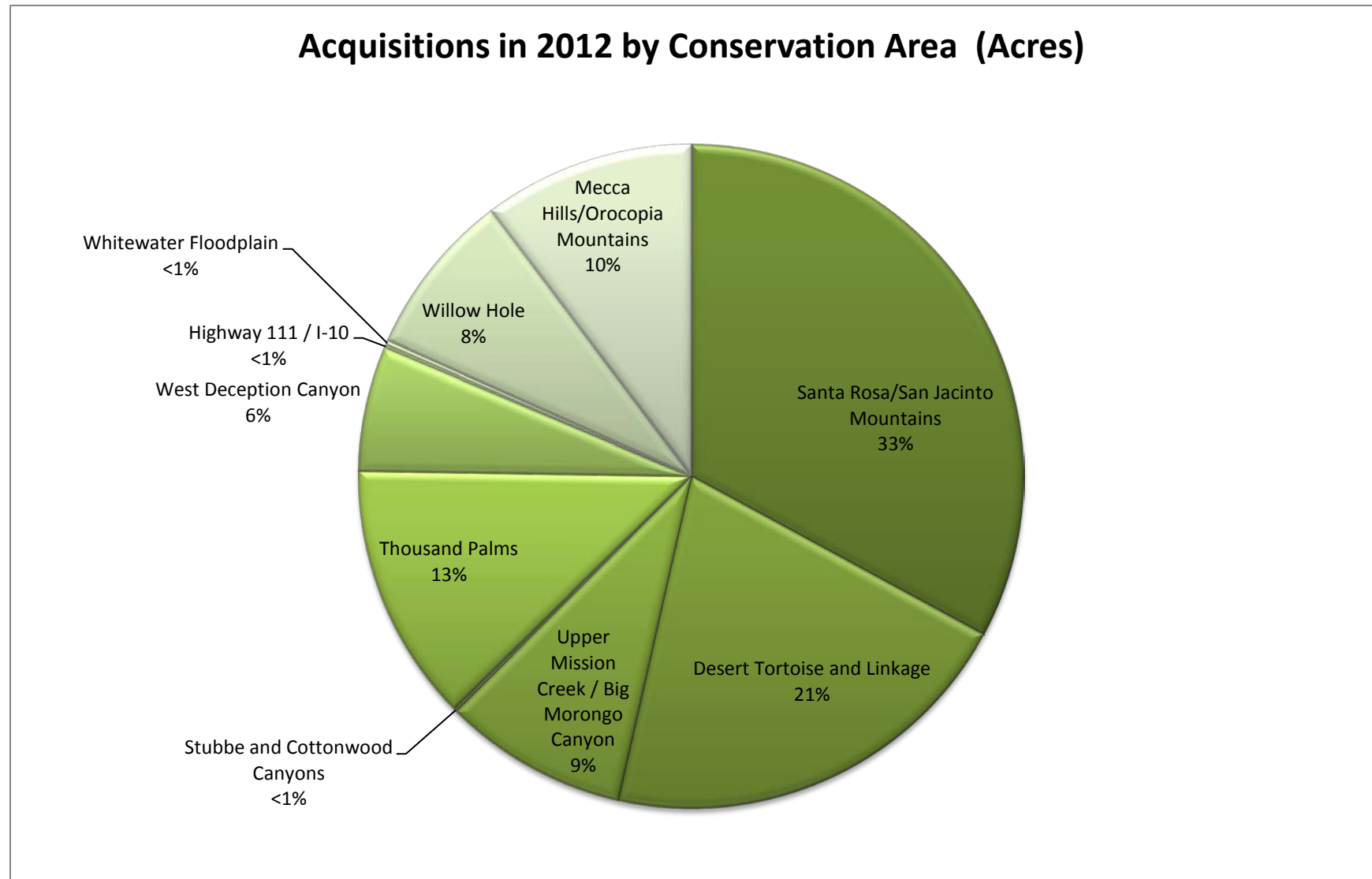


Please note these acreages are based on Riverside County Assessor information and include transfers of some lands from other conservation agencies to CVCC. As such, these acreage numbers will not directly correspond with the conservation acreage in Sections I and II.

**Table 3: Lands Acquired by CVCC in 2012**

| Project                        | Acres    | Conservation Area                        | Purchase Price | Notes               |
|--------------------------------|----------|--|----------------|---------------------|
| Alvarez                        | 2.20     | Thousand Palms                           | \$25,000       |                     |
|                                |          |  |                | Section 6 / Prop 84 |
| Indio Trails                   | 494.76   | Thousand Palms                           | \$4,800,000    | Grants              |
| Mission Springs Water District | 6.50     | Upper Mission Creek / Big Morongo Canyon | \$0            | Donation            |
| Hassanein                      | 8.08     | Upper Mission Creek / Big Morongo Canyon | \$50,000       |                     |
| Jules Laurie Partnership       | 9.87     | Upper Mission Creek / Big Morongo Canyon | \$85,000       |                     |
| Cho                            | 2.52     | Upper Mission Creek / Big Morongo Canyon | \$20,000       |                     |
| Araiza                         | 5.03     | Upper Mission Creek / Big Morongo Canyon | \$40,000       |                     |
| Slattery                       | 2.51     | Upper Mission Creek / Big Morongo Canyon | \$20,000       |                     |
| SA California Corporation      | 88.07    | Upper Mission Creek / Big Morongo Canyon | \$735,000      | Section 6           |
| Ultimate Return                | 66.04    | Upper Mission Creek / Big Morongo Canyon | \$620,000      | Section 6           |
| Zarenejad                      | 7.13     | Upper Mission Creek / Big Morongo Canyon | \$60,000       | Section 6           |
| Indigo Lakes                   | 74.23    | Upper Mission Creek / Big Morongo Canyon | \$770,000      | Section 6           |
| Arce                           | 1.00     | Upper Mission Creek / Big Morongo Canyon | \$0            | Donation            |
| Belzman                        | 2.51     | Upper Mission Creek / Big Morongo Canyon | \$20,000       |                     |
| Snytsheuval                    | 5.04     | Upper Mission Creek / Big Morongo Canyon | \$40,000       |                     |
| Holtz                          | 8.19     | Upper Mission Creek / Big Morongo Canyon | \$70,000       | Section 6           |
| Covina Trust                   | 40.00    | Upper Mission Creek / Big Morongo Canyon | \$355,000      |                     |
| Palm Investment Group          | 20.00    | Upper Mission Creek / Big Morongo Canyon | \$180,000      |                     |
| Solomon                        | 1.25     | Willow Hole                              | \$20,000       |                     |
| Henderson                      | 1.25     | Willow Hole                              | \$20,000       |                     |
| Arugay                         | 0.50     | Willow Hole                              | \$36,000       |                     |
| Brasher                        | 10.00    | Willow Hole                              | \$50,000       |                     |
| LFRE LP                        | 121.46   | Willow Hole                              | \$885,000      |                     |
| Edgar                          | 0.29     | Willow Hole                              | \$18,000       |                     |
| Kading                         | 114.88   | Willow Hole                              | \$927,000      | EEM Grant           |
| Romo                           | 0.23     | Willow Hole                              | \$18,000       |                     |
| Alvarez                        | 9.21     | Willow Hole                              | \$74,000       |                     |
| Escobedo                       | 0.63     | Willow Hole                              | \$5,000        |                     |
| Patel                          | 5.00     | Willow Hole                              | \$25,000       |                     |
| Gonzales                       | 10.00    | Willow Hole                              | \$55,000       |                     |
| Feldman                        | 40.30    | Willow Hole                              | \$295,000      |                     |
| Desert Ranch Phase I           | 1,342.00 | Santa Rosa/San Jacinto Mountains         | \$1,800,000    | Section 6           |
|                                |          |  |                | Section 6 / Prop 84 |
| Desert Ranch Phase II          | 763.00   | Santa Rosa/San Jacinto Mountains         | \$1,200,000    | Grants              |
| Total Purchases                | 3,263.68 |  | \$13,318,000   |                     |

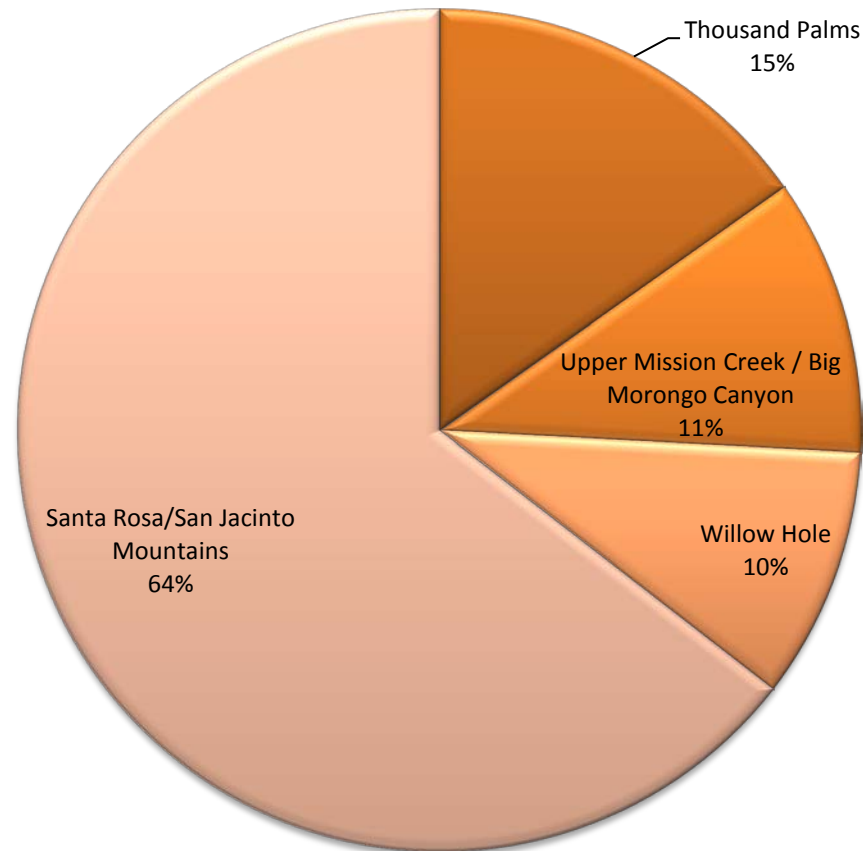
**Figure 2: Total Acquisitions in 2012 by Conservation Area**





**Figure 3: CVCC Acquisitions in 2012 by Conservation Area**

**CVCC Acquisitions in 2012 by Conservation Area (Acres)**



A major development in the Thousand Palms Conservation Area in 2012 was the acquisition for conservation of the former Indio Trails project by the CVCC. The Indio Trails project was a proposed residential development to take place on approximately 490 acres of land at the base of the Indio Hills. The County of Riverside, City of Indio and Coachella Valley Association of Governments signed a Memorandum of Understanding in summer 2006 that allowed the City of Indio to receive a transfer of 220 acres of take from the County of Riverside for the Indio Trails project on the condition that the remaining 270 acres be permanently conserved.

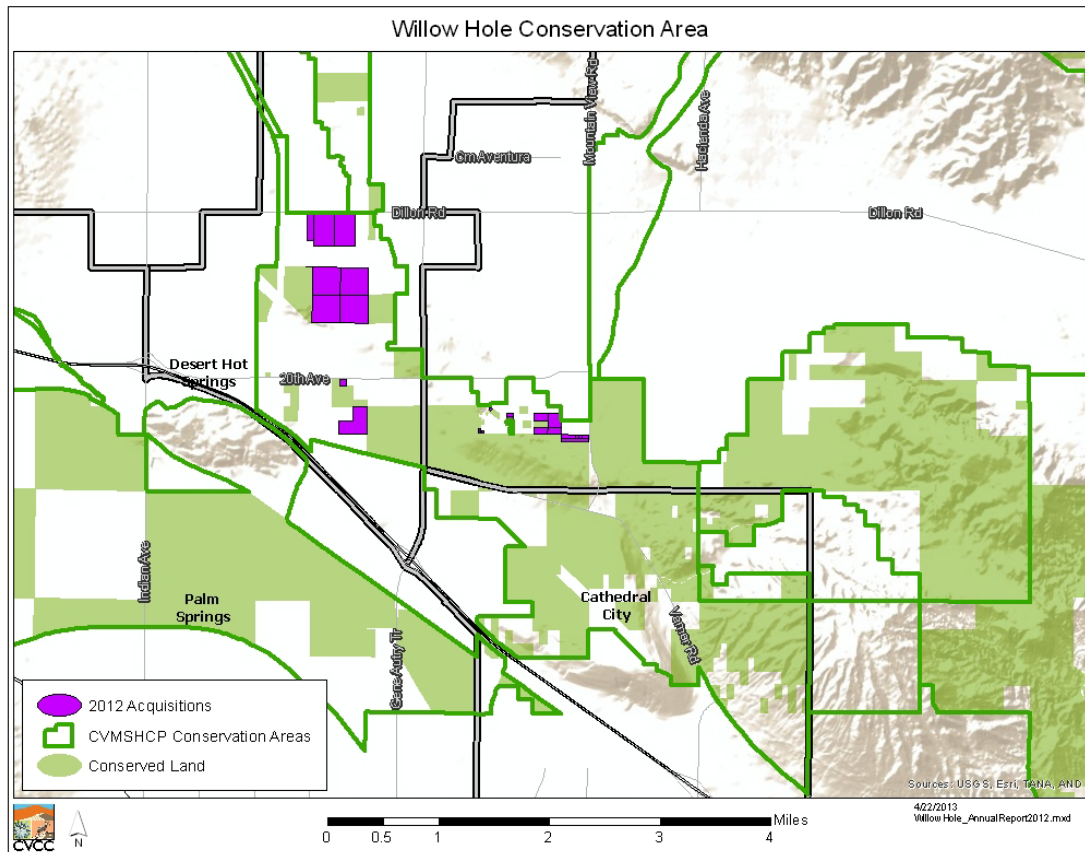
**Figure 4: CVCC Acquisitions in Thousand Palms Conservation Area**



## Willow Hole Conservation Area

In 2012, the Willow Hole Conservation Area saw the CVCC acquire 314 acres of additional conservation. The acquisitions were accomplished with approximately \$2.1 million in CVCC funds and \$350,000 in Environmental Enhancement Mitigation (EEM) grants. The acquisitions can be seen in Figure 5.

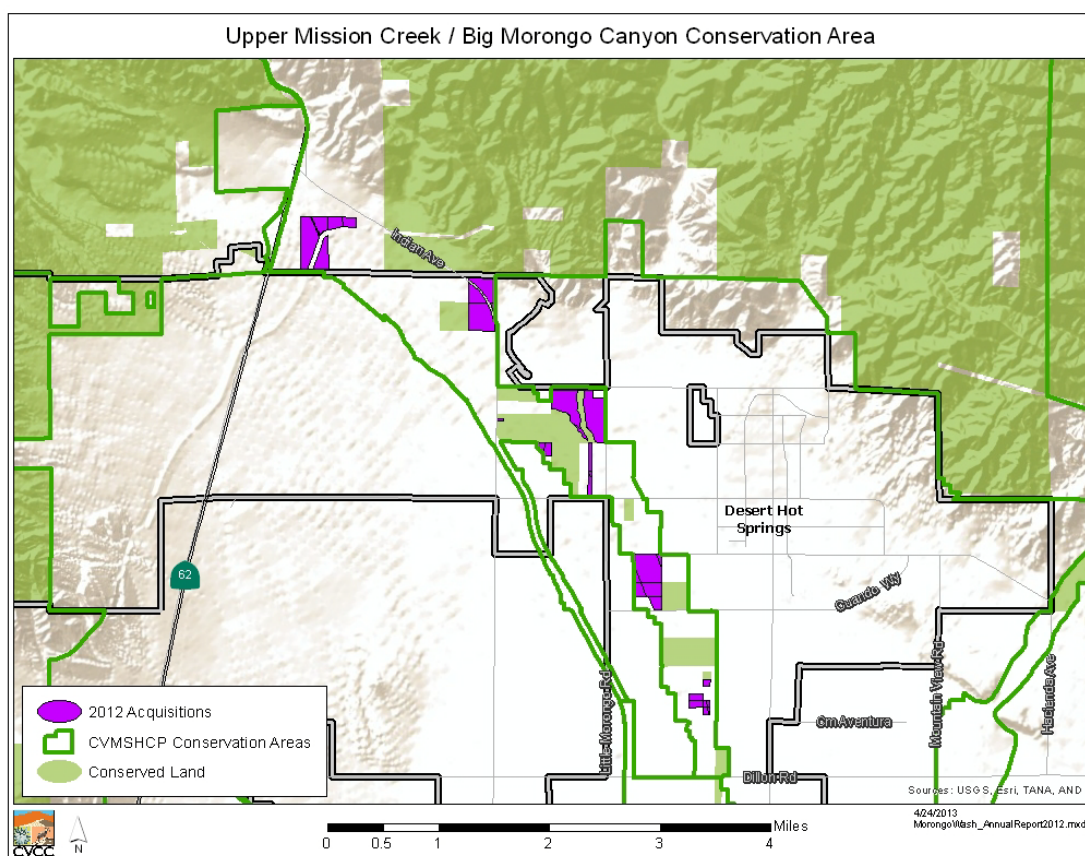
**Figure 5: CVCC Acquisitions in the Willow Hole Conservation Area**



## Upper Mission Creek / Big Morongo Canyon Conservation Area

Conservation in the Morongo Wash continues to be the focus of the Upper Mission Creek / Big Morongo Canyon Conservation Area. In 2012, CVCC acquired 350 acres within the Morongo Wash as seen in Figure 6. These acquisitions were funded with \$810,000 from CVCC and approximately \$2.2 million in Section 6 grants.

**Figure 6: CVCC Acquisitions in Morongo Wash**



## 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, 2012.

The progress toward our goals in terms of the Conservation Objectives is presented in Appendix 3.

## **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 4. 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 MSHCP. 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 2008.

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 3.

## **IX. Significant Issues in Plan Implementation**

T The implementation of the Local Development Mitigation Fee (LDMF) and the overall financing of the Coachella Valley Multiple Species Habitat Conservation Plan (MSHCP) have been significant concerns for several years. In 2011, CVCC prepared a new Nexus Study for the Local Development Mitigation Fee and a Revised Fee Ordinance to address these concerns. All the cities of the Coachella Valley and the County of Riverside adopted the Nexus Study and the Revised Fee Ordinance resolving the overall funding issues and the implementation of the LDMF. Since the adoption of the revised ordinances, all jurisdictions have been complying with Plan requirements for imposing the LDMF. In calendar year 2012, a total of \$1,079,940 was remitted to CVCC. This represents an increase of 39% over calendar year 2011.



## X. Expenditures for CVMSHCP: 2012/2013 Budget

### BUDGET BY PROGRAMS - FY 2012/2013

|                                     | MANAGEMENT<br>AND MONITORING | GENERAL<br>ADMINISTRATION | LAND<br>ACQUISITION  | ENDOWMENT           | LIZARD<br>ENDOWMENT | TOTAL                |
|-------------------------------------|------------------------------|---------------------------|----------------------|---------------------|---------------------|----------------------|
| <b>BEGINNING FUND BALANCE</b>       | \$ 256,542                   | \$ -                      | \$ 1,649,930         | \$ 4,002,785        | \$ 307,349          | \$ 6,216,606         |
| <b>REVENUES:</b>                    |                              |                           |                      |                     |                     |                      |
| Development Mitigation Fees         | \$ 144,500                   | \$ -                      | \$ 705,500           | \$ -                | \$ -                | \$ 850,000           |
| Agencies Mitigation Fees            | -                            | -                         | 4,026,187            | 1,584,247           | -                   | 5,610,434            |
| Tipping Fees                        | -                            | 370,000                   | -                    | -                   | -                   | 370,000              |
| Contributions                       | 10,000                       | -                         | -                    | -                   | -                   | 10,000               |
| Grants                              | -                            | -                         | 6,520,000            | -                   | -                   | 6,520,000            |
| Other Revenue                       | -                            | -                         | -                    | -                   | -                   | -                    |
| Investment Income                   | 1,000                        | -                         | 9,000                | 22,500              | 1,500               | 34,000               |
| <b>Total Revenues</b>               | <b>\$ 155,500</b>            | <b>\$ 370,000</b>         | <b>\$ 11,260,687</b> | <b>\$ 1,606,747</b> | <b>\$ 1,500</b>     | <b>\$ 13,394,434</b> |
| <b>EXPENDITURES:</b>                |                              |                           |                      |                     |                     |                      |
| Administrative Fees                 | \$ 1,445                     | \$ -                      | \$ 7,055             | \$ -                | \$ -                | \$ 8,500             |
| Accounting / Bank Service Charges   | -                            | 1,500                     | -                    | -                   | -                   | 1,500                |
| Comprehensive Insurance             | -                            | 10,124                    | -                    | -                   | -                   | 10,124               |
| Per Diem Payments                   | -                            | 9,600                     | -                    | -                   | -                   | 9,600                |
| Office Supplies                     | -                            | 3,000                     | -                    | -                   | -                   | 3,000                |
| Printing                            | -                            | 15,000                    | -                    | -                   | -                   | 15,000               |
| Land Improvements                   | -                            | -                         | 80,000               | -                   | -                   | 80,000               |
| Legal Services                      | -                            | 72,000                    | 3,000                | -                   | -                   | 75,000               |
| Professional Services               | -                            | 8,209                     | 35,000               | -                   | -                   | 43,209               |
| Consultants                         | 496,300                      | 411,050                   | 202,600              | -                   | -                   | 1,109,950            |
| <b>Sub-Total Expenditures</b>       | <b>\$ 497,745</b>            | <b>\$ 530,483</b>         | <b>\$ 327,655</b>    | <b>\$ -</b>         | <b>\$ -</b>         | <b>\$ 1,355,883</b>  |
| <b>OTHER</b>                        |                              |                           |                      |                     |                     |                      |
| Land Acquisitions                   | \$ -                         | \$ -                      | \$ 10,586,187        | \$ -                | \$ -                | \$ 10,586,187        |
| Furniture and Equipment             | -                            | 1,000                     | -                    | -                   | -                   | 1,000                |
| Operating Transfers Out             | -                            | -                         | -                    | 452,371             | -                   | 452,371              |
| Operating Transfers In              | (290,888)                    | (161,483)                 | -                    | -                   | -                   | (452,371)            |
| <b>Sub-Total Other</b>              | <b>\$ (290,888)</b>          | <b>\$ (160,483)</b>       | <b>\$ 10,586,187</b> | <b>\$ 452,371</b>   | <b>\$ -</b>         | <b>\$ 10,587,187</b> |
| <b>Total Expenditures and Other</b> | <b>\$ 206,857</b>            | <b>\$ 370,000</b>         | <b>\$ 10,913,842</b> | <b>\$ 452,371</b>   | <b>\$ -</b>         | <b>\$ 11,943,070</b> |
| <b>Net Excess (Deficit)</b>         | <b>\$ (51,357)</b>           | <b>\$ -</b>               | <b>\$ 346,845</b>    | <b>\$ 1,154,376</b> | <b>\$ 1,500</b>     | <b>\$ 1,451,364</b>  |
| <b>ENDING FUND BALANCE</b>          | <b>\$ 205,185</b>            | <b>\$ -</b>               | <b>\$ 1,996,775</b>  | <b>\$ 5,157,161</b> | <b>\$ 308,849</b>   | <b>\$ 7,667,970</b>  |

## **XI. Compliance Activities of Permittees**

All Permittees are in compliance with requirements of the CVMSHCP. CVCC completed 6 Joint Project Reviews in 2012.

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 LDMF activity and remit the revenue to CVCC monthly. CVCC reviews all LDMF reports and receipts monthly.

Coachella Valley Water District and Imperial Irrigation District completed payment of their endowment contributions in 2012.

Southern California Edison (SCE) became the first Participating Special Entity (PSE) for coverage of a pole replacement project. CVCC is now working with SCE on an overall PSE to provide coverage to all their future projects. This may be a significant source of revenue for CVCC and will bring SCE projects into the Plan process rather than project by project mitigations that have previously been the norm.

CVCC adopted the Public Records Act as the standard data policy to address the availability of biological monitoring data to the public. It has always been the intention of CVCC to make any data developed through the CVMSHCP publicly available. The Public Records Act provides broad access to government records. By establishing the Public Records Act procedures as the data policy, CVCC fulfills the CVMSHCP requirement and codifies CVCC's commitment to transparency.

## **XII. Annual Audit**

CVCC approved their Fiscal Year 2012/2013 budget at their June 2012 meeting. The budget can be downloaded from the CVAG website at:

[http://www.cvag.org/library/pdf\\_files/admin/CVCC%20Financials%20Reports%20FY\\_2012\\_2013/CVCC%20Budget%20\(FY%2012-13\).pdf](http://www.cvag.org/library/pdf_files/admin/CVCC%20Financials%20Reports%20FY_2012_2013/CVCC%20Budget%20(FY%2012-13).pdf). .

The first audit of the expenditures for the period July 1, 2011 to June 30, 2012 was approved by CVCC on February 14, 2013. 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 73710 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. CVCC also works with code enforcement to resolve issues of unauthorized grading/development. Riverside County Code Enforcement currently has several outstanding cases in the Thousand Palms Conservation Area that were detected and reported by CVCC.



# Appendix 1

## Biological Monitoring Report

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

# **Coachella Valley Wildlife Corridor Analysis**

## **Final Report**

**Michelle L. Murphy-Mariscal &  
Cameron W. Barrows**

**Prepared by the  
University of Riverside Center for Conservation Biology  
Funded by Southern California Edison**



**SOUTHERN CALIFORNIA  
EDISON**

## **Abstract**

Habitat connectivity is a key component for the persistence of populations, for maintaining genetic diversity, and for weathering environmental extremes and climate shifts. Desert environments are stressful largely because of extreme swings in precipitation and temperature, and thus maintaining connectivity becomes a critical conservation strategy to ensure mobile species can track temporal and spatial shifts in habitat suitability. Expansion of urbanization and energy resource development, as well as the transportation and energy infrastructure required to support those changes, are fragmenting desert environments at an increasing rate. Highway underpasses are often identified in conservation planning as wildlife corridors, providing connections between previously contiguous suitable habitats, but do they facilitate or constrain wildlife movement? Wildlife use of seven pre-existing interstate freeway and state highway underpass structures were evaluated to determine whether they are utilized as corridors for wildlife movement. The underpasses occur between southern California's Peninsular and Transverse Mountain Ranges, a key linkage between Baja California's biotic province and that of the Sierra Nevada. Non-invasive monitoring methods were utilized over 29 months to capture wildlife occurrence rates, identify spatial and temporal wildlife use patterns, and to assess factors that may constrain wildlife use. Our results indicate that a wide diversity of wildlife species utilize the underpass structures. Structural attributes of the underpasses were found to influence occurrence rates of small and medium-bodied mammals, whereas for bobcats structural characteristics and human activity both contribute to determining preference. Differences were found for both wildlife and human occurrence rates between the canyon and the underpass sites monitored. Activity patterns exhibited by bobcats and coyotes suggest that these species modify their behavior to avoid human activity at the underpass sites. Wildlife in this desert environment are adapted to evade peak daytime temperatures which also minimizes the influence of human activities on their behavior. Future strategies for maintaining or enhancing landscape connectivity in desert systems should provide a range of underpass structures to support use by many animals, and develop underpasses that minimize human disturbance.

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## **Introduction**

A consequence of human development is often habitat fragmentation and the loss of habitat connectivity. Wildlife corridors, which function to connect habitat patches, can be critical conservation design components for sustaining biodiversity in increasingly fragmented landscapes. Such corridors provide a means for species to disperse, to track preferred habitat conditions in a dynamic environment, and enable genetic heterogeneity between populations (Noss 1987). Wide-ranging animals, such as large-bodied carnivores, require extensive ranges to sustain their needs and are especially impacted by habitat fragmentation (Haas 2000, Morrison and Boyce 2009). When forced to move through a human-dominated landscape, wildlife encounter increased contact with humans and urban development leading to mortality from poaching, vehicle collisions, and depredation by land and livestock owners (Beier 1995, Foster and Humphrey 1995, Tigas et al. 2002, Morrison and Boyce 2009).

With extensive recent and on-going urban and agricultural development within southern California's arid lands, and with opportunities for alternative energy resource development on the horizon, California's desert regions are becoming increasingly fragmented. A population increase of 200% between the years 1980 and 2002 made Riverside County the fastest growing region in California, now with more residents than live in 13 other states (Chen et al. 2010, <http://www.countyofriverside.us/visiting/aboutriverside/riversidecounty.html>). Additionally, this region is expected to experience some of the most pronounced departures from current climate conditions due to anthropogenic climate change (Kerr 2008), further emphasizing the need for available dispersal conduits. In order to enable the persistence of the rich biodiversity of southern California's arid lands in the face of these stressors, evaluating the permeability of landscapes and maintaining corridors for wildlife movement will become especially important.

The Coachella Valley is a primary transportation artery between coastal areas and the rest of the continental U.S., in addition to being a major center of suburban development. Highway systems, which connect these population centers, exacerbate fragmentation by creating linear barriers to wildlife movement which may result in gene flow disruption, alteration of wildlife behavior and isolation of wildlife populations (Jackson 1999, Bennett 1991). Highway underpasses are a key feature which may ameliorate some of the restrictive barriers development places on natural systems. Underpasses may facilitate dispersal and animal movement beneath roadway barriers, decreasing faunal and human motorist mortality due to roadway collisions during crossing attempts, and allow genetic connectivity between otherwise severed habitats and populations.

Understanding species preference for underpass characteristics has become especially significant to wildlife managers charged with the task of maximizing connectivity. Several studies have focused on identifying factors which influence the efficacy of crossing structures, many of which found that structural attributes of the passages are important in determining usage (Reed et al. 1975, Clevenger and Waltho 2005, Dodd et al. 2007, Gagnon et al. 2011). For example, Clevenger and Waltho (2005) examined 13 wildlife crossing structures in Banff National Park, Canada, for 34 months post-construction and found that structural attributes were most influential for determining usage by both predator and prey species when human activity was absent. The presence of atria, cover, and natural substrate within underpass structures has also been determined to positively influence wildlife crossings (Jackson and Griffith 1998, van der Ree et al. 2007). Atria are openings in the roof of an underpass structure where highway traffic is separated. These openings allow natural light to illuminate the underpass during the day and may facilitate growth of vegetative cover within the underpass. Also, placement and

surrounding habitat have been found to influence underpass use in other studies (Foster and Humphrey 1995, Yanes et al. 1995, Rodriguez et al. 1996, Ng et al. 2004).

The differences between the influence of habitat, placement, and structural attributes of the underpasses on determining use can most likely be explained by species- or habitat-specific factors (Clevenger and Waltho 2005) or by inter-specific species interactions. For example, carnivores have been shown to prefer underpasses with low human activity and high vegetative cover (Rodriguez et al 1996, Clevenger and Waltho 2000, Clevenger and Waltho 2005), and small mammals tend to prefer narrow passages where the potential for predation may be low (Rodriguez et al. 1996). Ungulates are inclined to utilize passages with high openness ratios (Dodd et al. 2007). In a study of 11 underpasses in Banff National Park, Canada, ungulate use of underpass structures was determined by structural and landscape characteristics whereas carnivore use of the same underpasses was negatively related to human activity (Clevenger and Waltho 2000). Still other studies have found that wildlife may become habituated to structures over time thus decreasing the influence of structural characteristics on wildlife preference (Gagnon et al. 2011).

Evaluations of underpass effectiveness have been rarely addressed in arid landscapes and research on the efficacy of corridor configuration in developing desert regions is needed to provide scientific input to conservation planning efforts. Understanding wildlife movement near and through pre-existing structures will provide a framework for decisions made regarding construction of wildlife specific structures, such as overpasses and underpasses, in the future as well as inform local conservation planning and habitat management efforts. To avoid further deterioration of the existing natural connectivity, UCR's Center for Conservation Biology has been engaged to assess the effectiveness of existing highway underpasses as wildlife corridors at



what is believed to be a critical point of connectivity between the Peninsular and Transverse Mountain ranges (Penrod et al. 2005a). This region of the western Coachella Valley potentially connects the flora and fauna of Baja California to the northern mountains of the Sierra Nevada and beyond, as well as desert mountain ranges in Joshua Tree National Park to much larger coastal mountains of the Transverse Range. Our objectives of this study were first, to evaluate whether wildlife utilize existing underpass structures at critical wildlife linkages between the Peninsular and Transverse mountain ranges; second, to identify spatial and temporal wildlife use patterns; third, to assess factors, such as structural attributes and human activity, that may constrain wildlife use; and fourth, to ascertain whether the same suite of species occurring in habitat adjacent to the underpasses, i.e. the canyons, are also utilizing the underpass structures.

## **Methods**

### *Study Area*

Southern California's Coachella Valley is situated at the junction of the Sonoran and Mojave Deserts with the coastal and cismontane ecoregions to the west, as well as between the Peninsular and Transverse Mountain Ranges which connect Baja California to the Sierra Nevada (Fig. 1). The juxtaposition of geographic and bioregional features results in an area rich in biodiversity.

The eight lane Interstate-10 freeway (hereafter referred to as I-10) and four lane Highway 111 run west to east through the Coachella Valley and are bordered to the north by the San Bernardino Mountains and to the south by the San Jacinto Mountains (Fig. 2). The San Jacinto – San Bernardino corridor linkage, which is bisected by these two highways, has been identified as a critical connection between the Peninsular and Transverse Mountain ranges (Penrod et al. 2005a). State Route 62 (hereafter SR-62) is a four-lane highway that branches off of the I-10 north of Palm Springs, California, and bisects the San Bernardino Mountains where they

converge with the Little San Bernardino Mountains (Fig. 2). SR-62 presents a potential barrier at another critical corridor connection between the South Coast and Mojave Desert ecoregions of the Transverse Mountain range (Penrod et al. 2005b). Several underpass structures are located along these highways allowing water runoff to flow unimpeded beneath the roadway. Although not specifically designed for wildlife crossings these underpass structures may be functioning as important linkages by enabling the movement of wildlife utilizing the corridors.

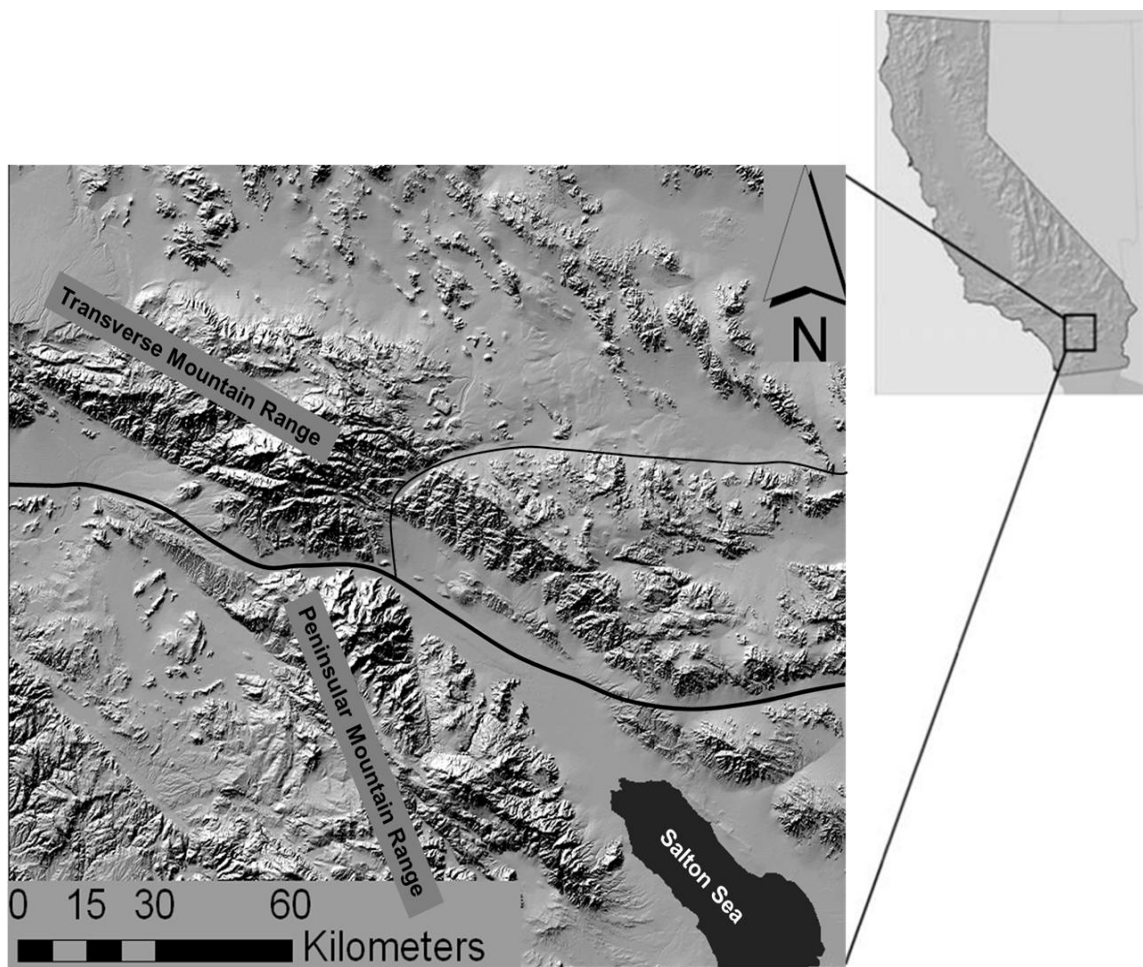


Figure 1. Location of the study region within the Coachella Valley in southern California. The study area includes the San Jacinto Mountains, which are part of the Peninsular Range, and the San Bernardino and Little San Bernardino Mountains which are part of the Transverse Range. Interstate-10 and State Route 62 are depicted as black lines.

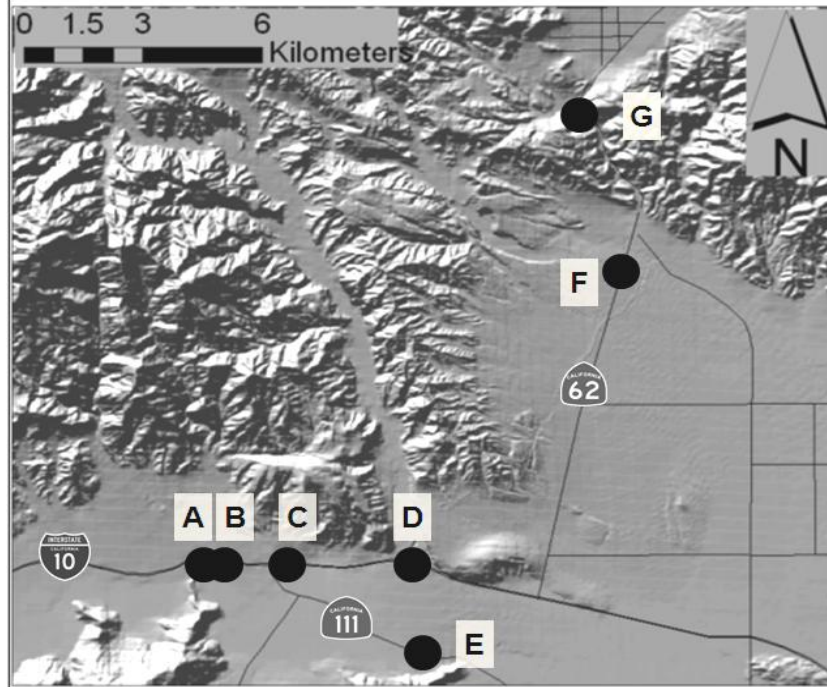


Figure 2. Locations of the underpasses monitored in this study, indicated by black circles: (A) Stubbe West, (B) Stubbe East, (C) Cottonwood, (D) Whitewater, (E) Highway 111, (F) Mission Creek, and (G) Dry Morongo.

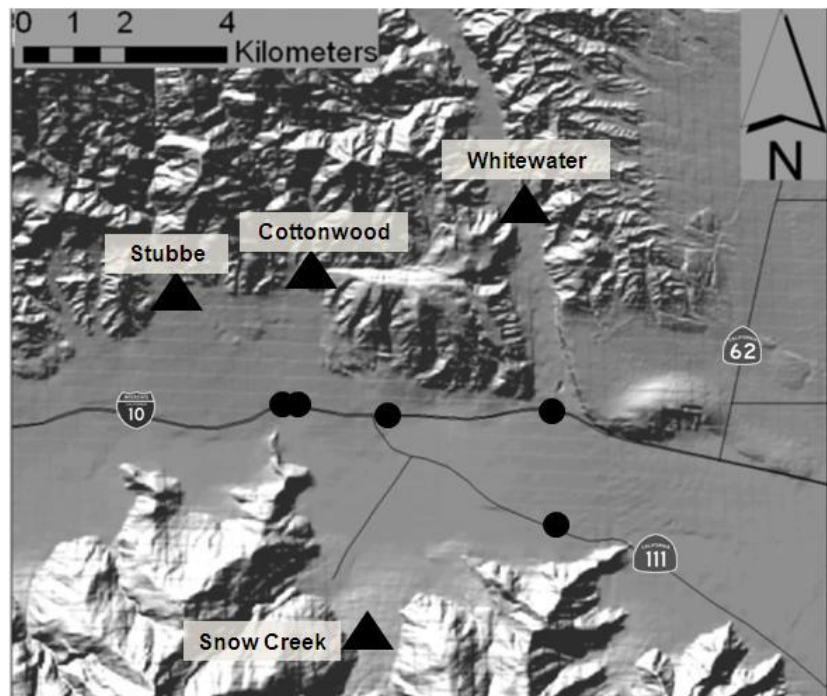


Figure 3. Locations of the canyon sites monitored in this study, indicated by black triangles. Underpass locations are indicated by black circles.

### *Study Sites*

The canyon sites were included in this study to determine whether the same suite of species occurring within the habitat adjacent to the underpasses are also approaching and utilizing the underpass structures. This data was intended to help us to determine if certain species do not approach the freeway as well as whether wildlife species decrease in occurrence as the highway is approached, a phenomenon known as a filter effect. The canyon sites are also assumed to have a lower rate of human occurrence and thus offer an opportunity to examine the influence of human activity near the underpass structures via comparisons with the canyon sites.

Stubbe Canyon and its corresponding underpasses are the western-most of the linkages we studied, and located north of I-10 at the southern edge of the San Bernardino Mountains (Fig. 2). Stubbe Canyon was monitored during the second sampling period to determine wildlife diversity. Two underpass structures run beneath the I-10 highway and adjacent railway and are separated by a distance of 30-m. The western structure is aptly named Stubbe West (Fig. 4a) and the eastern structure is referred to as Stubbe East (Fig. 4b). Both structures contain three atria and the portion of underpass beneath the highway is comprised of a single chamber. The length of the underpass (Table 1, Fig. 5) was calculated as the distance needed to traverse the full length of the structure and includes the structures beneath the freeway, beneath an adjacent utility road and an adjacent railway, with an atrium separating each (Fig. 6). The substrate within the structures is natural and is comprised of hard packed soil, gravel and sand. Due to the railway at the southern end of both underpasses being offset, the visibility through the underpasses is obstructed.

Although the structures are similar in dimensions they differ in rates of human and wildlife usage. Stubbe East is utilized by hikers on the Pacific Crest Trail (a long-distance hiking trail running between Canada and Mexico) and utility vehicles accessing properties located south of

the underpass whereas Stubbe West is used only occasionally by off-road vehicles and humans on foot. Access by full-sized vehicles is limited due to substrate loss and the narrow underpass openings beneath the railway at the southern end which restrict access by full-sized vehicles.

Cottonwood Canyon is located east of Stubbe Canyon at the base of the San Bernardino Mountains (Fig. 3). The wash leading out of the canyon has been modified into a concrete channel as it approaches the I-10 from the north, and consists of natural habitat to the south. Concrete support walls run the length of the underpass dividing the structure into three separated chambers (Fig. 4c). The substrate within the underpass is concrete with patches of sand repeatedly deposited and washed away by wind and water. During January 2012, Riverside Flood Control District removed debris and sediment that had accumulated within the underpass structure. During this process, sparse shrubbery which had taken root in the debris was also removed, eliminating all cover within the underpass. Prior to this, during the first sampling period, the substrate consisted of blow sand and gravel, with patches of exposed concrete. Visibility through the underpass is unobstructed and the structure has one atrium.

Whitewater Canyon is the easternmost of the canyons and of the corresponding underpasses located along I-10 (Fig. 2-4d). This canyon was monitored during the first sampling period until the camera and suitable tracking medium were washed away during a flood event. Monitoring was subsequently moved to Stubbe Canyon. Whitewater River flows through the canyon and underpass year-round providing recreational opportunities as well as riparian habitat for a number of species. The underpass is comprised of eight chambers (Table 1) containing rocky outcroppings against all support walls, and a large atrium. The chambers are not separated from each other within the underpass; therefore movement between chambers is possible. Substrate consists of earthen material and the natural habitat on both sides of the freeway is clearly visible from the entrance of each opening.

One underpass structure was selected for monitoring along Highway 111, located almost directly south of the Whitewater underpass (Fig. 2, 4e). This bridge underpass contains one atrium and seven chambers which are not separated from each other within the structure (Table 1). The line of sight through the underpass is unobstructed and substrate consists of fine sand which contributes to the sand dune habitat located to the south. Although this habitat is closed to off-highway vehicle activity, vehicles are frequently observed accessing the habitat via this underpass structure. South of Highway 111, at the base of the San Jacinto Mountains, Snow Creek Canyon and Oasis de los Osos are the likely points of arrival and departure for a species traversing this corridor to and from the south. Snow Creek Canyon was monitored for the full duration of the study to determine species diversity.

Mission Creek underpass is located north of I-10, along SR-62, where the dry wash of Mission Creek intersects with the highway (Fig. 2, 4f). The structure is comprised of four chambers and a large atrium, with earthen substrate throughout (Table 1). Due to dense vegetative cover and uneven topography at the eastern opening of the structure, line of sight through the underpass is obstructed.

Dry Morongo underpass is located on the border of Riverside and San Bernardino Counties and is the northern-most site included in this study (Fig. 2, 4g). Relative to the other monitored structures, Dry Morongo underpass is closest to the mountain ranges on either side of the underpass openings, is the only underpass lacking an atrium, and has the second highest openness ratio (Table 1). Visibility through the underpass is high and the substrate consists of natural material. Several homes exist at the mouth of the canyon to the west of the underpass opening and the underpass is used frequently by humans on foot, and by off-highway and full-sized vehicles.

Table 1. Characteristics and classifications of the seven monitored underpass structures

| Underpass Attributes                               |            | Underpass   |             |             |             |             |               |             |
|--|------------|-------------|-------------|-------------|-------------|-------------|---------------|-------------|
|  |            | Stubbe West | Stubbe East | Cotton-wood | White-water | Highway 111 | Mission Creek | Dry Morongo |
| Width (m)  |            | 11.5        | 17          | 39          | 150         | 68          | 30.5          | 18.3        |
| Length (m)   |            | 112         | 112         | 77          | 48.2        | 37          | 44.5          | 12.2        |
| Height (m)   |            | 4.5         | 4.5         | 2.9         | 9           | 2.5         | 5.4           | 7.6         |
| Openness   |            | 0.46        | 0.68        | 1.47        | 28.01       | 4.59        | 3.70          | 11.40       |
| Adjacent Highway                                   |            | I-10        | I-10        | I-10        | I-10        | Highway 111 | SR-62         | SR-62       |
| Substrate  |            | Natural     | Natural     | Concrete    | Natural     | Natural     | Natural       | Natural     |
| Atrium Present                                     |            | Yes         | Yes         | Yes         | Yes         | Yes         | Yes           | No          |
| Number of Chambers                                 |            | 1           | 1           | 3           | 8           | 7           | 4             | 1           |
| Visibility through Underpass                       |            | No          | No          | Yes         | Yes         | Yes         | No            | Yes         |
| Classification based on rate of human activity     | Opening: 1 | Natural     | Disturbed   | Natural     | Disturbed   | Natural     | Natural       | Disturbed   |
|  | 2          | Natural     | Disturbed   | Natural     | Natural     | Natural     | Natural       | Disturbed   |
| Classification based on vegetation quality & cover | Opening: 1 | Disturbed   | Disturbed   | Disturbed   | Natural     | Disturbed   | Natural       | Natural     |
|  | 2          | Natural     | Natural     | Natural     | Natural     | Natural     | Natural       | Disturbed   |

Attributes measured by the author and supplemented with measurements from Penrod et al. (2005a, 2005b). Openness is calculated by  $(W*H)/L$ , with larger values indicating greater openness. The last two rows indicate the classification of each underpass opening based on rate of human activity and vegetative quality.



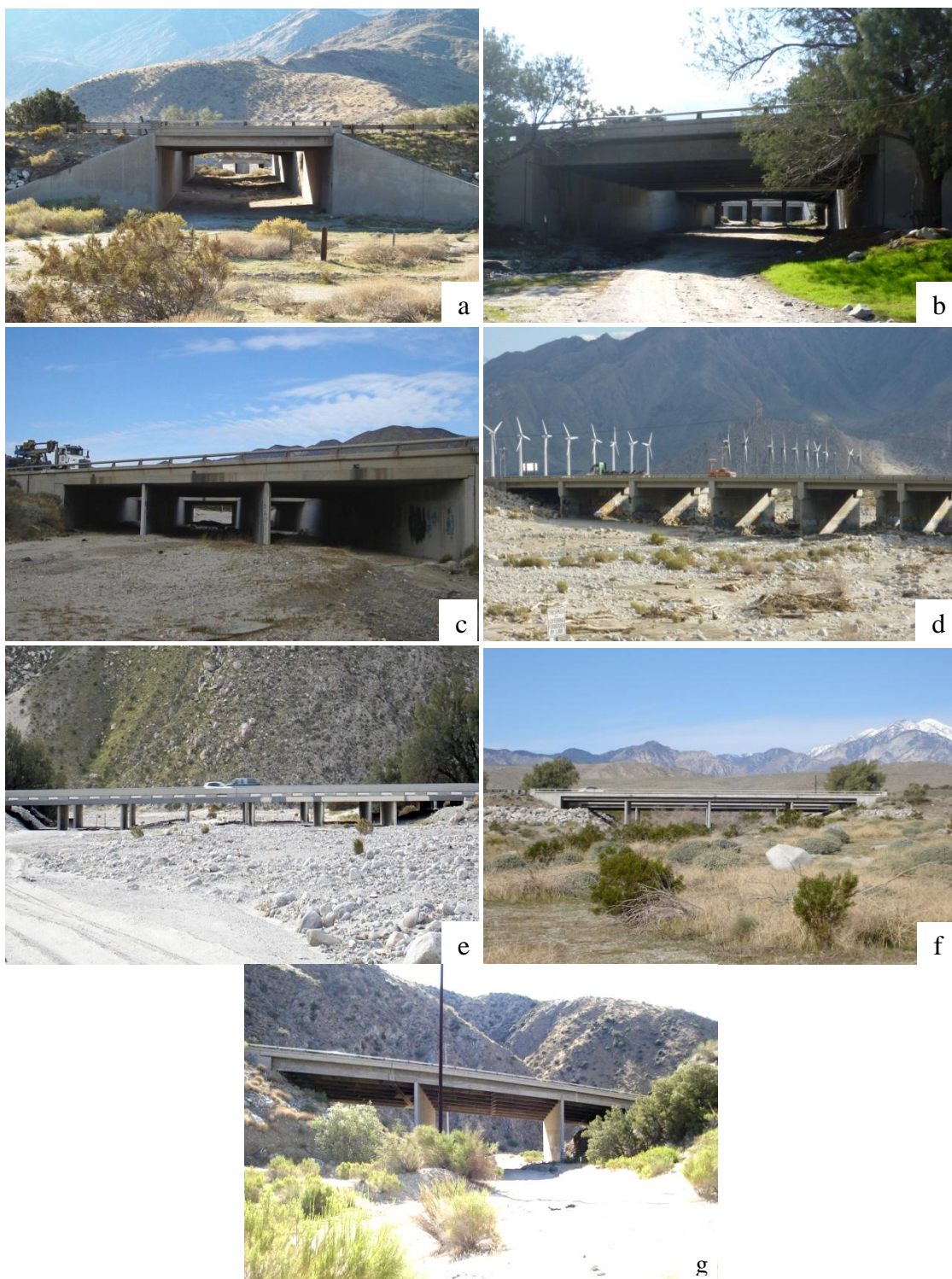


Figure 4. Photographs of the seven underpass sites: (a) north side of Stubbe West, (b) north side of Stubbe East, (c) south side of Cottonwood, (d) north side of Whitewater, (e) north side of Highway 111, (f) west side of Mission Creek, and (g) east side of Dry Morongo.





Figure 5. Photograph of a characteristic atrium, a large opening in the roof of the underpass structure. Stubbe West (pictured) has three atria.

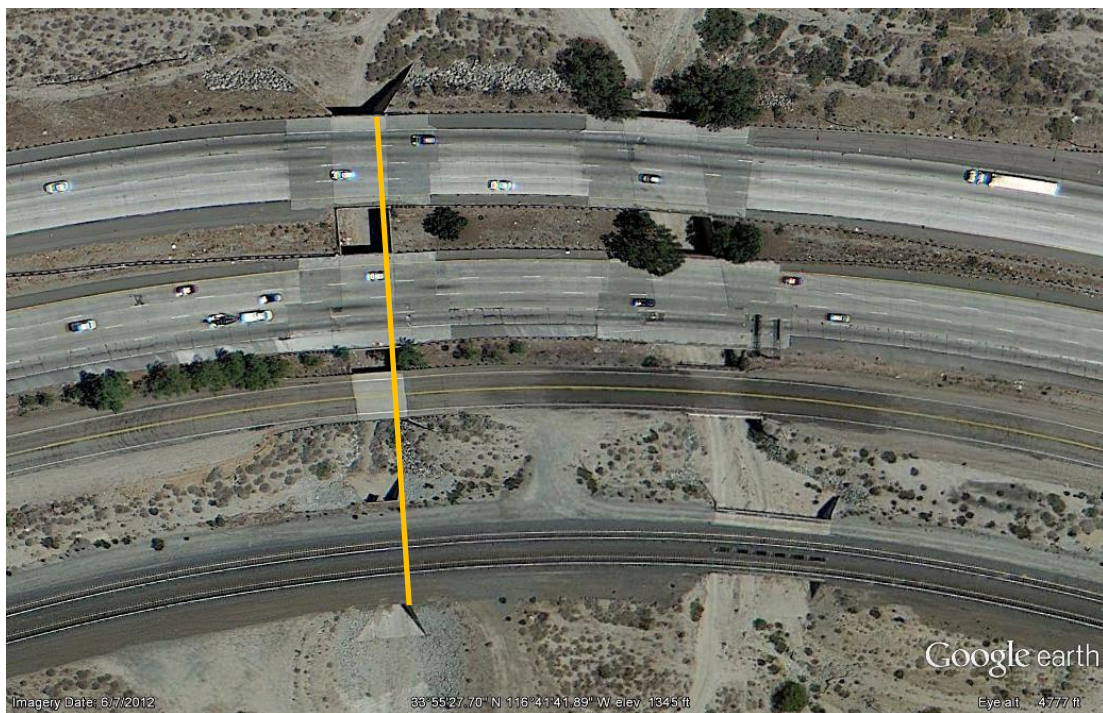


Figure 6. Photograph of Stubbe West and Stubbe East underpass structures. Stubbe West underpass is pictured on the left and Stubbe East on the right. The westbound and eastbound lanes of traffic on I-10 are separated by an atrium at the top of the figure, followed by an adjacent raised utility roadway and an adjacent railway at the bottom of the figure. The orange line illustrates the distance over which the length was measured. This photograph was obtained from Google Earth.

### *Data Collection*

We monitored wildlife movement at each of the highway underpasses from July 2010 through November 2012, resulting in 29 months of data by the study's conclusion. There were two sampling periods, the first ranged from July 2010 through August 2011 and the second sampling period was from September 2011 through November 2012. To document use of the underpass structures two non-invasive monitoring methods were utilized: track beds and infrared motion detection trail cameras (DLC Covert II, 4338 Greenridge Spa Road, Lewisburg, KY 42256, and Bushnell Trophy Cam Model 119436c, Bushnell Corporation, 9200 Cody, Overland Park, KS 66214). At least one camera was maintained at each monitoring site and at some sites a second camera was maintained, depending upon instances of theft and availability of secure camera placement locations. Cameras were placed low to the ground to make them less detectable by humans and to increase the detection of small wildlife species. Camera placement was dependent upon locations deemed suitable to disguise or minimize camera detectability, and locations selected were generally within 45-cm (18 inches) from the ground. In the event of human or animal movement near the underpass opening, the camera would be triggered to take three photos at one second intervals. Cameras saved data onto 4GB memory cards and memory cards were replaced twice per month per site on average. Photos were then downloaded from the memory card onto a computer where they would be viewed, and species would be identified. The date, time, direction of travel and type of activity occurring in each of the photos would be recorded. Additionally, photographs allowed the distinction between species with similar tracks, such as domestic canines and coyotes. Rate of species occurrence was determined by dividing the number of detections of a species by the number of days the camera was active. In the event of multiple occurrences of the same species, only one occurrence was recorded per every half

hour. If a distinction could be made between individuals of the same species (for example two canines with different coat colors) occurring multiple times then each individual would be recorded once per direction of travel. Because individuals could not be identified in most photographs these data represent occurrence rather than abundance of the species present at each study site.

To complement the camera surveys, track beds (Rodriguez et al. 1996) were employed at each underpass to record the tracks of animals utilizing the corridor. In this study, track beds, ranged from 1.5 to 2-m wide and consisted of swaths of sandy substrate spanning the entire width of the underpass opening, enabling the detection of small bodied mammals and reptiles that may not have triggered the motion sensor cameras. Supplements of sand were required at sites where naturally occurring sand was insufficient to develop a track bed. During each visit to an underpass, tracks left in the sand of the track bed were inspected and species identification and direction of travel were recorded. The track bed was then smoothed with a broom to eliminate all tracks, ensuring that only new tracks would be recorded during subsequent surveys. Earthen substrate in each underpass wash and at each canyon site was also opportunistically surveyed for tracks to determine species presence; that is, substrate was studied while accessing each site and tracks were recorded opportunistically rather than along developed transects. Rate of species occurrence was recorded as the number of detections of a particular species at a track bed divided by the number of days the track bed was sampled. In the event of multiple occurrences of the same species, only one occurrence was recorded in each direction of travel; multiples of the same species were recorded if distinct individuals could be determined by track size comparisons. As with cameras, these data represent occurrence rather than abundance of the species present at the study sites.

## **Analysis**

Due to non-normality, non-parametric tests were used to analyze the data. As with similar studies (Yanes et al. 1995, Ng et al. 2004), Spearman's rank correlation was used to quantify the relationship between use of the underpass structures by wildlife and underpass characteristic variables, which include structural attributes (length, width, height, and openness) and extent of human activity near each underpass. Human activity consisted of six categories: (1) rate of humans on foot (2) rate of off-highway vehicles), (3) rate of full sized full-sized vehicles, (4) rate of all vehicles (full-sized and off-highway vehicles combined), (5) total human use (calculated as the rates of the previous categories combined), and (6) the rate of domestic canines. Due to the difficulty of distinguishing between domestic canines and coyotes by tracks, only camera data were used in the analyses when the relationships for those species were examined. For all other species, camera and track data for each site visit were combined. Data were then compared to identify duplicate records which were removed to prevent double-counting an occurrence. For the analyses, wildlife species were grouped according to body size classifications and whether they were carnivores or prey species, per previous underpass studies (Yanes et al. 1995, Rodriguez et al. 1996, Ng et al. 2004, Clevenger and Waltho 2005). The carnivore category included both canid and feline carnivore species due to their similar prey base and large range requirements.

The Mann Whitney U test was used to compare differences in occurrence rates of wildlife and human activity between underpass sites, and between canyon and underpass sites. Data was composed of camera and track records from the full sampling period. The Mann-Whitney U test was also used to detect differences in the rates of wildlife use between sites deemed "natural" versus sites deemed "disturbed" on the basis of human activity and adjacent habitat vegetative

quality (Table 1). For these analyses underpass openings were considered as separate sites. Sites with crossing rates of  $<0.5$  for total human activity were placed in the “natural” category ( $n = 9$ ) and all other sites were placed in the “disturbed” category ( $n = 5$ ). For the second analysis, sites were divided according to nearby vegetative cover and quality. Sites generally natural in vegetation composition and cover ( $n = 9$ ) were compared to more disturbed habitat sites ( $n = 5$ , Table 1). These designations clearly have a subjective character, however understanding the additive impacts of surrounding vegetation management, habitat conditions, and human use patterns and the range of acceptable surrounding land use can provide important information for effective corridor designations. Camera data used for the last two Mann-Whitney U analyses were from the full sampling period.

A traditional a level for statistical significance is most often  $P \leq 0.05$ ; however due to small sample size and the use of non-parametric tests, we have opted to follow Ng et al. (2004) and use  $P \leq 0.10$  as our significance threshold. We acknowledge while this level does increase the chance for a Type I error (assigning statistical significance to a relationship that would prove not significant with a larger sample size), it reduces the chance of a Type II error (dismissing relationships as not significant when in fact they are).

## **Results**

### *Diversity of Wildlife*

In total, 3,676 wildlife occurrences and 5,541 human-related activities were recorded as tracks and photos at the underpass sites (Table 2, Fig. 7). At the canyon sites, 1,139 wildlife occurrences and 304 human-related activities were recorded. Of total wildlife detections (canyon and underpass sites combined), 242 were of reptiles, 822 were of birds (Fig. 8a), 1433 were of small-bodied mammals (Fig. 8b), 1130 were of medium-bodied mammals (Fig. 8c), and 1188

were of large-bodied mammals (Fig. 8d-f). Data collected from the cameras allowed for accurate distinction between coyote and domestic canine occurrences, therefore only those records were used when the relationships for those two species were analyzed. Combining track and camera data for canid species (coyote, gray fox, and domestic canine) resulted in almost twice as many detections ( $n = 786$ ) than camera data alone (coyote  $n = 216$ , gray fox  $n = 4$ , domestic canine  $n = 209$ ). Of the human related activities detected, 2227 were of humans on foot, 3272 were of full-sized vehicles, and 346 were of off-highway vehicles.

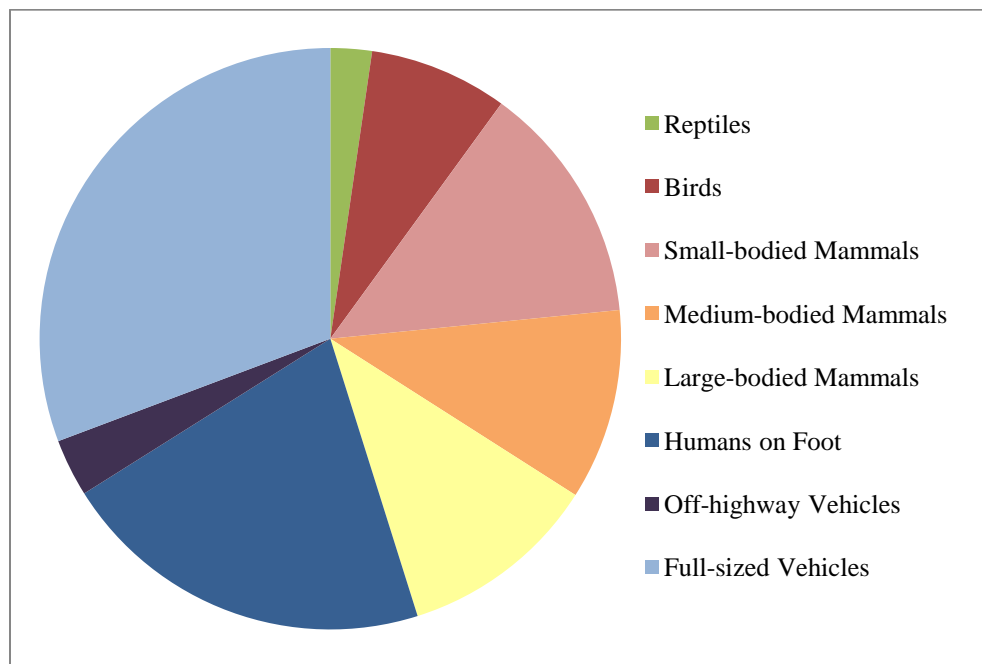


Figure 7. Proportions of wildlife and human activity, underpass and canyon sites combined.



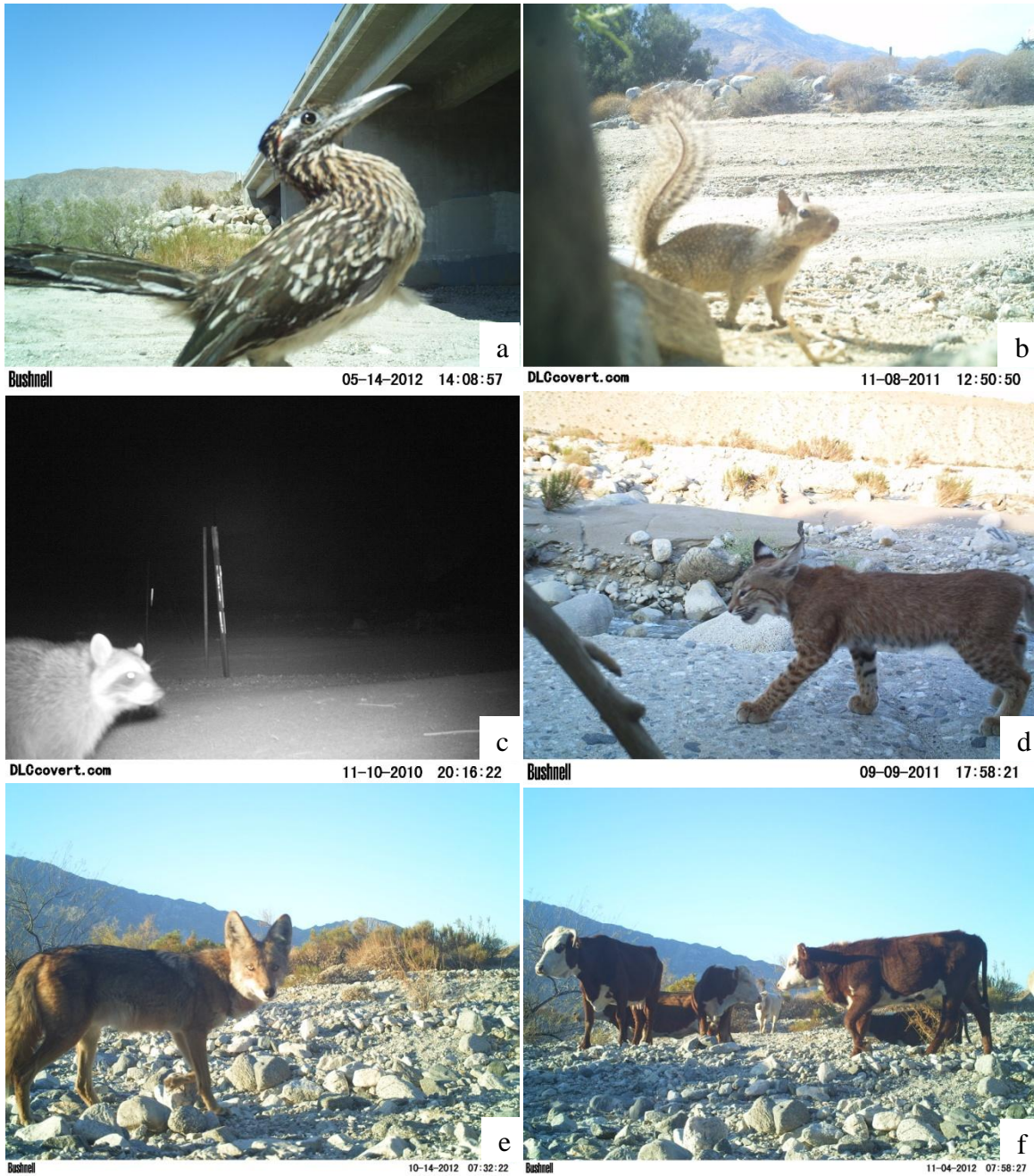


Figure 8. Photographs of wildlife taken by the trail cameras: (a) Greater roadrunner at Mission Creek underpass, (b) California ground squirrel at Cottonwood underpass, (c) raccoon at Highway 111 underpass, (d) juvenile bobcat at Whitewater underpass, (e) coyote in Stubbe Canyon, and (f) cattle in Stubbe Canyon.

Table 2. Crossing rates of wildlife during each monitoring period, camera and track data combined

| Underpass Sites               |             |              |             |              |             |              | Canyon Sites |              |            |              |             |              |
|-------------------------------|-------------|--------------|-------------|--------------|-------------|--------------|--------------|--------------|------------|--------------|-------------|--------------|
| Sampling Period               | 1           |              | 2           |              | Full        |              | 1            |              | 2          |              | Full        |              |
| No. of Days Monitored         | 1964        |              | 2278        |              | 4242        |              | 644          |              | 898        |              | 1542        |              |
| Species                       | N           | Rate         | N           | Rate         | N           | Rate         | N            | Rate         | N          | Rate         | N           | Rate         |
| Reptile                       | 74          | 0.038        | 115         | 0.050        | 189         | 0.045        | 29           | 0.045        | 24         | 0.027        | 53          | 0.034        |
| Small-bodied mammal           | 821         | 0.418        | 429         | 0.188        | 1250        | 0.295        | 120          | 0.186        | 63         | 0.070        | 183         | 0.119        |
| Medium-bodied mammal          | 442         | 0.225        | 386         | 0.169        | 828         | 0.195        | 91           | 0.141        | 211        | 0.235        | 302         | 0.196        |
| Bird                          | 192         | 0.098        | 342         | 0.150        | 534         | 0.126        | 113          | 0.175        | 175        | 0.195        | 288         | 0.187        |
| Large-bodied mammal           | 317         | 0.161        | 558         | 0.245        | 875         | 0.206        | 63           | 0.098        | 250        | 0.278        | 313         | 0.203        |
| <b>Total Animal</b>           | <b>1846</b> | <b>0.940</b> | <b>1830</b> | <b>0.803</b> | <b>3676</b> | <b>0.867</b> | <b>416</b>   | <b>0.646</b> | <b>723</b> | <b>0.805</b> | <b>1139</b> | <b>0.739</b> |
| Human on Foot                 | 454         | 0.231        | 1471        | 0.646        | 1925        | 0.454        | 281          | 0.436        | 21         | 0.023        | 302         | 0.196        |
| Off-Highway Vehicle           | 101         | 0.051        | 243         | 0.107        | 344         | 0.081        | 1            | 0.002        | 1          | 0.001        | 2           | 0.001        |
| Full-Sized Vehicle            | 351         | 0.179        | 2921        | 1.282        | 3272        | 0.771        | 0            | 0.000        | 0          | 0.000        | 0           | 0.000        |
| <b>Total Human Activities</b> | <b>906</b>  | <b>0.461</b> | <b>4635</b> | <b>2.035</b> | <b>5541</b> | <b>1.306</b> | <b>282</b>   | <b>0.438</b> | <b>22</b>  | <b>0.024</b> | <b>304</b>  | <b>0.197</b> |

(Rate = No. of occurrences / No. of monitoring days)



### *Relationships between Underpass Structural Attributes and Wildlife Use*

When both monitoring periods were combined to explore the relationships between underpass structural attributes and wildlife occurrences medium-bodied mammals had a significant negative association with underpass width and openness ratios ( $P < 0.01$ ; Table 3). Bobcat occurrences were significantly associated with underpass width and openness ( $P < 0.01$  and  $P = 0.10$ , respectively). Reptiles, small-bodied mammals, birds, canid species, and large mammals did not display any significant trends. When analyzed together, carnivore species (including canid species, bobcats and mountain lions) had significant positive associations with underpass height and openness ( $P < 0.10$  and  $P = 0.10$ , respectively), while prey species (including small and medium-bodied mammals) had a negative association with underpass openness ( $P = 0.10$ ).

Table 3. Spearman rank correlation coefficient values for underpass structural variables and rates of wildlife occurrences

| Species              | Length | Width           | Height        | Openness        |
|----------------------|--------|-----------------|---------------|-----------------|
| Reptile              | -0.134 | 0.214           | 0.402         | 0.464           |
| Small-bodied mammal  | -0.170 | 0.071           | 0.509         | 0.357           |
| Bird                 | 0.116  | -0.357          | 0.688         | 0.107           |
| Medium-bodied mammal | 0.670  | <b>-0.893**</b> | -0.295        | <b>-0.893**</b> |
| Canid                | -0.402 | 0.036           | 0.598         | 0.536           |
| Coyote               | -0.188 | 0.027           | 0.491         | 0.080           |
| Domestic Canine      | -0.045 | -0.134          | 0.580         | 0.366           |
| Bobcat               | -0.473 | <b>0.857**</b>  | 0.313         | <b>0.714*</b>   |
| Large mammal         | -0.402 | 0.036           | 0.598         | 0.536           |
| Carnivore            | -0.491 | 0.214           | <b>0.723*</b> | <b>0.714*</b>   |
| Prey                 | 0.688  | -0.679          | -0.134        | <b>-0.714*</b>  |

Statistically significant associations are indicated with asterisks (\* $P < 0.10$ , \*\* $P < 0.05$ , \*\*\* $P < 0.01$ ).

### *Relationships between Human Activity and Wildlife Use*

When both monitoring periods were combined to explore the relationships between human activity and wildlife use of the underpass structures, small-bodied mammals and birds both had a significant positive association with domestic canines, and medium-bodied mammals had a significant positive association with off-highway vehicle use (Table 4). Reptile species were found to have significant positive associations with humans on foot and total human activity. Bobcat occurrence rates were negatively associated with full-sized vehicles and all vehicles analyzed together. Prey species (small-bodied mammals and medium-bodied mammals) had a strong positive association with off-highway vehicle use. There was no significant relationship between the carnivore grouping and any of the human activity categories.

Using only camera data to accurately distinguish between coyotes and domestic canines, coyotes were positively associated with domestic canines and domestic canines were positively associated with total human activity (Table 4). When these relationships were explored temporally, domestic canines and total human activity follow the same pattern of peak activity occurring during daytime hours, whereas coyote activity was crepuscular (Fig. 9).

Off-highway vehicle use was the only human activity that was significantly associated with any of the passage attributes (Table 5), and their use was found to be associated with narrow structures and low openness ratios. This relationship is important to note because it may confound results; that is, wildlife found to be associated with OHV activity may display that relationship because of a mutual preference for the same structural attributes. A Mann-Whitney U test was used to detect differences between sites categorized as “natural” versus “disturbed” on the basis of human activity (Table 1). The test revealed that the occurrence rates of large-bodied mammals, coyotes and domestic canines were higher in sites categorized as “disturbed” (Table

6a). There were no significant relationships found when “natural” versus “disturbed” sites based on vegetative quality were analyzed (Table 6b).

Stubbe West and Stubbe East underpass structures are similar in dimensions, but differ in rates of human usage (see Appendix), although only being separated by roughly 30-m. This presents an opportunity to examine the influence that human activity may have on wildlife preference of these structures. When a Mann-Whitney U test was used to compare the occurrence rates of human activities at Stubbe West and Stubbe East a significant difference was found between sites ( $U=18.581$ ,  $P < 0.001$ ). When the rates of occurrences for total wildlife were compared between sites, no significant difference was found. When each wildlife group was analyzed separately, a significant difference was found between sites for the large mammal and carnivore groupings (both  $U= 3.89$ ,  $P < 0.05$ ).

Table 4. Spearman rank correlation coefficient values for human activity variables and rates of wildlife occurrences

| Species              | Full-Sized Vehicle | Off-Highway Vehicle | Total Vehicle   | Humans on Foot | Total Human    | Domestic Canine |
|----------------------|--------------------|---------------------|-----------------|----------------|----------------|-----------------|
| Reptile              | 0.393              | -0.143              | 0.286           | <b>0.857**</b> | <b>0.857**</b> | 0.705           |
| Small-bodied mammal  | 0.393              | 0.071               | 0.321           | 0.214          | 0.429          | <b>0.848**</b>  |
| Medium-bodied mammal | 0.464              | <b>0.964***</b>     | 0.536           | -0.071         | -0.036         | -0.009          |
| Canid                | 0.393              | -0.107              | 0.357           | 0.643          | <b>0.750*</b>  | -----           |
| Coyote               | 0.241              | 0.223               | 0.313           | 0.313          | 0.402          | <b>0.714**</b>  |
| Domestic Canine      | 0.563              | 0.152               | 0.491           | 0.598          | <b>0.759**</b> | -----           |
| Bobcat               | <b>-0.750*</b>     | -0.107              | <b>-0.786**</b> | -0.286         | -0.357         | -0.188          |
| Bird                 | 0.357              | 0.286               | 0.321           | 0.643          | 0.643          | <b>0.830**</b>  |
| Large mammal         | 0.393              | -0.107              | 0.357           | 0.643          | <b>0.750*</b>  | -----           |
| Carnivore            | 0.214              | -0.321              | 0.143           | 0.607          | 0.679          | -----           |
| Prey                 | 0.607              | <b>0.929***</b>     | 0.643           | 0.107          | 0.214          | 0.366           |

Statistically significant associations are indicated with asterisks (\* $P < 0.10$ , \*\* $P < 0.05$ , \*\*\* $P < 0.01$ ).

Table 5. Spearman rank correlation coefficients for underpass structural variables and rates of human activities at the underpass sites

| Human Activity      | Length | Width           | Height | Openness        |
|---------------------|--------|-----------------|--------|-----------------|
| Full-Sized Vehicle  | 0.116  | -0.357          | -0.277 | -0.214          |
| Off-Highway Vehicle | 0.670  | <b>-0.857**</b> | -0.295 | <b>-0.857**</b> |
| Total Vehicle       | 0.080  | -0.464          | -0.348 | -0.321          |
| Humans on Foot      | 0.116  | 0.000           | 0.295  | 0.250           |
| Total Human         | -0.045 | 0.000           | 0.205  | 0.286           |

Statistically significant associations are indicated with asterisks (\* $P < 0.10$ , \*\* $P < 0.05$ ).

Table 6. Mann-Whitney U values for wildlife occurrence rates at sites deemed “natural” versus “disturbed” based on (a) human activity and (b) habitat quality.

|                     | Small-bodied Mammals | Medium-bodied Mammals | Large-bodied Mammals | Coyote        | Bobcat | Dom. Canine    | Full Sized Vehicles | Off Highway Vehicles | Humans on Foot |
|---------------------|----------------------|-----------------------|----------------------|---------------|--------|----------------|---------------------|----------------------|----------------|
| (a) Human Activity  |                      |                       |                      |               |        |                |                     |                      |                |
| Median: Natural     | 0.1429               | 0.0536                | 0.0336               | 0.0101        | 0.0122 | 0.0169         |                     |                      |                |
| Median: Disturbed   | 0.1326               | 0.0750                | 0.1892               | 0.0240        | 0.0063 | 0.0938         |                     |                      |                |
| U                   | 0.218                | 0.040                 | 8.218                | 3.771         | 0.112  | 4.840          |                     |                      |                |
| P-value             | 0.641                | 0.841                 | <b>0.004***</b>      | <b>0.052*</b> | 0.738  | <b>0.028**</b> |                     |                      |                |
| (b) Habitat Quality |                      |                       |                      |               |        |                |                     |                      |                |
| Median: Natural     | 0.2538               | 0.0998                | 0.1032               | 0.071         | 0.0122 | 0.0201         | 0.0214              | 0.0661               | 0.1202         |
| Median: Disturbed   | 0.0625               | 0.0226                | 0.0336               | 0.0063        | 0.0063 | 0.0235         | 0.1034              | 0.0621               | 0.1445         |
| U                   | 1.604                | 0.538                 | 0.751                | 1.977         | 0.363  | 0.111          | 1.284               | 0.040                | 0.040          |
| P-value             | 0.205                | 0.463                 | 0.386                | 0.160         | 0.547  | 0.739          | 0.257               | 0.841                | 0.841          |

Statistically significant associations are indicated with asterisks (\* $P < 0.10$ , \*\* $P < 0.05$ , \*\*\* $P < 0.01$ ).

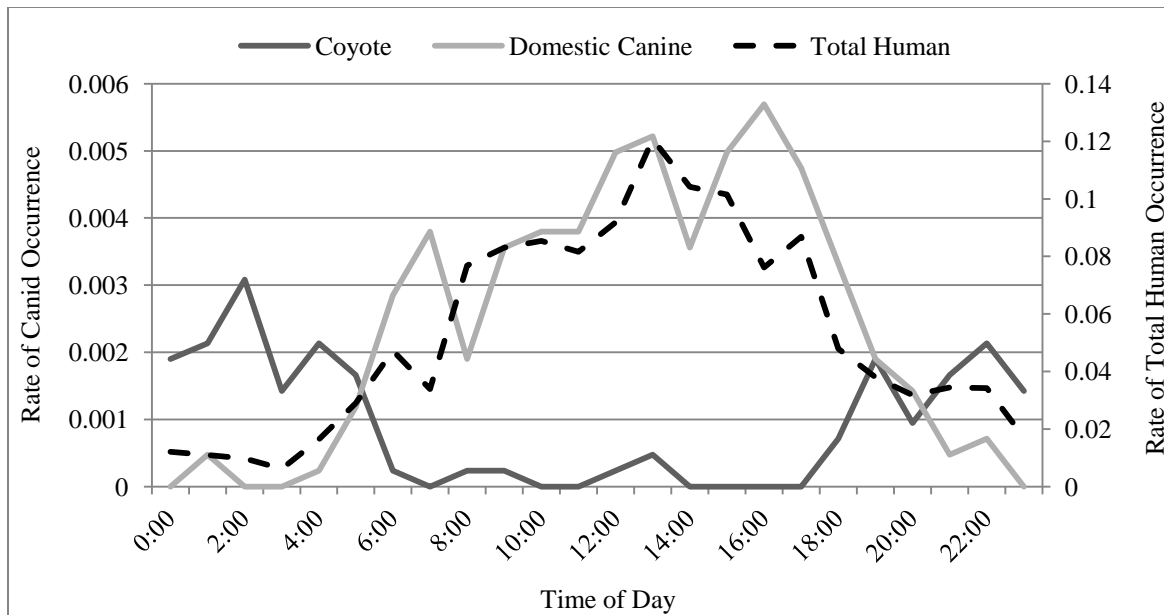


Figure 9. Temporal comparisons of coyote, domestic canine, and total human activity at the underpass sites over the full sampling period.

#### *Patterns of Occurrence at Underpass Sites versus Canyon Sites*

Wildlife occurrence rates between the canyon and underpass sites were significantly different ( $U = 3.007$ ,  $P = 0.083$ ; Figure 10), as were the occurrence rates of total human activity ( $U = 28.305$ ,  $P < 0.0001$ ). When wildlife groups were compared between canyons and underpass sites, differences in occurrence rates were identified. Small-bodied mammals made up the largest proportion of wildlife occurrences at the underpass sites (34.0%), whereas birds, medium-bodied mammals and large mammals made up relatively equal proportions at the canyon sites (25.3%, 26.5%, and 27.5%, respectively). All human activities had higher occurrences at the underpass sites. Statistically, bobcat occurrence rates were significantly difference between canyon and underpass sites ( $U = 3.687$ ,  $P = 0.055$ ), as were small-bodied mammals, large-bodied mammals, carnivores and prey species (Table 7).

Next, the temporal activity of wildlife species during the full monitoring period was examined. Peak activity for coyotes at the underpass sites occurred at approximately 02:00 military time whereas peak coyote activity at the canyon sites occurred at approximately 06:00 (Fig. 11a). Human activity at the underpass sites begins to increase between 04:00-06:00, the time period during which coyote activity begins to decrease (Fig. 11b). A similar pattern was found for bobcat, with activity near the underpasses peaking at approximately 04:00 (Fig. 12a), before the increase in human activity (Fig 12b), and activity at the canyon sites peaking at approximately 06:00.

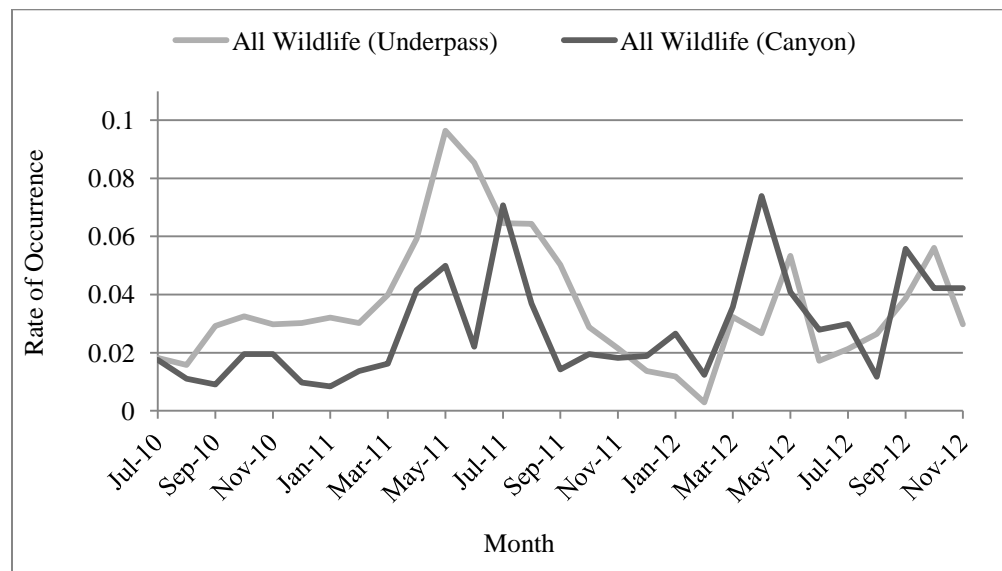


Figure 10. Occurrence rates of wildlife at the canyon and underpass sites over the full sampling period.

Table 7. Mann-Whitney U values for wildlife occurrence rates at canyon versus underpass sites

| Grouping | Small-bodied Mammal | Medium-bodied Mammal | Large-bodied Mammal | Bobcat        | Coyote | Carnivore       | Prey            | All Wildlife  | Total Human      |
|----------|---------------------|----------------------|---------------------|---------------|--------|-----------------|-----------------|---------------|------------------|
| U        | 16.578              | 0.197                | 6.119               | 3.687         | 0.57   | 8.291           | 7.622           | 3.007         | 28.305           |
| P-value  | <b>0.00004***</b>   | 0.657                | <b>0.013**</b>      | <b>0.055*</b> | 0.45   | <b>0.004***</b> | <b>0.005***</b> | <b>0.083*</b> | <b>0.0001***</b> |

Statistically significant associations are indicated with asterisks (\* $P < 0.10$ , \*\* $P < 0.05$ , \*\*\* $P < 0.01$ ).



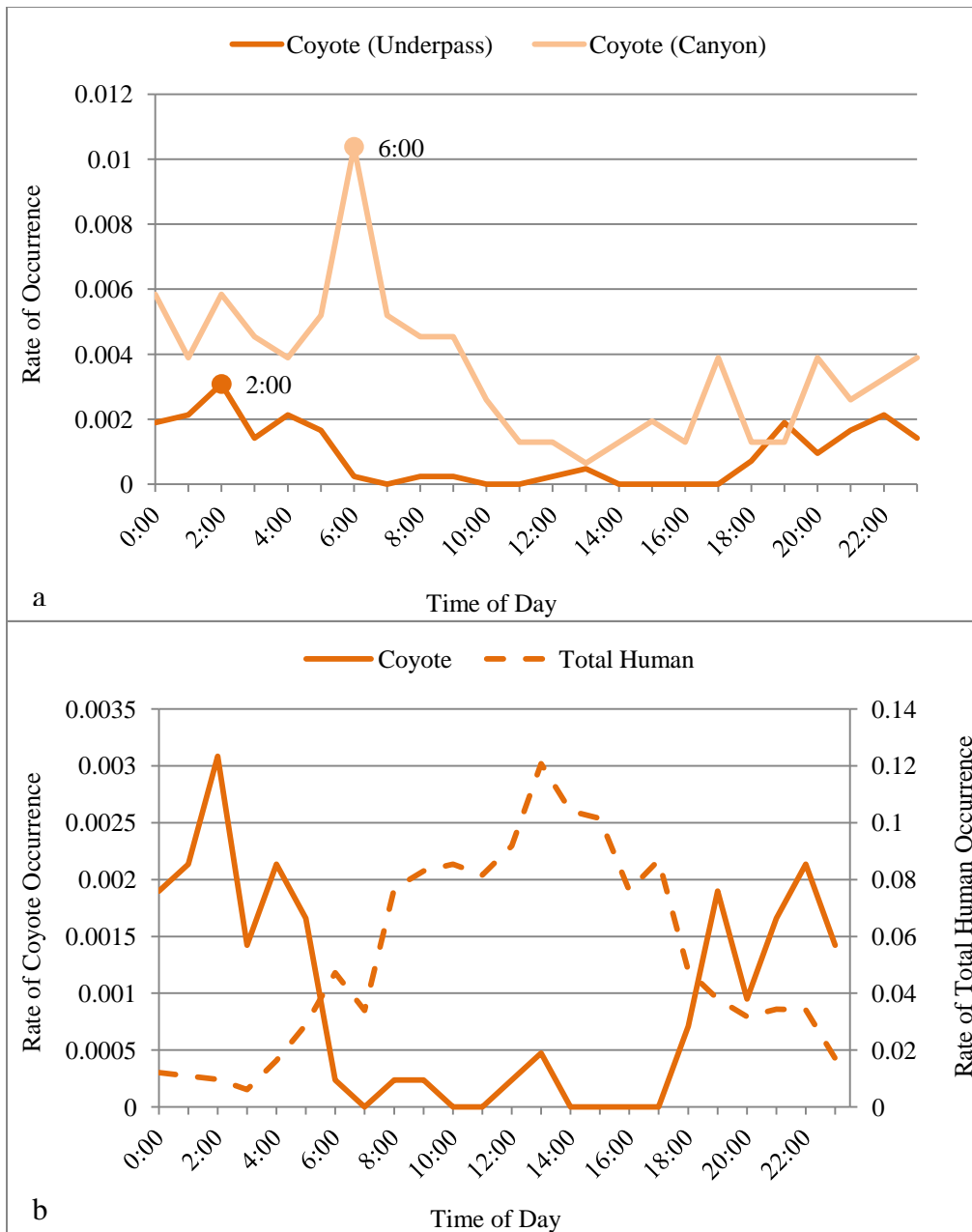


Figure 11. Temporal comparisons of coyote activity (a) at the underpass sites and the canyon sites, and (b) compared to total human activity at the underpass sites.

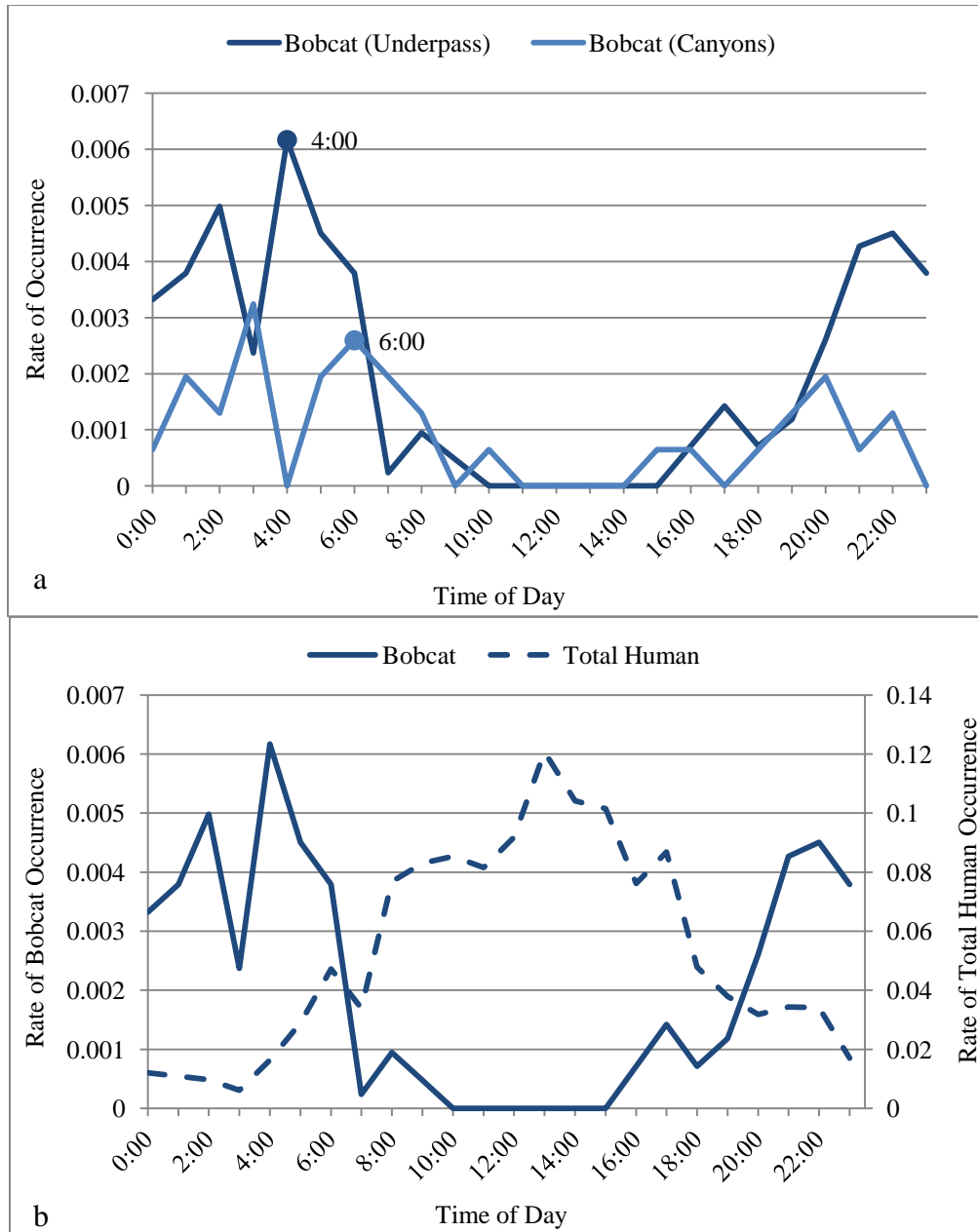


Figure 12. Temporal comparisons of bobcat activity (a) at the underpass sites and the canyon sites, and (b) compared to total human activity at the underpass sites.

## Discussion

A wide variety of wildlife used each of the underpass structures included in this study, confirming their value in allowing wildlife movement. For species with small home ranges, such as ground squirrels, desert cottontails, and black-tailed jackrabbits, underpasses likely provide convenient access to foraging habitat on either side of the highway. Small rodent species and reptiles may reside within or near the underpass structures. Habitat within the corridor can be important for sustaining small-bodied and less motile corridor-dwelling species (Barrows et al. 2011), and such species were found both near and within the underpasses. Large-bodied mammal species, such as coyotes and bobcats, are utilizing the underpasses as linkages between larger territories and home ranges.

### *Relationships between Underpass Structural Attributes and Wildlife Use*

Because there was only one underpass that lacked an atrium (Dry Morongo) and only one underpass that lacked natural substrate (Cottonwood) an analysis of the influence of these two factors on wildlife preference was not possible. Atria allow vegetation to grow within the underpass structures and also provide natural illumination making them appear less confining; this structural feature is generally preferred, however traffic noise within the underpass is higher when atria are present and may disturb more sensitive species (Jackson and Griffith 1998). Because this is an attribute common to the underpasses in our study area, wildlife may be accustomed to the noise levels within the structures and the benefits may outweigh the impact. Substrate can be another important feature influencing wildlife preference (van der Ree 2007, Jackson and Griffith 1998), thus the natural substrate occurring within most of the underpass structures is likely a feature that encourages rather than constrains use.

When the occurrence rates for medium-bodied mammals were analyzed there was a negative association with underpass width and openness ratios. Prey species also had a negative association with underpass openness. Similar relationships have been found elsewhere for this group (Ng et al. 2004, Rodriguez et al. 1996). Rodriguez et al. (1996) hypothesized that this preference exists because prey species are better secured from being ambushed by predatory species in structures with these attributes.

Data collected from the cameras allowed for accurate distinction between coyote and domestic canine occurrences. Therefore only those records were used when the relationships for those two species were analyzed. Data from the first monitoring period indicated that coyote occurrence rates were negatively correlated with underpass width. These data were at odds with expected results, such as those reported by Clevenger and Waltho (2005) during their 34 month study of 13 newly constructed underpasses who found that carnivore species, such as wolves (*Canis lupus*), tend to prefer structures that are wide and short. Because of these contrasting results additional monitoring was suggested to better understand these relationships. When data from the first and second monitoring periods were combined the relationships between coyote and carnivore species more closely resembled that reported by previous studies, that is, a negative trend with underpass length, and a positive trend with openness ratios.

Overall, the similarity in these trends between studies may indicate that animal behavior in desert environments resembles that of more mesic, vegetated habitats. The data available from underpass studies conducted in other environments may also be applicable to our desert study sites with regards to wildlife structural preferences.

### *Relationships between Human Activity and Wildlife Use*

Medium-bodied mammals had a significant positive association with off-highway vehicle usage. Both of these groups were negatively correlated with width and openness structural characteristics which indirectly resulted in these groups being positively correlated with each other. Small bodied mammals and birds were both positively associated with domestic canines, however there is no direct evidence to explain these relationships. Reptile species were positively correlated with humans on foot, which could be due to both group's propensity to utilize open areas; reptiles to thermoregulate or sun themselves, and humans to travel unimpeded.

For sites categorized as “natural” versus “disturbed” on the basis of human activity, the rates of occurrence of large-bodied mammals, coyotes, and domestic canines were higher in sites categorized as “disturbed”. This may indicate a willingness for these wildlife groups to use areas near human activity, not necessarily an attraction to the human activity itself. Indeed, when coyote and domestic canine temporal activity patterns were explored, domestic canines and total human activity followed a similar pattern of peak daytime activity, whereas coyotes, which were found to be positively associated with domestic canines, had a crepuscular activity pattern which evaded both domestic canine and total human activity peaks. The significant finding for the large mammal grouping is likely influenced by the inclusion of coyotes and domestic canines, as bobcats were not significantly different when analyzed separately and other large mammals species (cattle, mule deer) were rarely detected at the underpass sites.

When data from the first sampling period was analyzed for an earlier report, the same test revealed that the crossing rates of small-bodied mammals, medium-bodied mammals, canids, and all wildlife analyzed together (excluding canids) were higher in sites categorized as “disturbed”. Occurrence rates for small and medium-bodied mammals decreased between the first and second

sampling period, whereas occurrence rates for large-bodied mammals increased (Table 3). This may reflect why differences were detected during the first sampling period for small and medium-bodied species, a period of time when those groupings were more prevalent.

When sites were analyzed as “natural” versus “disturbed” on the basis of vegetative quality and proximity to human development during the first sampling period, a Mann-Whitney U test detected differences between the crossing rates of medium-bodied mammals ( $U = 2.778$ ,  $P = 0.096$ ) which were lower at “good” versus “compromised” sites, as well as for rates of full-sized vehicles ( $U = 3.247$ ,  $P = 0.072$ ) and total human activity ( $U = 2.778$ ,  $P = 0.0960$ ) which were both higher at “compromised” sites. When data from the second sampling period were added no significant difference was found for any of the groupings. The results for both of the “natural” versus disturbed” analyses based on either human activity or vegetative quality highlight the importance of extended monitoring to capture the range of variation common in dynamic natural environments.

Because the Stubbe West and Stubbe East underpasses are closely located and have similar dimensions, but differ in their rates of human activity, they provide an opportunity to examine the influence that human activity may have on wildlife preference of these structures. Human activity was significantly different between sites, with higher rates of occurrence at Stubbe East. The narrow southern opening of Stubbe West is only wide enough to allow the passage of off-highway vehicles; therefore, full-sized vehicle passage is concentrated at Stubbe East. Additionally, the Pacific Crest Trail passes beneath the I-10 freeway at Stubbe East. A peak in human foot traffic occurs during the spring through Stubbe East when hikers are utilizing the trail. Although human activity has been demonstrated as being much higher at Stubbe East, when total wildlife occurrence rates were compared between sites no significant difference was found.



When each wildlife group was analyzed, a significant difference was found for large mammals and carnivores. When domestic canines were excluded from the carnivore category to analyze native carnivore occurrence rates (which essentially included bobcats and coyotes because no mountain lions or gray foxes were detected at either site), no significant difference was found. Although domestic canine occurrence rates were not significantly different between sites when analyzed alone, these results indicate that they contributed considerably to influencing significance when the data were grouped. The Spearman Rank analysis determined that domestic canines were significantly associated with total human activity at the underpass sites, therefore their inclusion in both wildlife groupings is most likely the cause of the significant findings. Previous underpass studies have found that human activity has a negative impact on underpass use by wildlife (Clevenger and Waltho 2005). A possible explanation for the lack of a significant difference for total wildlife between sites, despite the difference in human activity, may be a product of adaptations by wildlife to this desert environment; crepuscular and nocturnal activity to evade peak daytime temperatures also minimizes the impact of human activities.

#### *Patterns of Occurrence at Underpass Sites versus Canyon Sites*

When the occurrence rates of wildlife at the canyon versus the underpass sites were compared a significant difference was detected. Bobcat occurrence rates were significantly different between the canyon and underpass sites, with more occurrences near the underpass structures. This is likely due to the “funneling” or concentrating nature of the underpasses; that is, bobcats attempting to cross the highway are funneled towards a limited number of underpass structures, and are more likely to be detected than bobcats in the canyons where they traverse a wider expanse of area. Indeed, most of the wildlife groups show this same concentration effect at the underpass sites (Table 2). Occurrence rates of total human activity were also significantly

different between canyon and underpass sites. Overall wildlife occurrence rates as well as patterns for individual species were found to be influenced by human activity. Although no significant difference was found for coyote occurrence rates between canyon and underpass sites, coyotes displayed different activity patterns between these sites. At the canyon sites, coyotes remained active later in the morning with a peak in activity occurring 4 hours after peak coyote activity near the underpass structures. Bobcat occurrence patterns were significantly different between the canyon and underpass sites, and they displayed an activity pattern similar to coyotes, with activity in the canyons peaking two hours after the peak in activity near the underpass sites. Both of these species are crepuscular, with peaks in activity typically occurring during dusk and dawn. While the data support crepuscular activities, the decreases in bobcat and coyote activity at the underpass sites as human activity begins to increase also indicates an influence by human activity. It has been suggested that bobcats and coyotes residing near urbanized areas adjust their behavior to spatially and temporally avoid human activities (Tigas et al. 2002); thus these species are avoiding underpass structures during times when human activity is most likely.

### *Wildlife Diversity*

While we recorded a wide range of species using the underpasses, there were apparent differences between underpasses with regards to species use. Mule deer were only documented at Whitewater underpass ( $n = 1$ ) and Dry Morongo ( $n = 12$ ). Of the underpasses included in this study, Dry Morongo has the shortest length (Table 1) and the largest single chamber width (Fig. 4g), which both contribute to its relatively high openness ratio of 11.40. Numerous studies have reported that ungulate species are particularly influenced by structural characteristics of underpasses (Reed et al. 1975, Foster and Humphrey 1995, Dodd et al. 2007). Preferred underpass dimensions combined with close proximity to the mountain ranges on either side of

the structure may combine to make this a suitable crossing structure for ungulates. However, desert bighorn sheep (*Ovis canadensis nelsoni*), which are known to inhabit the mountain ranges on either side of State Route-62 (Penrod et al. 2005a) and which were documented near the underpass (I. Hawkins, *pers. comm.* and M.L. Murphy-Mariscal, *wildlife camera*), were never found approaching or utilizing the underpass. This may be due to the high relative frequency of human activity and domestic canines near and through this underpass structure, as well as use of this structure by other ungulates (Bristow and Crabb 2008).

Although Dry Morongo has a relatively high human activity occurrence rate, it was also the only underpass in our study where mountain lion crossings were verified. Mountain lions show little aversion to human activities (Beier 1995), and previous studies found no correlation between human and cougar use of underpass structures (Gloyne and Clevenger 2001). A positive correlation has been found between cougars, mule deer and white-tailed deer, the latter being the primary food source of the lions (Gloyne and Clevenger 2001). As Dry Morongo underpass had the highest mule deer occurrence rate, cougars may be utilizing this underpass to track this food source between mountain ranges.

Whitewater Canyon was delineated as a primary least cost corridor, or best potential route, for mountain lions by a landscape permeability analysis (Penrod et al. 2005b). Although mountain lions have been observed traversing the canyon (Frazier Haney, Whitewater Preserve, *pers. comm.*) no mountain lions were documented near the underpass opening. Bobcats were recorded on several occasions as having utilized the underpass, indicating no aversion to the underpass dimensions or surrounding landscape characteristics and therefore demonstrating the potential suitability of this structure for use by other large carnivore species.

## **Conclusions and Recommendations**

Highways may present impenetrable barriers to wildlife movement; however, underpass structures can mitigate this problem by providing linkages which connect suitable habitats on both sides of the barrier. This study identified that underpass structures along Interstate-10, Highway 111 and State Route- 62 in the Coachella Valley are facilitating crossings by a broad range of wildlife beneath these potential barriers, and are serving to maintain connectivity between the Peninsular and Transverse Mountain ranges for many of the species occurring in this area. By utilizing non-invasive monitoring methods we were able to identify specific wildlife species which utilize the underpasses, temporal and spatial use patterns by both humans and wildlife, and potential factors which constrain or encourage underpass use by wildlife.

Existing literature suggests that wildlife preference of underpass structures is influenced by human activity. Data from our first sampling period was in agreement with the literature; that is, human activity had a greater influence than structural characteristics in determining underpass preference. However when we analyzed the data from the full sampling period we found that human activity had less of an impact than was originally determined. Our comparison of Stubbe West and Stubbe East underpass sites illustrates this point. However, those results were site-specific. The contribution of each variable, overall, should be evaluated when explaining wildlife preference. For example, bobcats were found to have a negative association with vehicle usage across all sites and a positive association with structural width and openness. If we consider the combined influence of each of these variables, the widest underpasses with the lowest vehicle occurrence rates (Whitewater, Highway 111 and Mission Creek underpasses) all consequently had the highest bobcat occurrence rates. When openness is factored in, Whitewater underpass,

having the highest openness ratio, a high measure of width, and a relatively low vehicle occurrence rate, promoted the highest bobcat occurrence rate of all the structures monitored.

The results presented here only account for the frequency of occurrence near the underpass structures and canyons monitored, and do not provide the data necessary to address whether these structures are effective; that is, whether gene flow is enabled. Genetic analysis of populations on both sides of the barrier should be undertaken to determine whether there is genetic variability and whether heterozygosity among populations is being maintained (Riley et al. 2006). Special attention should be extended to determine wildlife behavioral responses to alternative energy and transmission projects near the corridor and whether these projects are impacting or impeding movement through the landscape matrix, especially by wide ranging species.

All but one of the structures included in this study (Dry Morongo) contain atria which allow natural sunlight and water to enter the passages and have been found to be beneficial to wildlife preference. However refuse has accumulated within the Stubbe West structure inhibiting growth of vegetation beneath the atria. Clearance of the refuse is recommended to allow growth of native vegetation within the structure and may improve the condition of this underpass and positively influence its use by native wildlife species.

The Bureau of Land Management has protected 3-km of land on both sides of Dry Morongo underpass, which secures connectivity between the mountain ranges for bighorn sheep movement (Penrod et al. 2005b). Although land south the Dry Morongo underpass was delineated as a best potential route for bighorn sheep movement by a landscape permeability analysis (Penrod et al 2005b), no bighorn sheep were found approaching or utilizing Dry Morongo underpass during the duration of monitoring. Human recreational activities may inhibit

wildlife use and degrade habitat quality. Regulators may want to reduce vehicle access to Dry Morongo underpass to eliminate habitat disturbance and wildlife avoidance of these areas.

Appendix. Crossing rates of wildlife at each site for the full monitoring period, tracks and camera images combined

|                       |  | Stubbe East |        | Stubbe West |       | Cottonwood |       | Whitewater |       | Highway 111 |       | Dry Morongo |       |
|-----------------------|--|-------------|--------|-------------|-------|------------|-------|------------|-------|-------------|-------|-------------|-------|
| No. of Days Monitored |  | 232         |        | 752         |       | 658        |       | 810        |       | 752         |       | 448         |       |
| Group                 | Species  | N           | Rate   | N           | Rate  | N          | Rate  | N          | Rate  | N           | Rate  | N           | Rate  |
| Reptile species       |  | 15          | 0.065  | 16          | 0.021 | 24         | 0.036 | 49         | 0.060 | 39          | 0.052 | 24          | 0.054 |
| Small-bodied mammals  | Pocket mouse ( <i>Perognathus</i> spp.), kangaroo rat ( <i>Dipodomys</i> spp.), woodrat ( <i>Neotoma</i> spp.), deer mouse ( <i>Peromyscus</i> spp.), California ground squirrel ( <i>Spermophilus beecheyi</i> ), round-tailed ground squirrel ( <i>Spermophilus tereticaudus</i> ), white-tailed antelope ground squirrel ( <i>Ammospermophilus leucurus</i> ) | 71          | 0.306  | 145         | 0.193 | 278        | 0.422 | 303        | 0.374 | 77          | 0.102 | 204         | 0.455 |
| Bird species          |  | 62          | 0.267  | 62          | 0.082 | 49         | 0.074 | 136        | 0.168 | 44          | 0.059 | 114         | 0.254 |
| Medium-bodied mammals | Desert cottontail ( <i>Sylvilagus audubonii</i> ), black-tailed jackrabbit ( <i>Lepus californicus</i> ), striped skunk ( <i>Mephitis mephitis</i> ), raccoon ( <i>Procyon lotor</i> ), domestic cat   | 88          | 0.379  | 320         | 0.426 | 150        | 0.228 | 37         | 0.046 | 84          | 0.112 | 62          | 0.138 |
| Large-bodied mammals  | Domestic dog, coyote ( <i>Canis latrans</i> ), gray fox ( <i>Urocyon cinereoargenteus</i> ), bobcat ( <i>Felis rufus</i> ), mountain lion ( <i>Puma concolor</i> ), mule deer ( <i>Odocoileus hemionus</i> ), horse, burrow, cattle  | 65          | 0.280  | 68          | 0.090 | 66         | 0.100 | 222        | 0.274 | 118         | 0.157 | 237         | 0.529 |
| Humans on Foot        |  | 886         | 3.819  | 128         | 0.170 | 64         | 0.097 | 399        | 0.493 | 193         | 0.257 | 215         | 0.480 |
| Off-highway Vehicle   |  | 57          | 0.246  | 77          | 0.102 | 66         | 0.100 | 7          | 0.009 | 44          | 0.059 | 43          | 0.096 |
| Full-sized Vehicle    |  | 2807        | 12.099 | 39          | 0.052 | 131        | 0.199 | 4          | 0.005 | 117         | 0.156 | 172         | 0.384 |



Appendix. Continued

|                              |  | Mission<br>Creek |       | Cottonwood<br>Canyon |       | Snow Creek<br>Canyon |       | Whitewater<br>Canyon |       | Stubbe<br>Canyon |       |
|------------------------------|--|------------------|-------|----------------------|-------|----------------------|-------|----------------------|-------|------------------|-------|
| No. of Days Monitored        |  | 590              |       | 653                  |       | 682                  |       | 135                  |       | 72               |       |
| Group                        | Species  | N                | Rate  | N                    | Rate  | N                    | Rate  | N                    | Rate  | N                | Rate  |
| Reptile<br>species           |  | 22               | 0.037 | 22                   | 0.034 | 25                   | 0.037 | 4                    | 0.030 | 2                | 0.028 |
| Small-<br>bodied<br>mammals  | Pocket mouse ( <i>Perognathus</i> spp.), kangaroo rat ( <i>Dipodomys</i> spp.), woodrat ( <i>Neotoma</i> spp.), deer mouse ( <i>Peromyscus</i> spp.), California ground squirrel ( <i>Spermophilus beecheyi</i> ), round-tailed ground squirrel ( <i>Spermophilus tereticaudus</i> ), white-tailed antelope ground squirrel ( <i>Ammospermophilus leucurus</i> ) | 172              | 0.292 | 83                   | 0.127 | 72                   | 0.106 | 28                   | 0.207 | 0                | 0.000 |
| Bird species                 |  | 67               | 0.114 | 130                  | 0.199 | 127                  | 0.186 | 5                    | 0.037 | 26               | 0.361 |
| Medium-<br>bodied<br>mammals | Desert cottontail ( <i>Sylvilagus audubonii</i> ), black-tailed jackrabbit ( <i>Lepus californicus</i> ), striped skunk ( <i>Mephitis mephitis</i> ), raccoon ( <i>Procyon lotor</i> ), domestic cat   | 71               | 0.120 | 264                  | 0.404 | 29                   | 0.043 | 4                    | 0.030 | 5                | 0.069 |
| Large-<br>bodied<br>mammals  | Domestic dog, coyote ( <i>Canis latrans</i> ), gray fox ( <i>Urocyon cinereoargenteus</i> ), bobcat ( <i>Felis rufus</i> ), mountain lion ( <i>Puma concolor</i> ), mule deer ( <i>Odocoileus hemionus</i> ), horse, burrow, cattle  | 99               | 0.168 | 115                  | 0.176 | 64                   | 0.094 | 36                   | 0.267 | 98               | 1.361 |
| Human on<br>Foot             |  | 40               | 0.068 | 25                   | 0.038 | 11                   | 0.016 | 266                  | 1.970 | 0                | 0.000 |
| Off-highway<br>Vehicle       |  | 50               | 0.085 | 2                    | 0.003 | 0                    | 0.000 | 0                    | 0.000 | 0                | 0.000 |
| Full-sized<br>Vehicle        |  | 2                | 0.003 | 0                    | 0.000 | 0                    | 0.000 | 0                    | 0.000 | 0                | 0.000 |

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December 31, 2012

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

# 2012 Year-End Aeolian Sand Community Monitoring Summary

Final Report



*Summaries of the 2012 aeolian sand community monitoring results were provided to the CVCC in June 2012. The following is a more in-depth analysis of those data examining the impact and threats of Sahara mustard on two of the covered aeolian sand species. This analysis is provided to inform the CVCC and cooperating agencies as they allocate finite management resources.*

## Impacts of Sahara Mustard on the Population Trajectories of Coachella Valley Fringe-toed and Flat-tailed Horned Lizards

### **Abstract**

In arid environments identifying variables that impact a population's long-term persistence can be confounded due to the often dominant influence of annual rainfall. Long-term data sets collected across temporal and spatial gradients of rainfall, vegetation and other habitat conditions allow the identification of sometimes subtle early and then increasing influences of habitat variables that may challenge the sustainability of populations. Here we examine the impact of an invasive non-native annual plant, Sahara mustard, *Brassica tournefortii*, on two lizard species, the Coachella valley fringe-toed lizard, *Uma inornata*, and the flat-tailed horned lizard, *Phrynosoma mcallii*. Previous research has documented the mustard's negative impact on native annual plants and arthropods; this is the first rigorous attempt to identify whether those impacts extend higher within the aeolian sand community food web. Our analysis focused on the central Coachella Valley's Thousand Palms Preserve, a site where the mustard has reached higher densities than elsewhere within the remaining aeolian sand communities of this region. For the fringe-toed lizard the close correlation between population growth and annual rainfall began to deteriorate after 2008. In 2011 just 24% of the plots showed positive population growth compared to an expected  $\geq 60$ -70%. Similar declines were noted in reproductive success. For the horned lizard population there was a separation from annual rainfall as an important population driver after 2005, the first year the mustard dominated the lizard's habitat. The variables that best explained the temporal changes in the horned lizard's population growth were harvester ant abundance (their primary food) and a negative response to the mustard. For both lizard species the mustard was identified as negatively influencing their population growth. Despite recent years with average to above average rainfall these lizards have responded much the same way they would have during drought conditions. Population persistence, at least at the high levels observed over the past decade, is likely dependent on positive population growth during wetter years in order to compensate for declines during dry years. If populations aren't rebounding during wetter years long-term sustainability could be at risk.

## **Introduction**

In arid environments annual or seasonal rainfall accumulations are often dominant drivers in plant and animal population dynamics (Noy-Meir 1973, Barrows 2006). Identifying more subtle influences from additional environmental variables, especially potential threats that affect population trajectories and ultimately the persistence of conservation targets can be much more challenging. Long-term data sets collected across temporal and spatial gradients of rainfall, vegetation and other habitat conditions allow the identification of sometimes subtle early and then increasing influences of habitat variables that may challenge the sustainability of populations (Barrows et al. 2005). While the negative impacts of Sahara mustard, *Brassica tournefortii*, on native annual plants occurring on the aeolian sand community of the Coachella Valley have been documented (Barrows et al. 2009), the impacts of this invasive species on vertebrates have not received a rigorous analysis. Hulton et al. (in review) examined patterns of arthropod abundance, diversity and species richness on the Coachella Valley's aeolian sand communities and have documented a temporal decline in all their arthropod metrics over the past decade. However, that decline was statistically significant only on those sites with dense Sahara mustard cover and those with increasing mustard levels. Evidence of negative impacts on both annual plants and arthropods as mustard cover increases could be a harbinger of broader biodiversity declines that could possibly extend into higher trophic levels.

Here we examine the contribution of Sahara mustard, annual rainfall and other independent variables affecting population dynamics for two aeolian sand community vertebrates, the Coachella Valley fringe-toed lizard, *Uma inornata*, and the flat-tailed horned lizard, *Phrynosoma mcallii*. Both species are a focus of conservation efforts in the Coachella Valley and in the case of the horned lizard, elsewhere within its limited range. Previous research has identified important environmental variables that describe both suitable habitat as well as population changes in these species, including annual rainfall, sand compaction, harvester ant abundance and vegetation characteristics including Sahara mustard (Barrows 2006, Barrows and Allen 2009, Barrows and Allen 2010). The ten years of species abundance and community condition data we have collected have included areas of dense mustard cover as well as areas where the mustard has made only limited inroads. Temporally these data span extreme record-setting droughts as well as near-record wet years. That time frame has also included years when the mustard was an uncommon component of the community to the current condition where, in wet years, it dominates to the near exclusion of indigenous annual plant species. These spatial patterns and temporal changes provide an *in situ* natural experiment from which to understand the importance of a suite of environmental variables in driving the population dynamics, and ultimately the long-term persistence, for these two lizard species.

## **Methods**

*Study Sites* – Our primary sites for this study were located within the Coachella Valley, near Thousand Palms, Riverside County, California, USA, on the Coachella Valley National Wildlife



Refuge and California State Ecological Reserve (latitude 33.78, longitude -116.32). This area is part of an extremely arid shrub desert with a mean annual rainfall of 79 mm (most recent 60 year means, Western Regional Climate Center, Indio reporting station). The lowest rainfall years on record occurred in 2002 and 2007, with <10 mm of rainfall recorded. In contrast, in 2005, 210 mm of rainfall was measured, the largest annual rainfall total recorded in the past 50 years. Temperatures show similar extremes ranging from a low approaching 0° C in the winter to high exceeding 45°C commonly recorded during July and August. Although we collected data on the condition of the aeolian sand community in over 100 plots throughout the Coachella Valley, these analyses are limited to just the eastern-most plots, sites where the mustard dominates annual plant growth. The plots were also limited to only those sites where these two lizard species are detected with regularity; calculating population growth requires consecutive years of detections (see below). Thirty-four study plots were surveyed within active to partially stabilized dunes for assessing the population dynamics of the fringe-toed lizard and 19 plots were surveyed within stabilized sand fields and partially stabilized dunes to examine the horned lizard dynamics. Study sites were located in a random manner; horned lizard plots located within 50 m of roadways were excluded to avoid confounding edge effects (Barrows et al 2006). Each plot was 1m × 100 m (0.1 ha).

*Species and Habitat Data Collection* – We followed the monitoring protocols developed for the Coachella Valley Multiple Species Habitat Conservation Plan (CVMSHCP) throughout this study. The fine aeolian sand of the Coachella Valley's dune fields provided an opportunity unique to sand dunes to quantify the occurrence and relative abundance of lizards occurring within plots by counting individuals of each species by tracks they left as they moved across or within each plot. Each reptile species occurring on the aeolian sands could be identified to species and age class by their diagnostic tracks. Our tracking method was also non-intrusive, which is particularly important when surveying threatened or endangered species such as the Coachella Valley fringe-toed lizards. Identifying differences in track size and features, and following tracks off the plots ensured that each counted track represented a unique individual. Because late afternoon and evening breezes would usually remove all evidence of tracks, those observed during any of the sampling events could not be confused with those from the previous day. At least for flat-tailed horned lizards when we compared tracking data to mark and recapture derived densities there was a close proportional relationship ( $R^2 = 0.9599$  and  $P = 0.0006$ ; Barrows and Allen, 2009). Each plot was surveyed six times from late May through early July each year; lizard abundance metrics represented a mean of those six repetitions for each year.

Annual plants were counted and cover estimated in a 1 m<sup>2</sup> frame placed at 12 locations along the midline of each plot. Four samples were taken on alternating sides of the center line at each end point, and two samples were taken on each side of the center point. In each frame all individual plants were counted by species to determine species densities and for each species we made a visual estimate of its percent cover within each frame. These values were then averaged for each

species for the 12 frames of each plot. Annual plant data presented in our analyses were all measures of percent cover. Sand compaction has been described as a key habitat variable for *U. inornata* (Barrows, 1997, 2006). In order to capture the variation within each plot, sand compaction was measured at 25 points, approximately 4 m apart, along the plot midline, each year, using a hand-held pocket penetrometer with an adapter foot for loose soils (Ben Meadows Company, Janesville, WI, USA). Data were recorded as the force ( $\text{kg}/\text{cm}^2$ ) required to penetrate the sand surface. Annual precipitation was measured from a rain gauge located within the study area. In all but one year the data represent total rainfall for the rain year from July 1 through June 30. The exception was in the 2006 rain year when the majority of rain fell in September and had no discernible impact on the following spring's annual plant germination and associated food resources. In that year only December 1 through June 30 rainfall was used.

Arthropods were sampled using dry pitfall traps in April. Pitfall traps were placed at both ends and at the middle of each plot for a total of three pitfalls per plot. The traps were collected within 24 h of being set out to avoid any mortality of vertebrates captured in the traps. All arthropods were identified to the species level. Arthropod data are presented here as the total individuals/taxa/plot (combined counts for the three pitfall traps).

*Analyses* – Our dependent variable metric for describing population dynamics in the two lizard species was the observed mean annual rate of lizard population increase ( $r$ ), calculated using  $r = \ln(N_{i+1}/N_i)$  where  $N_i$  is the mean count of lizards observed during spring surveys in year  $i$ . An additional population metric, annual reproductive success (ARS) was calculated for fringe-toed lizards by dividing the mean number of hatchlings observed in September-October by the mean number of adults present on a given plot during the peak breeding period that same year (May through July).

For the purpose of the Logistic Regression values of  $r \leq 0$  were noted as “0” and those  $> 0$  as “1”; for ARS values  $< 1$  were noted as “0” and those  $\geq 1$  as “1”. Independent variables included annual rainfall, mean sand compaction, total captures of *Pogonomyrmex californicus* (red harvester ants), mean Sahara mustard cover/ $\text{m}^2$ , and the change ( $\Delta$ ) in mustard cover from year  $i$  to year  $i+1$ . These five variables were then the “full model” in the subsequent construction of Logistic Regression models. Logistic Regression “best fit” model selection was based on the smallest Akaike information criterion (AIC) value, coupled with a statistically significant ( $p \leq 0.05$ ) Chi Square analysis for the Likelihood Ratio.

T-Tests were performed on each of the independent variables for the 2005 through 2011 data (2005 being the first year the mustard reached dominance). Data were grouped by their corresponding  $r$  values, with those plots with  $r$  values  $\geq 0.5$  in one group and those with  $r$  values  $\leq -0.5$  in the second group. We assumed these somewhat more extreme values to have less

ambiguous relationships to associated independent variables than those closer to  $r = 0$ . Statistical significance corresponded with  $p$  values  $\leq 0.05$ .

## **Results**

*Fringe-toed Lizards* – Annual rainfall is a dominant driver of population growth ( $r$ ) in Coachella Valley fringe-toed lizards (Figure 1). Population growth relative to annual rainfall follows a logarithmic curve, becoming positive as annual rainfall levels rise approximately above 25 mm and gradually increasing above that level; however, there is substantial variability between individual plots, with negative and positive population growth occurring under the full range of rainfall levels experienced here from 2003-2008 (Figure 2). The addition of 2009, 2010, and 2011 data resulted in a substantial decline in the data fit to the model ( $R^2$ ) and an increase in the variation especially below the model prediction for those three most recent added years (Figure 3). This is especially evident for the 2011 data, a year that based on the annual rainfall levels should be predominantly positive population growth. In 2011, just 24% of the plots had positive growth.

As 2005 was the first year that the mustard became the dominant annual plant cover, we performed  $t$ -Tests on the 2005 through 2011 data comparing groupings of the independent variables based on their corresponding  $r$  for each plot; groups were defined based on  $r$  values either  $\leq -0.5$  or  $\geq 0.5$ . The only independent variable other than annual rainfall that statistically differed between these groupings was the change in mustard cover; plots with  $r$  values  $\leq -0.5$  were significantly associated with increasing levels of mustard cover.

The logistic regression model that best fit the multivariate distribution of the 2003-2011 population growth data was the “full model”, comprised of all five variables (Table 1). Increases in rainfall, less mustard cover, decreased mustard cover in the following year, increases in harvester ant abundance, and increases in sand compaction together contributed to explaining increases in fringe-toed lizard population growth ( $r$ ). Annual rainfall was a statistically significant (Chi Square,  $p \leq 0.05$ ) component of the six top models. The change in *Brassica* cover was a statistically significant component in each of the top four models, including one model comprised of just the mustard and annual rainfall. Single variate models with both annual rainfall and the mustard each created statistically significant models, although not as good a fit to the distribution of fringe-toed lizard population growth ( $r$ ) values as the multivariate models. Both metrics for mustard (percent cover and the change in mustard cover) were correlated with annual rainfall ( $r = 0.426$  and  $0.332$  respectively,  $p < 0.0001$  for both metrics; the only other independent variable correlation was a positive relationship between sand compaction and percent mustard cover,  $r = 0.352$ ,  $p < 0.0001$ ). Factoring in the change in mustard cover lowered the AIC value and therefore improved the model fit.

Annual reproductive success (ARS) showed a similar close association with annual rainfall (Figure 4). The best fit model for a regression of ARS against annual rainfall was linear (Figure 5). As with the regression of  $r$  versus annual rainfall the data for the years 2003-2008 had a better model fit ( $R^2 = 0.349$ ) than when the most recent years were also included ( $R^2 = 0.291$ ). The years 2011 and 2012 showed the greatest departure from the model with just 9% and 3% of the data point spread above the model line rather than the expected 50%.

*Flat-tailed Horned Lizards* – Flat-tailed horned lizards occurred primarily in more stabilized sand habitats, although since 2005 they have been increasingly found on the more active dune habitats (Figure 6). Annual rainfall was only correlated with annual population growth ( $r$ ) in flat-tailed horned lizards from 2003 through 2005; after 2005 no rainfall correlation was evident (Figure 7). This graphic observation is supported by the logistic regression model in which annual rainfall was not a component to the best-fit model explaining the variation in  $r$  (Table 2). Unlike the regression model for the fringe-toed lizard, just two variables, reductions in mustard cover and higher harvester ant abundance, remained in the best-fitting model explaining higher values for  $r$ .

To understand mechanisms underlying the impacts of Sahara mustard on these lizards, during June of the 2012 surveys we measured snout-vent lengths (SVL) for separate juvenile flat-tailed horned lizards on dense mustard sites and compared them with those sampled in less infested plots. While the sample size was small (five on active dunes, six on stabilized, more heavily mustard infested sand fields), the SVL between these two community types had no overlap. Mean SVL for juvenile horned lizards on the active dunes was 62.4 mm; for the stabilized sand areas it was 54.3 mm. Using a  $t$ -Test these differences were found to be significant ( $p = 0.002$ ).

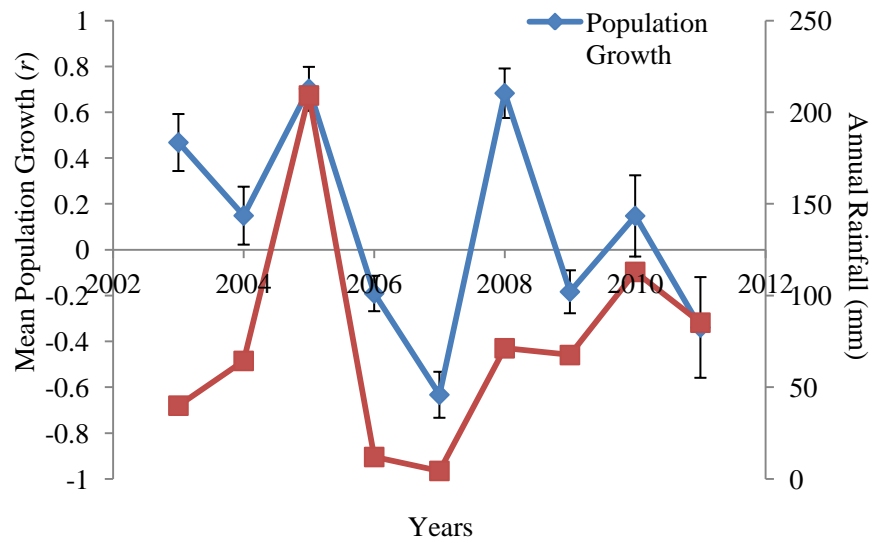


Figure 1. Annual variation in population growth ( $r$ ) with annual rainfall for Coachella Valley fringe-toed lizards within the Coachella Valley National Wildlife Refuge and California State Ecological Reserve.

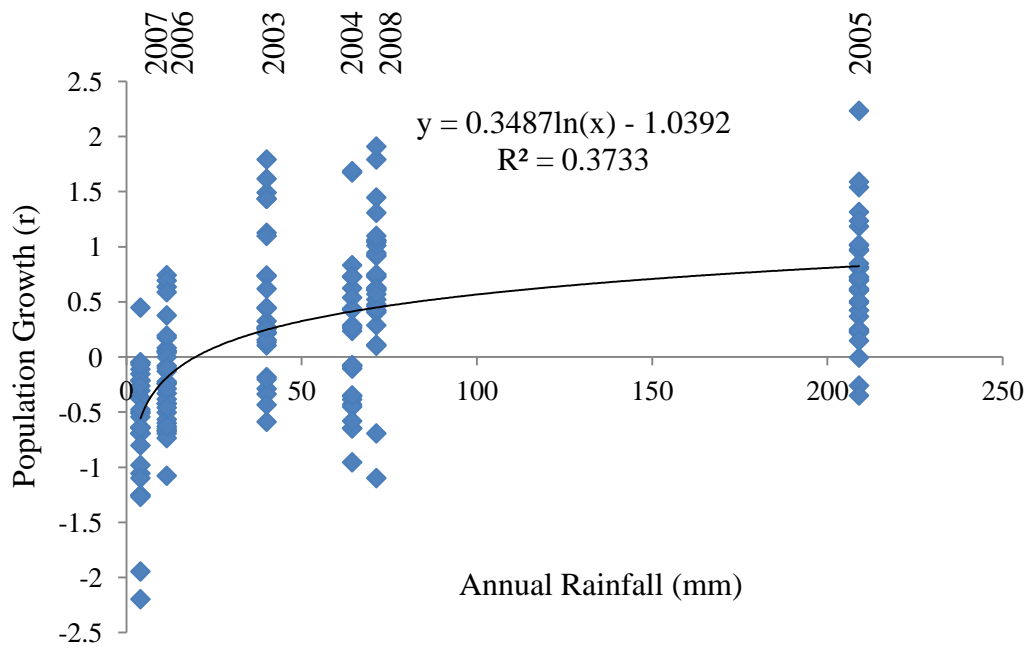


Figure 2. Patterns of annual population growth ( $r$ ) in Coachella Valley fringe-toed lizards from 2003-2008 with respect to annual rainfall. Blue dots represent population growth values for individual plots for each survey year.

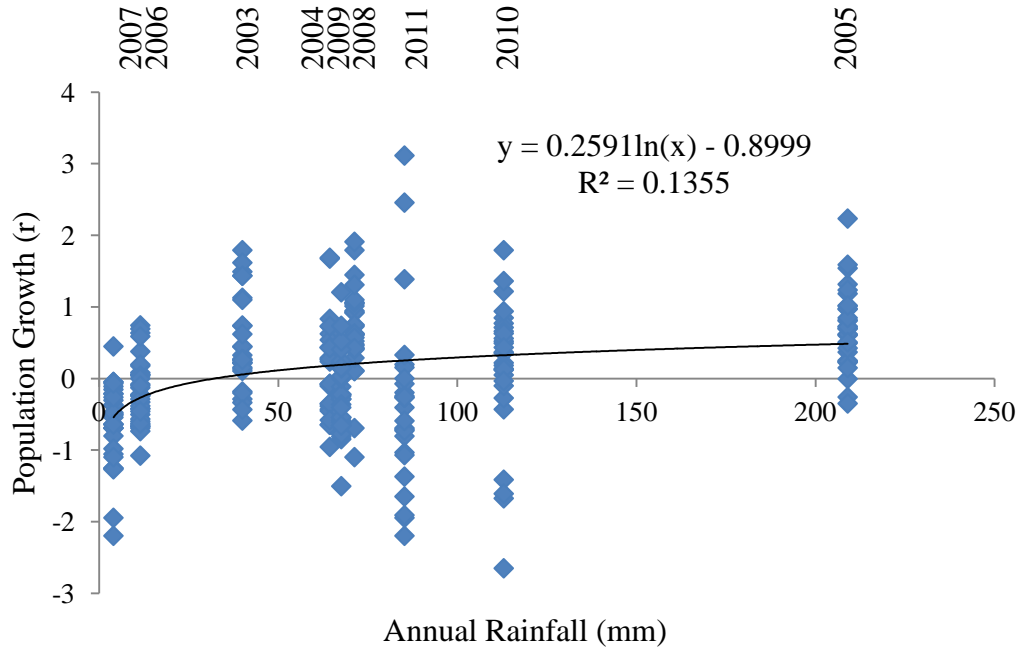


Figure 3. Patterns of annual population growth ( $r$ ) in Coachella Valley fringe-toed lizards from 2003-2011 with respect to annual rainfall. Blue dots represent population growth values for individual plots for each survey year.

Table 1. Comparisons of a multivariate logistic regression analyses assessing the contribution of up to five independent variables in explaining the variation in annual population growth ( $r$ ) in Coachella Valley fringe-toed lizards. See text for variable descriptions.

| Model Variables  | AIC     | $\Delta$ AIC | Likelihood Ratio – Chi Square |
|--|---------|--------------|-------------------------------|
| Annual. Rainfall + <i>Brassica</i> Cover + $\Delta$ <i>Brassica</i> + Harvester Ants + Sand Compaction | 301.036 | ---          | < 0.0001                      |
| Annual Rainfall + $\Delta$ <i>Brassica</i> + Harvester Ants  | 306.606 | 6.570        | < 0.0001                      |
| Annual Rainfall + $\Delta$ <i>Brassica</i> + Harvester Ants + <i>Brassica</i> Cover                    | 306.632 | 6.596        | < 0.0001                      |
| Annual Rainfall + $\Delta$ <i>Brassica</i>   | 313.716 | 12.680       | < 0.0001                      |
| Annual Rainfall + <i>Brassica</i> Cover + Harvester Ants + Sand Compaction                             | 322.419 | 21.383       | < 0.0001                      |
| Annual Rainfall  | 330.757 | 29.721       | < 0.0001                      |
| $\Delta$ <i>Brassica</i> + Harvester Ants + Sand Compaction  | 345.208 | 44.172       | 0.0018                        |
| $\Delta$ <i>Brassica</i>   | 351.044 | 50.008       | < 0.0001                      |

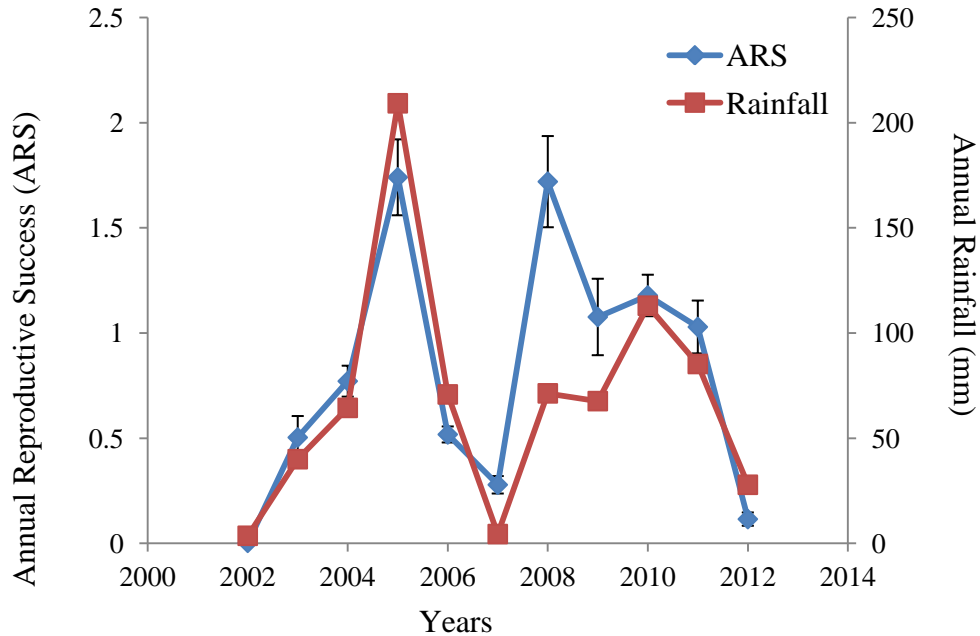


Figure 4. Patterns of annual reproductive success (ARS) in Coachella Valley fringe-toed lizards within the Coachella Valley National Wildlife Refuge and California State Ecological Reserve.

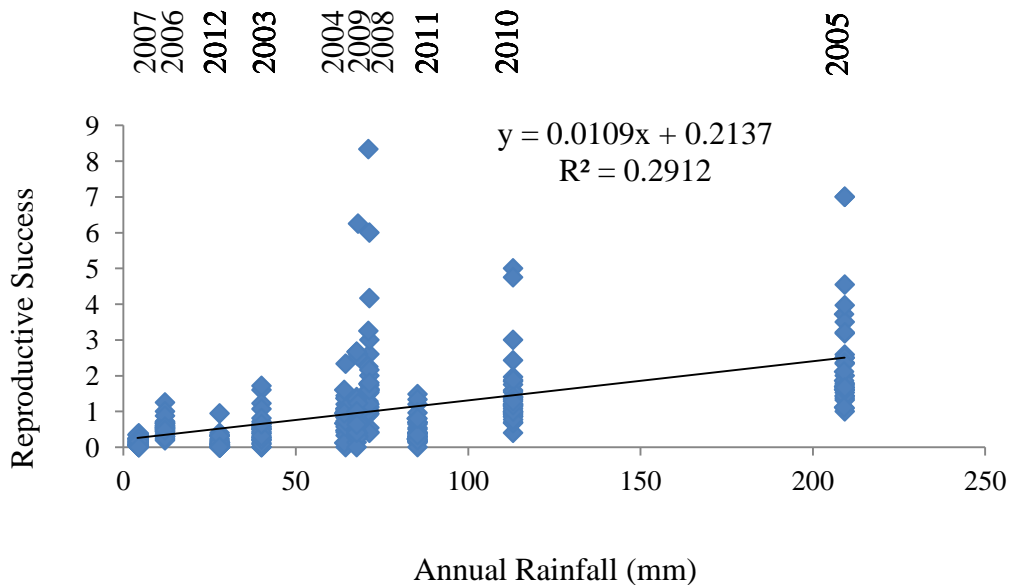


Figure 5. Patterns of annual reproductive success (ARS) in Coachella Valley fringe-toed lizards from 2003-2011 with respect to annual rainfall.



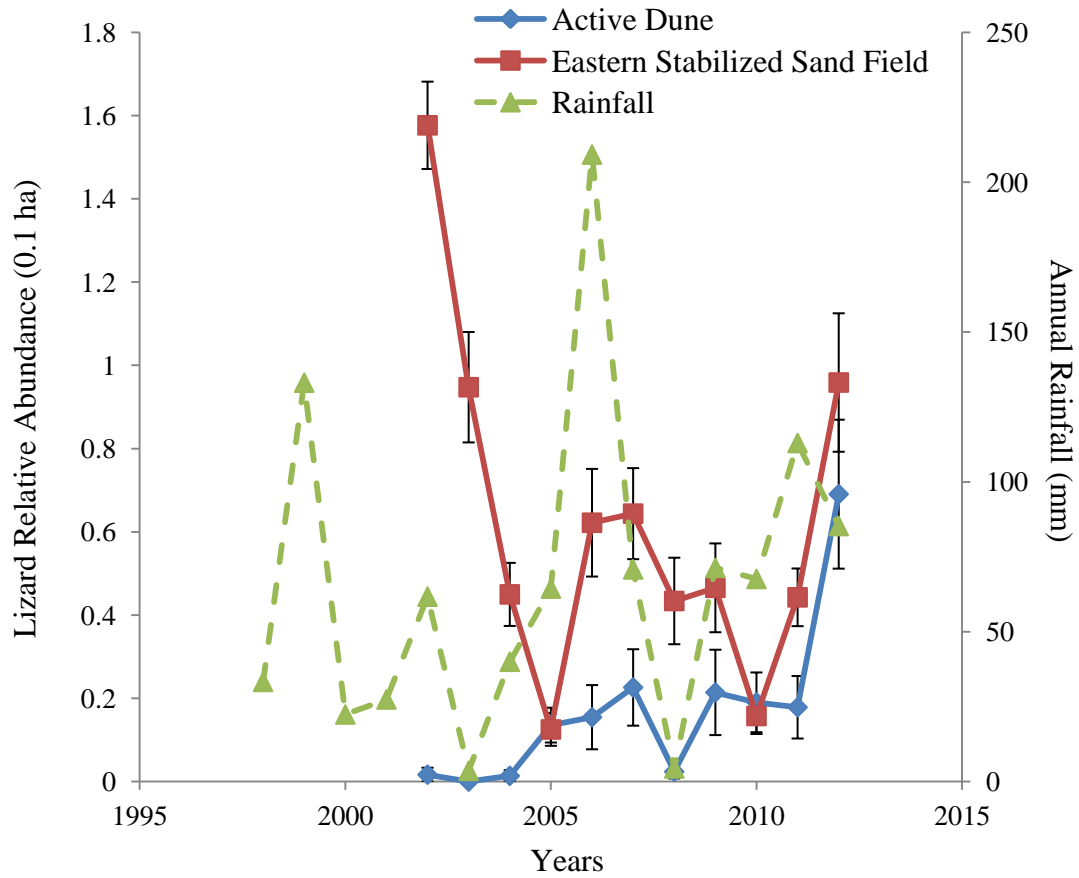


Figure 6. Annual flat-tailed horned lizard abundances on active dunes and stabilized sand fields within the Coachella Valley National Wildlife Refuge and California State Ecological Reserve.

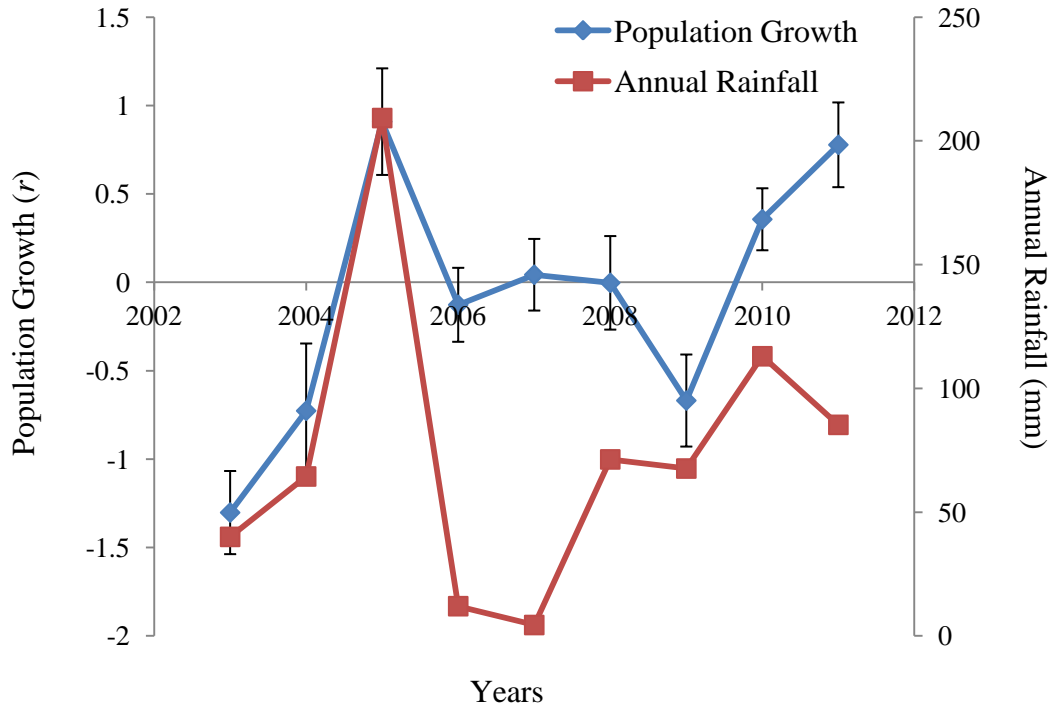


Figure 7. Patterns of annual population growth ( $r$ ) in flat-tailed horned lizards within the Coachella Valley National Wildlife Refuge and California State Ecological Reserve.

Table 2. Comparisons of a multivariate logistic regression analyses assessing the contribution of up to five independent variables in explaining the variation in annual population growth in flat-tailed horned lizards in the Coachella Valley, CA. See text for variable descriptions.

| Model Variables   | AIC     | $\Delta$ AIC | Likelihood Ratio – Chi Square |
|---|---------|--------------|-------------------------------|
| Harvester Ants + $\Delta$ <i>Brassica</i>   | 124.706 | ---          | 0.0002                        |
| Harvester Ants + $\Delta$ <i>Brassica</i> + Annual Rainfall   | 125.859 | 1.153        | 0.0005                        |
| Harvester Ants  | 126.684 | 1.878        | 0.0003                        |
| Harvester Ants + $\Delta$ <i>Brassica</i> + Annual Rainfall + <i>Brassica</i> Cover                   | 127.494 | 2.788        | 0.0011                        |
| Harvester Ants + $\Delta$ <i>Brassica</i> + Annual Rainfall + <i>Brassica</i> Cover + Sand Compaction | 129.387 | 4.681        | 0.0026                        |

## **Discussion**

Although Sahara mustard has had earlier population explosions associated with El Niño-related high rainfall years in the 1980s and 1990s, within the span of time of our research the mustard only became dominant during 2005, a dominance that has continued and increased for each subsequent non-drought year thereafter (Barrows et al. 2009). For annual plants the negative impact of increased mustard cover was apparent in 2005 (Barrows et al. 2009) and for arthropod abundance and species richness the indication for a negative impact has accumulated each year thereafter (Hulton et al. in review). In order to capture dynamic relationships between rainfall and other variables we employed measures of population trajectories including the lizards' annual population growth ( $r$ ) and annual reproductive success (ARS) rather than measures of abundance. In addition to variables that change from year to year, abundance reflects more static habitat conditions such as perennial plant structure-density-species richness-occurrence of palatable species, and structural conditions like sand depth-grain size and dune topography, variables that change over multiple years to decades, but are more resistant to annual vagaries. Using metrics that are more sensitive to annual change here we provide evidence that Sahara mustard dominance is retarding population growth in both lizard species, for flat-tailed horned lizards beginning after 2005, and Coachella Valley fringe-toed lizards after 2008.

Analysis results for the fringe-toed lizard clearly reflect rainfall's dominant influence in both annual reproduction and population growth, however additional environmental variables also contributed to the annual changes observed for this lizard species. Of the variables measured, the increase or change in Sahara mustard was the most consistent covariate with annual rainfall in the best-fitting explanatory models. When patterns of these metrics modeled with rainfall for 2003-2008 were compared to those for 2003-2011, there was deterioration in the rainfall-population model fit. When we examined each independent variable separately for the period of 2005-2011 (the period of mustard dominance) only annual rainfall and the change in mustard cover emerged as statistically significant variables that explained the changes in population growth.

For flat-tailed horned lizards a somewhat different pattern emerged. Except for 2003-2005 a strong annual rainfall-annual population growth correlation was not observed. The best-fit logistic regression model explaining patterns in  $r$  from 2003-2011 included just the change in mustard cover and harvester ant abundance.

Our data implicate Sahara mustard as the cause for the deteriorating correlations between population metric responses to stochastic annual rainfall for both fringe-toed and flat-tailed horned lizards. However correlations don't identify mechanisms for these patterns. Potential mechanisms include reduced food resources, dense mustard growth reducing mobility across the lizard habitats and increased sand compaction due to the mustard retarding aeolian sand movement.

The more stabilized aeolian sand habitat seemingly preferred by the horned lizards has much higher mustard cover than the more active sand preferred by fringe-toed lizards (Barrows 2006, Barrows and Allen 2009). The earlier response to mustard observed in horned lizards (post-2005) than as compared with the fringe-toed lizard (post-2008) may be related to the much denser mustard cover on the horned lizard's habitat. Prior to 2005 few horned lizards were detected in the more active dune areas but since 2005 horned lizards have increasingly been found in the more open active dunes. In 2012 we measured growth rates in juvenile flat-tailed horned lizards occurring on both active dunes and stabilized sand habitat sand found juvenile horned lizards on the stabilized sand fields were 10% smaller than those on active dunes. While other potential mechanisms, such as reduced mobility and increased sand compaction were not examined, this observation points to reduced food resources as a causal factor and is consistent with the findings of reduced arthropods due to the increasing dominance of mustard by Hulton et al. (in review). The apparently stronger negative response from horned lizards to establishment and spread of mustard may be due to their more exclusive diet of harvester ants, while fringe-toed lizards have a much broader plant diet of plants and other arthropods (Barrows 2006, Barrows and Allen 2009).

Population persistence, at least at the high levels observed over the past decade is likely dependent on positive population growth during wetter years in order to compensate for declines during dry years. If populations aren't rebounding during wetter years long-term sustainability could be at risk. With climate change dominating many concerns about our ability to sustain natural communities, populations and species, one of the important actions conservation programs can take is to reduce other stressors so that there are not multiplying effects with climate change that may lead to local population losses. Our results support other findings that indicate Sahara mustard is eroding biodiversity across trophic levels within those aeolian sand habitats where it is becoming, or has become the dominant annual plant species.

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## Appendix 2

### Table of Acquisitions for Conservation in 2012

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## CVMSHCP Annual Report 2012 - Parcels Acquired for Conservation

| Conservation Area                             | Acquisition Made By                    | Total Acres |
|---|--|-------------|
| Desert Tortoise and Linkage                   | <b>Friends of the Desert Mountains</b> | <b>806</b>  |
|   | 707240003                              | 643         |
|   | 707270007                              | 151         |
|   | 717110012                              | 4           |
|   | 717110021                              | 9           |
| <b>Desert Tortoise and Linkage Total</b>      |  | <b>806</b>  |
| Highway 111 / I-10                            | <b>Friends of the Desert Mountains</b> | <b>2</b>    |
|   | 522080055                              | 2           |
| <b>Highway 111 / I-10 Total</b>               |  | <b>2</b>    |
| Highway 111 / I-11                            | <b>Friends of the Desert Mountains</b> | <b>2</b>    |
|   | 522080056                              | 2           |
| <b>Highway 111 / I-11 Total</b>               |  | <b>2</b>    |
| Mecca Hills / Orocopia Mountains              | <b>Friends of the Desert Mountains</b> | <b>401</b>  |
|   | 709420025                              | 10          |
|   | 709420030                              | 31          |
|   | 709550007                              | 10          |
|   | 717080021                              | 5           |
|   | 717110012                              | 1           |
|   | 717110021                              | 1           |
|   | 717160008                              | 20          |
|   | 719090021                              | 10          |
|   | 719090056                              | 10          |
|   | 719190031                              | 10          |
|   | 719190032                              | 20          |
|   | 721060006                              | 18          |
|   | 721070009                              | 30          |
|   | 721070010                              | 30          |
|   | 709420013                              | 21          |
|   | 717120013                              | 10          |
|   | 717160011                              | 5           |
|   | 719090008                              | 158         |
| <b>Mecca Hills / Orocopia Mountains Total</b> |  | <b>401</b>  |
| Santa Rosa and San Jacinto Mountains          | <b>Friends of the Desert Mountains</b> | <b>542</b>  |
|   | 669230005                              | 14          |
|   | 669290007                              | 113         |
|   | 669290010                              | 5           |
|   | 669310002                              | 22          |
|   | 753120008                              | 43          |
|   | 753150016                              | 9           |
|   | 753160007                              | 20          |
|   | 753190018                              | 39          |
|   | 753290010                              | 39          |
|   | 755020003                              | 170         |
|   | 755290003                              | 10          |



## CVMSHCP Annual Report 2012 - Parcels Acquired for Conservation

| Conservation Area                                 | Acquisition Made By                             | Total Acres |
|---|---|-------------|
|   | 753200005                                       | 39          |
|   | 753280013                                       | 19          |
|   | <b>Wildlife Conservation Board</b>              | <b>58</b>   |
|   | 753040005                                       | 19          |
|   | 753040015                                       | 5           |
|   | 753040021                                       | 10          |
|   | 753040022                                       | 14          |
|   | 753050017                                       | 5           |
|   | 753050018                                       | 5           |
|   | <b>Trust for Public Lands</b>                   | <b>686</b>  |
|   | 751300006                                       | 552         |
|   | 755350001                                       | 25          |
|   | 755350009                                       | 29          |
|   | 755360012                                       | 49          |
|   | 755360013                                       | 29          |
| <b>Santa Rosa and San Jacinto Mountains Total</b> |   | <b>1286</b> |
| <b>Stubbe and Cottonwood Canyons</b>              | <b>Friends of the Desert Mountains</b>          | <b>5</b>    |
|   | 520030004                                       | 5           |
| <b>Stubbe and Cottonwood Canyons Total</b>        |   | <b>5</b>    |
| <b>Thousand Palms</b>                             | <b>Coachella Valley Conservation Commission</b> | <b>492</b>  |
|   | 648160010                                       | 2           |
|   | 750190003                                       | 451         |
|   | 750190004                                       | 29          |
|   | 750190005                                       | 10          |
| <b>Thousand Palms Total</b>                       |   | <b>492</b>  |
| <b>Upper Mission Creek / Big Morongo Canyon</b>   | <b>Coachella Valley Conservation Commission</b> | <b>350</b>  |
|   | 661020004                                       | 12          |
|   | 661020005                                       | 25          |
|   | 661020006                                       | 2           |
|   | 661020007                                       | 35          |
|   | 663270003                                       | 41          |
|   | 663280016                                       | 20          |
|   | 663280021                                       | 7           |
|   | 664090006                                       | 1           |
|   | 664090017                                       | 41          |
|   | 664090018                                       | 47          |
|   | 664100022                                       | 3           |
|   | 664100026                                       | 5           |
|   | 664120003                                       | 5           |
|   | 664130007                                       | 5           |
|   | 665090012                                       | 3           |
|   | 665100008                                       | 5           |
|   | 665100014                                       | 5           |
|   | 665100015                                       | 2           |
|   | 665100022                                       | 3           |

## CVMSHCP Annual Report 2012 - Parcels Acquired for Conservation

| Conservation Area                              | Acquisition Made By                      | Total Acres |
|--|--|-------------|
| Upper Mission Creek / Big Morongo Canyon       | 671200003                                | 38          |
|  | 671200004                                | 10          |
|  | 671200005                                | 19          |
|  | 671200006                                | 9           |
|  | 671200008                                | 7           |
| Upper Mission Creek / Big Morongo Canyon Total |  | 350         |
| West Deception Canyon                          | Friends of the Desert Mountains          | 238         |
|  | 645360002                                | 238         |
| West Deception Canyon Total                    |  | 238         |
| Whitewater Floodplain                          | Friends of the Desert Mountains          | 10          |
|  | 669290010                                | 10          |
| Whitewater Floodplain Total                    |  | 10          |
| Willow Hole                                    | Coachella Valley Conservation Commission | 314         |
|  | 660093002                                | 0           |
|  | 660101006                                | 0           |
|  | 660101007                                | 0           |
|  | 660102001                                | 0           |
|  | 660110025                                | 5           |
|  | 660110027                                | 5           |
|  | 660110029                                | 5           |
|  | 660110038                                | 10          |
|  | 660120005                                | 5           |
|  | 660120007                                | 3           |
|  | 660120008                                | 1           |
|  | 660120009                                | 1           |
|  | 660120010                                | 1           |
|  | 665190007                                | 10          |
|  | 665190025                                | 36          |
|  | 665190027                                | 36          |
|  | 665200009                                | 41          |
|  | 665200010                                | 40          |
|  | 665200011                                | 40          |
|  | 665200012                                | 40          |
|  | 669130003                                | 3           |
|  | 669140004                                | 30          |
|  | 660110004                                | 1           |
|  | 660110005                                | 1           |
| Willow Hole Total                              |  | 314         |
| Grand Total                                    |  | 3907        |

# Appendix 3

## Status of Conservation Objectives by Conservation Area

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### CVMSHCP Annual Report 2012 - Conservation Objectives by Conservation Area

|   | Total Acres in<br>Conservation<br>Area | Acres of<br>Disturbance<br>Authorized<br>(1996) | Remaining<br>Acres To Be<br>Conserved<br>(1996) | Acres<br>Conserved<br>Since 1996 | Acres<br>Conserved in<br>2012 | Percentage of<br>Required<br>Conservation<br>Acquired | Acres of<br>Permitted<br>Disturbance | Acres of Rough<br>Step |
|---|--|---|---|----------------------------------|-------------------------------|---|--------------------------------------|------------------------|
| <b>Cabazon Conservation Area - Riverside County</b>                                       |  |   |   |                                  |                               |   |                                      |                        |
| 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                      |
|   |  |   |   |                                  |                               |   |                                      |                        |
| <b>Coachella Valley Stormwater Channel and Delta Conservation Area - Riverside County</b> |  |   |   |                                  |                               |   |                                      |                        |
| 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<br>Conservation<br>Area | Acres of<br>Disturbance<br>Authorized<br>(1996) | Remaining<br>Acres To Be<br>Conserved<br>(1996) | Acres<br>Conserved<br>Since 1996 | Acres<br>Conserved in<br>2012 | Percentage of<br>Required<br>Conservation<br>Acquired | Acres of<br>Permitted<br>Disturbance | Acres of Rough<br>Step |
|---|--|---|---|----------------------------------|-------------------------------|---|--------------------------------------|------------------------|
| <b>Desert Tortoise and Linkage Conservation<br/>Area - Coachella</b>        |  |   |   |                                  |                               |   |                                      |                        |
| 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                      |
|   |  |   |   |                                  |                               |   |                                      |                        |
| <b>Desert Tortoise and Linkage Conservation<br/>Area - Riverside County</b> |  |   |   |                                  |                               |   |                                      |                        |
| Desert Tortoise - Core Habitat  | 88,878                                 | 4,998   | 44,978  | 3,259                            | 806                           | 7%  | 0                                    | 826                    |
| Orocopia Sage - Core Habitat  | 779                                    | 44  | 398   | 0                                | 0                             | 0%  | 0                                    | 4                      |
| Mecca Aster - Core Habitat  | 4,731                                  | 206   | 1,852   | 197                              | 13                            | 11%   | 0                                    | 40                     |
| Le Conte's Thrasher - Other Conserved Habitat                               | 49,114                                 | 2,813   | 25,319  | 1,226                            | 92                            | 5%  | 0                                    | 404                    |
| Desert dry wash woodland  | 13,443                                 | 752   | 6,771   | 467                              | 143                           | 7%  | 0                                    | 122                    |
| Desert Tortoise and Linkage Corridor  | 26,122                                 | 1,572   | 14,144  | 685                              | 13                            | 5%  | 0                                    | 226                    |
|   |  |   |   |                                  |                               |   |                                      |                        |

|  | Total Acres in<br>Conservation<br>Area | Acres of<br>Disturbance<br>Authorized<br>(1996) | Remaining<br>Acres To Be<br>Conserved<br>(1996) | Acres<br>Conserved<br>Since 1996 | Acres<br>Conserved in<br>2012 | Percentage of<br>Required<br>Conservation<br>Acquired | Acres of<br>Permitted<br>Disturbance | Acres of Rough<br>Step |
|--|--|---|---|----------------------------------|-------------------------------|---|--------------------------------------|------------------------|
| <b>Dos Palmas Conservation Area - Riverside<br/>County</b>                 |  |   |   |                                  |                               |   |                                      |                        |
| Crissal Thrasher - Core Habitat  | 536                                    | 38  | 343   | 141                              | 0                             | 41%   | 0                                    | 18                     |
| Desert Pupfish - Refugia Locations   | 0                                      | 0   | 0   | 0                                | 0                             | 0%  | 0                                    | 0                      |
| California Black Rail - Other Conserved Habitat                            | 597                                    | 37  | 334   | 270                              | 0                             | 81%   | 0                                    | 31                     |
| Le Conte's Thrasher - Other Conserved Habitat                              | 14,882                                 | 743   | 6,689   | 1,030                            | 0                             | 15%   | 0                                    | 177                    |
| Yuma Clapper Rail - Other Conserved Habitat                                | 682                                    | 42  | 374   | 270                              | 0                             | 72%   | 0                                    | 31                     |
| Predicted Flat-tailed Horned Lizard - Other<br>Conserved Habitat           | 5,537                                  | 403   | 3,631   | 265                              | 0                             | 7%  | 0                                    | 67                     |
| 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   | 131                              | 0                             | 41%   | 0                                    | 17                     |
| Desert sink scrub  | 7,195                                  | 487   | 4,381   | 837                              | 0                             | 19%   | 0                                    | 132                    |
| Desert dry wash woodland   | 1,856                                  | 83  | 746   | 170                              | 0                             | 23%   | 0                                    | 25                     |
| Cismontane alkali marsh  | 321                                    | 23  | 205   | 200                              | 0                             | 98%   | 0                                    | 22                     |
| Mesquite hummocks  | 55                                     | 3   | 23  | 10                               | 0                             | 43%   | 0                                    | 1                      |
|  |  |   |   |                                  |                               |   |                                      |                        |
| <b>East Indio Hills Conservation Area - Coachella</b>                      |  |   |   |                                  |                               |   |                                      |                        |
| Le Conte's Thrasher - Other Conserved Habitat                              | 62                                     | 6   | 56  | 0                                | 0                             | 0%  | 0                                    | 1                      |
| Palm Springs Pocket Mouse - Other Conserved<br>Habitat                     | 8                                      | 1   | 7   | 0                                | 0                             | 0%  | 0                                    | 0                      |
| Coachella Valley Round-tailed Ground Squirrel<br>- Other Conserved Habitat | 6                                      | 1   | 5   | 0                                | 0                             | 0%  | 0                                    | 0                      |
| Predicted Flat-tailed Horned Lizard - Other<br>Conserved Habitat           | 6                                      | 1   | 5   | 0                                | 0                             | 0%  | 0                                    | 0                      |
|  |  |   |   |                                  |                               |   |                                      |                        |

|   | Total Acres in<br>Conservation<br>Area | Acres of<br>Disturbance<br>Authorized<br>(1996) | Remaining<br>Acres To Be<br>Conserved<br>(1996) | Acres<br>Conserved<br>Since 1996 | Acres<br>Conserved in<br>2012 | Percentage of<br>Required<br>Conservation<br>Acquired | Acres of<br>Permitted<br>Disturbance | Acres of Rough<br>Step |
|---|--|---|---|----------------------------------|-------------------------------|---|--------------------------------------|------------------------|
| <b>East Indio Hills Conservation Area - Indio</b>                       |  |   |   |                                  |                               |   |                                      |                        |
| 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                      |
|   |  |   |   |                                  |                               |   |                                      |                        |
| <b>East Indio Hills Conservation Area - Riverside County</b>            |  |   |   |                                  |                               |   |                                      |                        |
| 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<br>Conservation<br>Area | Acres of<br>Disturbance<br>Authorized<br>(1996) | Remaining<br>Acres To Be<br>Conserved<br>(1996) | Acres<br>Conserved<br>Since 1996 | Acres<br>Conserved in<br>2012 | Percentage of<br>Required<br>Conservation<br>Acquired | Acres of<br>Permitted<br>Disturbance | Acres of Rough<br>Step |
|--|--|---|---|----------------------------------|-------------------------------|---|--------------------------------------|------------------------|
| <b>Edom Hill Conservation Area - Cathedral City</b>                        |  |   |   |                                  |                               |   |                                      |                        |
| Coachella Valley Round-tailed Ground Squirrel<br>- Other Conserved Habitat | 134                                    | 13  | 121   | 102                              | 0                             | 84%   | 0                                    | 11                     |
| Coachella Valley Milkvetch - Other Conserved<br>Habitat                    | 151                                    | 15  | 136   | 102                              | 0                             | 75%   | 0                                    | 12                     |
| Palm Springs Pocket Mouse - Other Conserved<br>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                     |
|  |  |   |   |                                  |                               |   |                                      |                        |
| <b>Edom Hill Conservation Area - Riverside<br/>County</b>                  |  |   |   |                                  |                               |   |                                      |                        |
| Coachella Valley Giant Sand-treader Cricket -<br>Other Conserved Habitat   | 103                                    | 5   | 40  | 43                               | 0                             | 100%  | 0                                    | 5                      |
| Coachella Valley Milkvetch - Other Conserved<br>Habitat                    | 1,637                                  | 134   | 1,205   | 1,020                            | 0                             | 85%   | 0                                    | 115                    |
| Coachella Valley Fringe-toed Lizard - Other<br>Conserved Habitat           | 103                                    | 5   | 40  | 43                               | 0                             | 100%  | 0                                    | 5                      |
| Coachella Valley Round-tailed Ground Squirrel<br>- Other Conserved Habitat | 1,701                                  | 145   | 1,302   | 1,107                            | 0                             | 85%   | 0                                    | 125                    |
| Palm Springs Pocket Mouse - Other Conserved<br>Habitat                     | 1,228                                  | 104   | 935   | 791                              | 0                             | 85%   | 0                                    | 90                     |
| Le Conte's Thrasher - Other Conserved Habitat                              | 2,238                                  | 194   | 1,745   | 1,323                            | 0                             | 76%   | 1                                    | 151                    |
| 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<br>Conservation<br>Area | Acres of<br>Disturbance<br>Authorized<br>(1996) | Remaining<br>Acres To Be<br>Conserved<br>(1996) | Acres<br>Conserved<br>Since 1996 | Acres<br>Conserved in<br>2012 | Percentage of<br>Required<br>Conservation<br>Acquired | Acres of<br>Permitted<br>Disturbance | Acres of Rough<br>Step |
|---|--|---|---|----------------------------------|-------------------------------|---|--------------------------------------|------------------------|
| <b>Highway 111/I-10 Conservation Area -<br/>Riverside County</b>                              |  |   |   |                                  |                               |   |                                      |                        |
| Coachella Valley Round-tailed Ground Squirrel<br>- Other Conserved Habitat                    | 389                                    | 39  | 350   | 51                               | 4                             | 15%   | 0                                    | 9                      |
| Coachella Valley Jerusalem Cricket - Other<br>Conserved Habitat                               | 372                                    | 37  | 335   | 48                               | 4                             | 14%   | 0                                    | 8                      |
| Le Conte's Thrasher - Other Conserved Habitat   | 389                                    | 39  | 350   | 51                               | 4                             | 15%   | 0                                    | 9                      |
| Coachella Valley Milkvetch - Other Conserved<br>Habitat                                       | 372                                    | 37  | 335   | 48                               | 4                             | 14%   | 0                                    | 8                      |
| Palm Springs Pocket Mouse - Other Conserved<br>Habitat  | 389                                    | 39  | 350   | 51                               | 4                             | 15%   | 0                                    | 9                      |
|   |  |   |   |                                  |                               |   |                                      |                        |
| <b>Indio Hills Palms Conservation Area -<br/>Riverside County</b>                             |  |   |   |                                  |                               |   |                                      |                        |
| 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                      |
|   |  |   |   |                                  |                               |   |                                      |                        |
| <b>Indio Hills/Joshua Tree National Park Linkage<br/>Conservation Area - Riverside County</b> |  |   |   |                                  |                               |   |                                      |                        |
| Desert Tortoise - Core Habitat  | 10,308                                 | 859   | 7,735   | 6,388                            | 0                             | 83%   | 0                                    | 724                    |
| Le Conte's Thrasher - Other Conserved Habitat   | 6,396                                  | 606   | 5,457   | 5,426                            | 0                             | 99%   | 0                                    | 603                    |
| Sand Transport  | 7,304                                  | 681   | 6,132   | 5,739                            | 0                             | 94%   | 5                                    | 637                    |
| Sand Source   | 5,823                                  | 460   | 4,135   | 3,078                            | 0                             | 74%   | 0                                    | 354                    |
| Indio Hills / Joshua Tree National Park Corridor  | 13,127                                 | 1,141   | 10,267  | 8,817                            | 0                             | 86%   | 5                                    | 991                    |
|   |  |   |   |                                  |                               |   |                                      |                        |

|  | Total Acres in<br>Conservation<br>Area | Acres of<br>Disturbance<br>Authorized<br>(1996) | Remaining<br>Acres To Be<br>Conserved<br>(1996) | Acres<br>Conserved<br>Since 1996 | Acres<br>Conserved in<br>2012 | Percentage of<br>Required<br>Conservation<br>Acquired | Acres of<br>Permitted<br>Disturbance | Acres of Rough<br>Step |
|--|--|---|---|----------------------------------|-------------------------------|---|--------------------------------------|------------------------|
| <b>Joshua Tree National Park Conservation Area -<br/>Riverside County</b>          |  |   |   |                                  |                               |   |                                      |                        |
| 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  | 11,741                           | 0                             | 76%   | 0                                    | 1,345                  |
| Desert dry wash woodland   | 2,195                                  | 13  | 119   | 192                              | 0                             | 100%  | 0                                    | 20                     |
| Mojave mixed woody scrub   | 57,099                                 | 800   | 7,195   | 5,770                            | 0                             | 80%   | 0                                    | 657                    |
| 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                    |
|  |  |   |   |                                  |                               |   |                                      |                        |
| <b>Mecca Hills/Orocopia Mountains<br/>Conservation Area - Riverside County</b>     |  |   |   |                                  |                               |   |                                      |                        |
| Desert Tortoise - Core Habitat   | 112,575                                | 2,624   | 23,617  | 5,283                            | 401                           | 22%   | 0                                    | 791                    |
| Le Conte's Thrasher - Other Conserved Habitat                                      | 17,467                                 | 652   | 5,866   | 1,372                            | 0                             | 23%   | 0                                    | 202                    |
| Orocopia Sage - Core Habitat   | 66,180                                 | 1,803   | 16,227  | 3,834                            | 338                           | 24%   | 0                                    | 564                    |
| Mecca Aster - Core Habitat   | 31,655                                 | 465   | 4,181   | 434                              | 120                           | 10%   | 0                                    | 90                     |
| Desert fan palm oasis woodland   | 1                                      | 0   | 0   | 0                                | 0                             | 0%  | 0                                    | 0                      |
| Desert dry wash woodland   | 9,317                                  | 318   | 2,861   | 1,018                            | 23                            | 36%   | 0                                    | 134                    |
|  |  |   |   |                                  |                               |   |                                      |                        |
| <b>Santa Rosa and San Jacinto Mountains<br/>Conservation Area - Cathedral City</b> |  |   |   |                                  |                               |   |                                      |                        |
| 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 -<br>Essential Habitat                       | 112                                    | 11  | 97  | 4                                | 0                             | 4%  | 0                                    | 2                      |
| Desert dry wash woodland   | 20                                     | 2   | 18  | 2                                | 0                             | 11%   | 0                                    | 0                      |
|  |  |   |   |                                  |                               |   |                                      |                        |

|  | Total Acres in<br>Conservation<br>Area | Acres of<br>Disturbance<br>Authorized<br>(1996) | Remaining<br>Acres To Be<br>Conserved<br>(1996) | Acres<br>Conserved<br>Since 1996 | Acres<br>Conserved in<br>2012 | Percentage of<br>Required<br>Conservation<br>Acquired | Acres of<br>Permitted<br>Disturbance | Acres of Rough<br>Step |
|--|--|---|---|----------------------------------|-------------------------------|---|--------------------------------------|------------------------|
| <b>Santa Rosa and San Jacinto Mountains<br/>Conservation Area - Indian Wells</b> |  |   |   |                                  |                               |   |                                      |                        |
| 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 -<br>Essential Habitat                     | 4,617                                  | 114   | 1,158   | 0                                | 0                             | 0%  | 0                                    | 11                     |
| Desert dry wash woodland   | 128                                    | 7   | 66  | 0                                | 0                             | 0%  | 0                                    | 1                      |
|  |  |   |   |                                  |                               |   |                                      |                        |
| <b>Santa Rosa and San Jacinto Mountains<br/>Conservation Area - La Quinta</b>    |  |   |   |                                  |                               |   |                                      |                        |
| Desert Tortoise - Other Conserved Habitat  | 5,936                                  | 157   | 1,409   | 209                              | 49                            | 15%   | 0                                    | 37                     |
| Le Conte's Thrasher - Other Conserved Habitat                                    | 683                                    | 43  | 387   | 80                               | 29                            | 21%   | 0                                    | 12                     |
| Peninsular Bighorn Sheep - Rec Zone 3 -<br>Essential Habitat                     | 6,185                                  | 159   | 2,545   | 223                              | 49                            | 9%  | 0                                    | 28                     |
| Desert dry wash woodland   | 147                                    | 8   | 76  | 15                               | 4                             | 20%   | 0                                    | 2                      |
|  |  |   |   |                                  |                               |   |                                      |                        |
| <b>Santa Rosa and San Jacinto Mountains<br/>Conservation Area - Palm Desert</b>  |  |   |   |                                  |                               |   |                                      |                        |
| Le Conte's Thrasher - Other Conserved Habitat                                    | 43                                     | 4   | 33  | 0                                | 0                             | 0%  | 0                                    | 0                      |
| Desert Tortoise - Other Conserved Habitat  | 581                                    | 48  | 436   | 783                              | 0                             | 100%  | 0                                    | 82                     |
| Peninsular Bighorn Sheep - Rec Zone 3 -<br>Essential Habitat                     | 78                                     | 7   | 65  | 0                                | 0                             | 0%  | 0                                    | 1                      |
| Peninsular Bighorn Sheep - Rec Zone 2 -<br>Essential Habitat                     | 492                                    | 7   | 65  | 761                              | 0                             | 100%  | 0                                    | 74                     |
| Desert dry wash woodland   | 38                                     | 3   | 29  | 1                                | 0                             | 3%  | 0                                    | 0                      |
|  |  |   |   |                                  |                               |   |                                      |                        |

|   | Total Acres in<br>Conservation<br>Area | Acres of<br>Disturbance<br>Authorized<br>(1996) | Remaining<br>Acres To Be<br>Conserved<br>(1996) | Acres<br>Conserved<br>Since 1996 | Acres<br>Conserved in<br>2012 | Percentage of<br>Required<br>Conservation<br>Acquired | Acres of<br>Permitted<br>Disturbance | Acres of Rough<br>Step |
|---|--|---|---|----------------------------------|-------------------------------|---|--------------------------------------|------------------------|
| <b>Santa Rosa and San Jacinto Mountains<br/>Conservation Area - Palm Springs</b>  |  |   |   |                                  |                               |   |                                      |                        |
| Le Conte's Thrasher - Other Conserved Habitat                                     | 793                                    | 103   | 560   | 378                              | 41                            | 68%   | 0                                    | 73                     |
| Peninsular Bighorn Sheep - Rec Zone 1 -<br>Essential Habitat                      | 9,195                                  | 226   | 2,511   | 1,809                            | 139                           | 72%   | 0                                    | 169                    |
| Desert Tortoise - Other Conserved Habitat   | 22,571                                 | 1,317   | 8,856   | 4,190                            | 139                           | 47%   | 0                                    | 692                    |
| Peninsular Bighorn Sheep - Rec Zone 2 -<br>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  | 0                                | 0                             | 0%  | 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                      |
|   |  |   |   |                                  |                               |   |                                      |                        |
| <b>Santa Rosa and San Jacinto Mountains<br/>Conservation Area - Rancho Mirage</b> |  |   |   |                                  |                               |   |                                      |                        |
| Desert Tortoise - Other Conserved Habitat   | 5,249                                  | 147   | 1,326   | 1,205                            | 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 -<br>Essential Habitat                      | 5,262                                  | 42  | 450   | 1,209                            | 0                             | 100%  | 0                                    | 106                    |
| Desert dry wash woodland  | 19                                     | 1   | 9   | 4                                | 0                             | 44%   | 0                                    | 1                      |
|   |  |   |   |                                  |                               |   |                                      |                        |

|  | Total Acres in<br>Conservation<br>Area | Acres of<br>Disturbance<br>Authorized<br>(1996) | Remaining<br>Acres To Be<br>Conserved<br>(1996) | Acres<br>Conserved<br>Since 1996 | Acres<br>Conserved in<br>2012 | Percentage of<br>Required<br>Conservation<br>Acquired | Acres of<br>Permitted<br>Disturbance | Acres of Rough<br>Step |
|--|--|---|---|----------------------------------|-------------------------------|---|--------------------------------------|------------------------|
| <b>Santa Rosa and San Jacinto Mountains<br/>Conservation Area - Riverside County</b> |  |   |   |                                  |                               |   |                                      |                        |
| Peninsular Bighorn Sheep - Rec Zone 2 -<br>Essential Habitat                         | 14,558                                 | 647   | 4,269   | 2,762                            | 0                             | 65%   | 0                                    | 441                    |
| Le Conte's Thrasher - Other Conserved Habitat  | 9,123                                  | 911   | 5,508   | 5,341                            | 471                           | 97%   | 0                                    | 886                    |
| Triple-ribbed Milkvetch - Known Locations  | 0                                      | 0   | 0   | 0                                | 0                             | 0%  | 0                                    | 0                      |
| Peninsular Bighorn Sheep - Rec Zone 1 -<br>Essential Habitat                         | 24,840                                 | 830   | 7,252   | 1,228                            | 14                            | 17%   | 0                                    | 209                    |
| Gray Vireo - Other Conserved Habitat   | 58,985                                 | 881   | 7,930   | 5,997                            | 0                             | 76%   | 0                                    | 688                    |
| Peninsular Bighorn Sheep - Rec Zone 3 -<br>Essential Habitat                         | 50,972                                 | 683   | 5,359   | 4,446                            | 385                           | 83%   | 0                                    | 578                    |
| Desert Tortoise - Other Conserved Habitat  | 86,875                                 | 2,950   | 23,856  | 15,014                           | 1,051                         | 63%   | 7                                    | 1,959                  |
| Peninsular Bighorn Sheep - Rec Zone 4 -<br>Essential Habitat                         | 34,597                                 | 258   | 2,325   | 7,196                            | 679                           | 100%  | 0                                    | 744                    |
| Southern sycamore-alder riparian woodland  | 518                                    | 12  | 117   | 5                                | 0                             | 4%  | 0                                    | 2                      |
| Red shank chaparral  | 12,514                                 | 253   | 2,274   | 1,803                            | 0                             | 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   | 3,267                            | 0                             | 100%  | 0                                    | 466                    |
| Southern arroyo willow riparian forest   | 16                                     | 2   | 15  | 0                                | 0                             | 0%  | 0                                    | 0                      |
| Desert dry wash woodland   | 3,566                                  | 298   | 1,244   | 1,242                            | 76                            | 100%  | 0                                    | 298                    |
| Desert fan palm oasis woodland   | 716                                    | 45  | 404   | 0                                | 0                             | 0%  | 0                                    | 5                      |
|  |  |   |   |                                  |                               |   |                                      |                        |

|  | Total Acres in<br>Conservation<br>Area | Acres of<br>Disturbance<br>Authorized<br>(1996) | Remaining<br>Acres To Be<br>Conserved<br>(1996) | Acres<br>Conserved<br>Since 1996 | Acres<br>Conserved in<br>2012 | Percentage of<br>Required<br>Conservation<br>Acquired | Acres of<br>Permitted<br>Disturbance | Acres of Rough<br>Step |
|--|--|---|---|----------------------------------|-------------------------------|---|--------------------------------------|------------------------|
| <b>Snow Creek/Windy Point Conservation Area -<br/>Palm Springs</b> |  |   |   |                                  |                               |   |                                      |                        |
| 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<br>- Core Habitat    | 934                                    | 93  | 838   | 260                              | 0                             | 31%   | 0                                    | 35                     |
| Coachella Valley Fringe-toed Lizard - Core<br>Habitat              | 749                                    | 75  | 672   | 249                              | 0                             | 37%   | 0                                    | 33                     |
| Coachella Valley Giant Sand-treader Cricket -<br>Core Habitat      | 749                                    | 75  | 672   | 249                              | 0                             | 37%   | 0                                    | 33                     |
| Coachella Valley Jerusalem Cricket - Core<br>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<br>Corridor              | 276                                    | 27  | 247   | 0                                | 0                             | 0%  | 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 2012 | Percentage of Required Conservation Acquired | Acres of Permitted Disturbance | Acres of Rough Step |
|---|----------------------------------|--|--|----------------------------|-------------------------|--|--------------------------------|---------------------|
| <b>Snow Creek/Windy Point Conservation Area - Riverside County</b>        |                                  |  |  |                            |                         |  |                                |                     |
| 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                   |
|   |                                  |  |  |                            |                         |  |                                |                     |
| <b>Stubbe and Cottonwood Canyons Conservation Area - Riverside County</b> |                                  |  |  |                            |                         |  |                                |                     |
| Desert Tortoise - Core Habitat  | 5,735                            | 253                                    | 2,276                                  | 809                        | 5                       | 36%  | 0                              | 106                 |
| Le Conte's Thrasher - Other Conserved Habitat                             | 1,265                            | 123                                    | 1,111                                  | 617                        | 0                       | 56%  | 0                              | 74                  |
| Desert dry wash woodland  | 289                              | 26                                     | 229                                    | 111                        | 0                       | 48%  | 0                              | 14                  |
|   |                                  |  |  |                            |                         |  |                                |                     |
| Sonoran cottonwood-willow riparian forest                                 | 267                              | 3                                      | 25                                     | 0                          | 0                       | 0%   | 0                              | 0                   |
| Sand Transport  | 1,375                            | 125                                    | 1,129                                  | 621                        | 0                       | 55%  | 0                              | 74                  |
| Stubbe Canyon Wash Corridor   | 1,181                            | 117                                    | 1,058                                  | 654                        | 5                       | 62%  | 0                              | 77                  |
|   |                                  |  |  |                            |                         |  |                                |                     |

|   | Total Acres in<br>Conservation<br>Area | Acres of<br>Disturbance<br>Authorized<br>(1996) | Remaining<br>Acres To Be<br>Conserved<br>(1996) | Acres<br>Conserved<br>Since 1996 | Acres<br>Conserved in<br>2012 | Percentage of<br>Required<br>Conservation<br>Acquired | Acres of<br>Permitted<br>Disturbance | Acres of Rough<br>Step |
|---|--|---|---|----------------------------------|-------------------------------|---|--------------------------------------|------------------------|
| <b>Thousand Palms Conservation Area -<br/>Riverside County</b>  |  |   |   |                                  |                               |   |                                      |                        |
| Coachella Valley Round-tailed Ground Squirrel<br>- Core Habitat | 8,513                                  | 468   | 2,974   | 1,563                            | 49                            | 53%   | 12                                   | 256                    |
| Coachella Valley Milkvetch - Core Habitat                       | 4,403                                  | 111   | 1,001   | 733                              | 0                             | 73%   | 4                                    | 80                     |
| Desert Pupfish - Refugia Locations                              | 0                                      | 0   | 0   | 0                                | 0                             | 0%  | 0                                    | 0                      |
| Coachella Valley Fringe-toed Lizard - Core<br>Habitat           | 3,962                                  | 93  | 834   | 667                              | 0                             | 80%   | 0                                    | 76                     |
| Le Conte's Thrasher - Other Conserved Habitat                   | 11,058                                 | 552   | 3,879   | 1,979                            | 326                           | 51%   | 7                                    | 302                    |
| Predicted Flat-tailed Horned Lizard - Core<br>Habitat           | 4,148                                  | 97  | 877   | 698                              | 0                             | 80%   | 0                                    | 79                     |
| Mecca Aster - Core Habitat                                      | 11,745                                 | 297   | 2,676   | 951                              | 204                           | 36%   | 0                                    | 125                    |
| Coachella Valley Giant Sand-treader Cricket -<br>Core Habitat   | 3,962                                  | 93  | 834   | 667                              | 0                             | 80%   | 0                                    | 76                     |
| Palm Springs Pocket Mouse - Core Habitat                        | 11,707                                 | 518   | 3,588   | 1,950                            | 346                           | 54%   | 11                                   | 294                    |
| Desert dry wash woodland  | 748                                    | 4   | 34  | 0                                | 0                             | 0%  | 0                                    | 0                      |
| Active sand fields  | 3,543                                  | 91  | 820   | 664                              | 0                             | 81%   | 0                                    | 75                     |
| Active desert dunes   | 421                                    | 2   | 14  | 5                                | 0                             | 36%   | 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                            | 388                           | 49%   | 12                                   | 296                    |
| Sand Source   | 13,056                                 | 412   | 3,712   | 1,630                            | 104                           | 44%   | 0                                    | 204                    |
| Thousand Palms Linkage  | 25,607                                 | 983   | 7,816   | 3,625                            | 492                           | 46%   | 12                                   | 497                    |
|   |  |   |   |                                  |                               |   |                                      |                        |



|  | Total Acres in<br>Conservation<br>Area | Acres of<br>Disturbance<br>Authorized<br>(1996) | Remaining<br>Acres To Be<br>Conserved<br>(1996) | Acres<br>Conserved<br>Since 1996 | Acres<br>Conserved in<br>2012 | Percentage of<br>Required<br>Conservation<br>Acquired | Acres of<br>Permitted<br>Disturbance | Acres of Rough<br>Step |
|--|--|---|---|----------------------------------|-------------------------------|---|--------------------------------------|------------------------|
| <b>Upper Mission Creek/Big Morongo Canyon<br/>Conservation Area - Desert Hot Springs</b> |  |   |   |                                  |                               |   |                                      |                        |
| Coachella Valley Jerusalem Cricket - Other<br>Conserved Habitat                          | 49                                     | 0   | 49  | 16                               | 9                             | 33%   | 0                                    | 0                      |
| Le Conte's Thrasher - Other Conserved Habitat  | 1,832                                  | 288   | 1,409   | 586                              | 267                           | 42%   | 0                                    | 137                    |
| Palm Springs Pocket Mouse - Core Habitat   | 1,748                                  | 270   | 1,403   | 584                              | 266                           | 42%   | 0                                    | 128                    |
| Little San Bernardino Mountains Linanthus -<br>Core Habitat                              | 1,020                                  | 53  | 967   | 324                              | 155                           | 34%   | 0                                    | 21                     |
| Desert dry wash woodland   | 135                                    | 6   | 58  | 0                                | 0                             | 0%  | 0                                    | 1                      |
| Sand Transport   | 1,869                                  | 286   | 1,399   | 593                              | 267                           | 42%   | 0                                    | 138                    |
| Sand Source  | 343                                    | 0   | 6   | 0                                | 0                             | 0%  | 0                                    | 0                      |
| Highway 62 Corridor  | 73                                     | 7   | 66  | 0                                | 0                             | 0%  | 0                                    | 1                      |
|  |  |   |   |                                  |                               |   |                                      |                        |
| <b>Upper Mission Creek/Big Morongo Canyon<br/>Conservation Area - Palm Springs</b>       |  |   |   |                                  |                               |   |                                      |                        |
| Le Conte's Thrasher - Other Conserved Habitat  | 24                                     | 2   | 22  | 0                                | 0                             | 0%  | 0                                    | 0                      |
| Palm Springs Pocket Mouse - Other Conserved<br>Habitat                                   | 24                                     | 2   | 22  | 0                                | 0                             | 0%  | 0                                    | 0                      |
|  |  |   |   |                                  |                               |   |                                      |                        |

|  | Total Acres in<br>Conservation<br>Area | Acres of<br>Disturbance<br>Authorized<br>(1996) | Remaining<br>Acres To Be<br>Conserved<br>(1996) | Acres<br>Conserved<br>Since 1996 | Acres<br>Conserved in<br>2012 | Percentage of<br>Required<br>Conservation<br>Acquired | Acres of<br>Permitted<br>Disturbance | Acres of Rough<br>Step |
|--|--|---|---|----------------------------------|-------------------------------|---|--------------------------------------|------------------------|
| <b>Upper Mission Creek/Big Morongo Canyon<br/>Conservation Area - Riverside County</b> |  |   |   |                                  |                               |   |                                      |                        |
| Desert Tortoise - Core Habitat   | 24,122                                 | 887   | 7,984   | 4,101                            | 83                            | 51%   | 21                                   | 478                    |
| Triple-ribbed Milkvetch - Core Habitat   | 819                                    | 47  | 426   | 329                              | 0                             | 77%   | 0                                    | 37                     |
| Coachella Valley Jerusalem Cricket - Other<br>Conserved Habitat                        | 666                                    | 52  | 460   | 42                               | 0                             | 9%  | 10                                   | -1                     |
| Le Conte's Thrasher - Other Conserved Habitat  | 1,871                                  | 146   | 1,323   | 380                              | 83                            | 29%   | 0                                    | 52                     |
| Palm Springs Pocket Mouse - Core Habitat   | 1,937                                  | 151   | 1,363   | 400                              | 78                            | 29%   | 0                                    | 55                     |
| Little San Bernardino Mountains Linanthus -<br>Core Habitat                            | 1,390                                  | 122   | 1,100   | 391                              | 81                            | 36%   | 0                                    | 51                     |
| Southern sycamore-alder riparian woodland  | 104                                    | 6   | 52  | 60                               | 0                             | 100%  | 0                                    | 7                      |
| Desert dry wash woodland   | 125                                    | 8   | 76  | 45                               | 8                             | 59%   | 0                                    | 5                      |
| Sonoran cottonwood-willow riparian forest  | 100                                    | 8   | 76  | 74                               | 0                             | 97%   | 0                                    | 8                      |
| Sand Transport   | 2,279                                  | 168   | 1,509   | 541                              | 83                            | 36%   | 0                                    | 71                     |
| Sand Source  | 19,789                                 | 721   | 6,488   | 3,964                            | 0                             | 61%   | 21                                   | 448                    |
| Highway 62 Corridor  | 907                                    | 79  | 715   | 83                               | 83                            | 12%   | 0                                    | 16                     |
|  |  |   |   |                                  |                               |   |                                      |                        |
| <b>West Deception Canyon Conservation Area -<br/>Riverside County</b>                  |  |   |   |                                  |                               |   |                                      |                        |
| Sand Source  | 1,302                                  | 118   | 1,063   | 789                              | 43                            | 74%   | 0                                    | 91                     |
|  |  |   |   |                                  |                               |   |                                      |                        |
| <b>Whitewater Canyon Conservation Area -<br/>Desert Hot Springs</b>                    |  |   |   |                                  |                               |   |                                      |                        |
| 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<br>Conservation<br>Area | Acres of<br>Disturbance<br>Authorized<br>(1996) | Remaining<br>Acres To Be<br>Conserved<br>(1996) | Acres<br>Conserved<br>Since 1996 | Acres<br>Conserved in<br>2012 | Percentage of<br>Required<br>Conservation<br>Acquired | Acres of<br>Permitted<br>Disturbance | Acres of Rough<br>Step |
|--|--|---|---|----------------------------------|-------------------------------|---|--------------------------------------|------------------------|
| <b>Whitewater Canyon Conservation Area -<br/>Riverside County</b>      |  |   |   |                                  |                               |   |                                      |                        |
| Desert Tortoise - Core Habitat   | 4,438                                  | 120   | 1,084   | 742                              | 0                             | 68%   | 0                                    | 86                     |
| Arroyo Toad - Core Habitat   | 2,082                                  | 78  | 706   | 676                              | 0                             | 96%   | 0                                    | 75                     |
| Little San Bernardino Mountains Linanthus -<br>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%   | 0                                    | 71                     |
| Whitewater Canyon Corridor   | 223                                    | 22  | 201   | 0                                | 0                             | 0%  | 0                                    | 2                      |
| <b>Whitewater Floodplain Conservation Area -<br/>Cathedral City</b>    |  |   |   |                                  |                               |   |                                      |                        |
| Coachella Valley Milkvetch - Core Habitat                              | 107                                    | 7   | 61  | 0                                | 0                             | 0%  | 0                                    | 1                      |
| Coachella Valley Round-tailed Ground Squirrel<br>- Core Habitat        | 105                                    | 7   | 59  | 0                                | 0                             | 0%  | 0                                    | 1                      |
| Coachella Valley Fringe-toed Lizard - Core<br>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 -<br>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<br>Conservation<br>Area | Acres of<br>Disturbance<br>Authorized<br>(1996) | Remaining<br>Acres To Be<br>Conserved<br>(1996) | Acres<br>Conserved<br>Since 1996 | Acres<br>Conserved in<br>2012 | Percentage of<br>Required<br>Conservation<br>Acquired | Acres of<br>Permitted<br>Disturbance | Acres of Rough<br>Step |
|---|--|---|---|----------------------------------|-------------------------------|---|--------------------------------------|------------------------|
| <b>Whitewater Floodplain Conservation Area -<br/>Palm Springs</b> |  |   |   |                                  |                               |   |                                      |                        |
| Coachella Valley Round-tailed Ground Squirrel<br>- Core Habitat   | 5,825                                  | 328   | 2,955   | 538                              | 10                            | 18%   | 0                                    | 87                     |
| Coachella Valley Milkvetch - Core Habitat                         | 5,432                                  | 297   | 2,671   | 514                              | 5                             | 19%   | 0                                    | 81                     |
| Palm Springs Pocket Mouse - Core Habitat                          | 6,173                                  | 347   | 3,122   | 555                              | 10                            | 18%   | 0                                    | 90                     |
| Coachella Valley Fringe-toed Lizard - Core<br>Habitat             | 5,418                                  | 295   | 2,659   | 514                              | 5                             | 19%   | 0                                    | 81                     |
| Coachella Valley Giant Sand-treader Cricket -<br>Core Habitat     | 5,418                                  | 295   | 2,659   | 514                              | 5                             | 19%   | 0                                    | 81                     |
| Le Conte's Thrasher - Other Conserved Habitat                     | 6,495                                  | 381   | 3,433   | 569                              | 10                            | 17%   | 0                                    | 95                     |
| Ephemeral sand fields   | 2,873                                  | 132   | 1,185   | 213                              | 0                             | 18%   | 0                                    | 35                     |
| 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%  | 0                                    | 14                     |
|   |  |   |   |                                  |                               |   |                                      |                        |

|   | Total Acres in<br>Conservation<br>Area | Acres of<br>Disturbance<br>Authorized<br>(1996) | Remaining<br>Acres To Be<br>Conserved<br>(1996) | Acres<br>Conserved<br>Since 1996 | Acres<br>Conserved in<br>2012 | Percentage of<br>Required<br>Conservation<br>Acquired | Acres of<br>Permitted<br>Disturbance | Acres of Rough<br>Step |
|---|--|---|---|----------------------------------|-------------------------------|---|--------------------------------------|------------------------|
| <b>Whitewater Floodplain Conservation Area -<br/>Riverside County</b> |  |   |   |                                  |                               |   |                                      |                        |
| Coachella Valley Milkvetch - Core Habitat                             | 96                                     | 6   | 58  | 0                                | 0                             | 0%  | 0                                    | 1                      |
| Coachella Valley Round-tailed Ground Squirrel<br>- Core Habitat       | 185                                    | 11  | 100   | 0                                | 0                             | 0%  | 0                                    | 1                      |
| Coachella Valley Giant Sand-treader Cricket -<br>Core Habitat         | 92                                     | 6   | 57  | 0                                | 0                             | 0%  | 0                                    | 1                      |
| Coachella Valley Fringe-toed Lizard - Core<br>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<br>Conservation<br>Area | Acres of<br>Disturbance<br>Authorized<br>(1996) | Remaining<br>Acres To Be<br>Conserved<br>(1996) | Acres<br>Conserved<br>Since 1996 | Acres<br>Conserved in<br>2012 | Percentage of<br>Required<br>Conservation<br>Acquired | Acres of<br>Permitted<br>Disturbance | Acres of Rough<br>Step |
|--|--|---|---|----------------------------------|-------------------------------|---|--------------------------------------|------------------------|
| <b>Willow Hole Conservation Area - Cathedral City</b>        |  |   |   |                                  |                               |   |                                      |                        |
| Coachella Valley Round-tailed Ground Squirrel - Core Habitat | 1,485                                  | 140   | 1,256   | 595                              | 0                             | 47%   | 0                                    | 74                     |
| Coachella Valley Milkvetch - Core Habitat                    | 938                                    | 87  | 782   | 172                              | 0                             | 22%   | 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   | 608                              | 0                             | 40%   | 0                                    | 77                     |
| 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   | 27                               | 0                             | 4%  | 0                                    | 11                     |
|  |  |   |   |                                  |                               |   |                                      |                        |

|   | Total Acres in<br>Conservation<br>Area | Acres of<br>Disturbance<br>Authorized<br>(1996) | Remaining<br>Acres To Be<br>Conserved<br>(1996) | Acres<br>Conserved<br>Since 1996 | Acres<br>Conserved in<br>2012 | Percentage of<br>Required<br>Conservation<br>Acquired | Acres of<br>Permitted<br>Disturbance | Acres of Rough<br>Step |
|---|--|---|---|----------------------------------|-------------------------------|---|--------------------------------------|------------------------|
| <b>Willow Hole Conservation Area - Riverside<br/>County</b> |  |   |   |                                  |                               |   |                                      |                        |
| Coachella Valley Fringe-toed Lizard - Core<br>Habitat       | 633                                    | 50  | 454   | 385                              | 91                            | 85%   | 2                                    | 41                     |
| Coachella Valley Milkvetch - Core Habitat                   | 2,228                                  | 195   | 1,751   | 1,148                            | 153                           | 66%   | 3                                    | 132                    |
| Palm Springs Pocket Mouse - Core Habitat                    | 3,465                                  | 298   | 2,684   | 1,531                            | 314                           | 57%   | 3                                    | 180                    |
| Le Conte's Thrasher - Other Conserved Habitat               | 3,601                                  | 298   | 2,677   | 1,516                            | 292                           | 57%   | 3                                    | 179                    |
| Desert saltbush scrub                                       | 169                                    | 17  | 152   | 137                              | 1                             | 90%   | 1                                    | 14                     |
| Mesquite hummocks   | 125                                    | 11  | 98  | 94                               | 3                             | 96%   | 0                                    | 11                     |
| Desert fan palm oasis woodland                              | 1                                      | 0   | 0   | 0                                | 0                             | 0%  | 0                                    | 0                      |
| Stabilized desert sand fields                               | 144                                    | 14  | 128   | 70                               | 15                            | 55%   | 0                                    | 8                      |
| Stabilized desert dunes                                     | 383                                    | 35  | 319   | 249                              | 51                            | 78%   | 2                                    | 26                     |
| Ephemeral sand fields                                       | 906                                    | 81  | 728   | 194                              | 24                            | 27%   | 0                                    | 28                     |
| Sand Transport  | 3,500                                  | 304   | 2,734   | 1,531                            | 315                           | 56%   | 3                                    | 181                    |
| Sand Source   | 186                                    | 2   | 17  | 8                                | 0                             | 47%   | 0                                    | 1                      |
| Mission Creek / Willow Wash Biological<br>Corridor          | 509                                    | 44  | 397   | 0                                | 0                             | 0%  | 0                                    | 4                      |

## CVMSHCP Annual Report 2012 - Covered Activity Impact Outside Conservation Areas

| Conservation Objective /<br>Jurisdiction                      | Estimated Acres Disturbed<br>Outside Conservation Areas |
|---|---|
| <b>Arroyo Toad</b>  |   |
| Riverside County  | 0   |
| <b>Arroyo Toad Total</b>                                      | <b>0</b>  |
|   |   |
| <b>California Black Rail</b>                                  |   |
| Coachella   | 0   |
| Indio   | 0   |
| Riverside County  | 0   |
| <b>California Black Rail Total</b>                            | <b>0</b>  |
|   |   |
| <b>Coachella Valley Fringe-toed<br/>Lizard</b>                |   |
| Cathedral City  | 237   |
| Coachella   | 0   |
| Indian Wells  | 424   |
| Indio   | 358   |
| La Quinta   | 402   |
| Palm Desert   | 394   |
| Palm Springs  | 332   |
| Rancho Mirage   | 534   |
| Riverside County  | 198   |
| <b>Coachella Valley Fringe-toed<br/>Lizard Total</b>          | <b>2879</b>   |
|   |   |
| <b>Coachella Valley Giant Sand-<br/>treader Cricket</b>       |   |
| Cathedral City  | 237   |
| Coachella   | 0   |
| Indian Wells  | 424   |
| Indio   | 358   |
| La Quinta   | 402   |
| Palm Desert   | 394   |
| Palm Springs  | 332   |
| Rancho Mirage   | 534   |
| Riverside County  | 198   |
| <b>Coachella Valley Giant Sand-<br/>treader Cricket Total</b> | <b>2879</b>   |



| Conservation Objective /<br>Jurisdiction                   | Estimated Acres Disturbed<br>Outside Conservation Areas |
|--|---|
| <b>Coachella Valley Jerusalem Cricket</b>                  |   |
| Cathedral City   | 245   |
| Desert Hot Springs   | 0   |
| Palm Desert  | 5   |
| Palm Springs   | 332   |
| Rancho Mirage  | 494   |
| Riverside County   | 58  |
| <b>Coachella Valley Jerusalem Cricket Total</b>            | <b>1134</b>   |
|  |   |
| <b>Coachella Valley Milkvetch</b>                          |   |
| Cathedral City   | 197   |
| Desert Hot Springs   | 0   |
| Indian Wells   | 334   |
| La Quinta  | 0   |
| Palm Desert  | 394   |
| Palm Springs   | 301   |
| Rancho Mirage  | 534   |
| Riverside County   | 194   |
| <b>Coachella Valley Milkvetch Total</b>                    | <b>1954</b>   |
|  |   |
| <b>Coachella Valley Round-tailed Ground Squirrel</b>       |   |
| Cathedral City   | 372   |
| Coachella  | 51  |
| Desert Hot Springs   | 0   |
| Indian Wells   | 706   |
| Indio  | 735   |
| La Quinta  | 500   |
| Palm Desert  | 518   |
| Palm Springs   | 340   |
| Rancho Mirage  | 540   |
| Riverside County   | 1351  |
| <b>Coachella Valley Round-tailed Ground Squirrel Total</b> | <b>5113</b>   |
|  |   |

| Conservation Objective /<br>Jurisdiction | Estimated Acres Disturbed<br>Outside Conservation Areas |
|--|---|
| <b>Crissal Thrasher</b>                  |   |
| Cathedral City                           | 0   |
| Coachella                                | 6   |
| Desert Hot Springs                       | 0   |
| Indian Wells                             | 21  |
| Indio                                    | 203   |
| La Quinta                                | 30  |
| Riverside County                         | 56  |
| <b>Crissal Thrasher Total</b>            | <b>316</b>  |
|  |   |
| <b>Desert Pupfish</b>                    |   |
| Indian Wells                             | 0   |
| NULL                                     | 0   |
| <b>Desert Pupfish Total</b>              | <b>0</b>  |
|  |   |
| <b>Desert Tortoise</b>                   |   |
| Cathedral City                           | 1   |
| Coachella                                | 0   |
| Desert Hot Springs                       | 0   |
| Indian Wells                             | 212   |
| Indio                                    | 0   |
| La Quinta                                | 235   |
| Palm Desert                              | 351   |
| Palm Springs                             | 3   |
| Rancho Mirage                            | 65  |
| Riverside County                         | 637   |
| <b>Desert Tortoise Total</b>             | <b>1504</b>   |
|  |   |
| <b>Gray Vireo</b>                        |   |
| Palm Springs                             | 0   |
| Riverside County                         | 5   |
| <b>Gray Vireo Total</b>                  | <b>5</b>  |

| Conservation Objective /<br>Jurisdiction                | Estimated Acres Disturbed<br>Outside Conservation Areas |
|---|---|
| <b>Le Conte's Thrasher</b>                              |   |
| Cathedral City  | 250   |
| Coachella   | 65  |
| Desert Hot Springs                                      | 0   |
| Indian Wells  | 814   |
| Indio   | 760   |
| La Quinta   | 661   |
| Palm Desert   | 755   |
| Palm Springs  | 348   |
| Rancho Mirage   | 672   |
| Riverside County  | 1848  |
| <b>Le Conte's Thrasher Total</b>                        | <b>6173</b>   |
|   |   |
| <b>Least Bell's Vireo - Breeding<br/>Habitat</b>        |   |
| 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   |
| <b>Least Bell's Vireo - Breeding<br/>Habitat Total</b>  | <b>86</b>   |
|   |   |
| <b>Least Bell's Vireo - Migratory<br/>Habitat</b>       |   |
| 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   |
| <b>Least Bell's Vireo - Migratory<br/>Habitat Total</b> | <b>832</b>  |

| Conservation Objective /<br>Jurisdiction                   | Estimated Acres Disturbed<br>Outside Conservation Areas |
|--|---|
| <b>Little San Bernardino Mountains<br/>Linanthus</b>       |   |
| Desert Hot Springs   | 0   |
| Riverside County   | 0   |
| <b>Little San Bernardino Mountains<br/>Linanthus Total</b> | <b>0</b>  |
|  |   |
| <b>Mecca Aster</b>   |   |
| Indio  | 1   |
| Riverside County   | 0   |
| <b>Mecca Aster Total</b>                                   | <b>1</b>  |
|  |   |
| <b>Orocopia Sage</b>                                       |   |
| Riverside County   | 7   |
| <b>Orocopia Sage Total</b>                                 | <b>7</b>  |
|  |   |
| <b>Palm Springs Pocket Mouse</b>                           |   |
| Cathedral City   | 372   |
| Coachella  | 44  |
| Desert Hot Springs   | 0   |
| Indian Wells   | 724   |
| Indio  | 679   |
| La Quinta  | 499   |
| Palm Desert  | 591   |
| Palm Springs   | 346   |
| Rancho Mirage  | 584   |
| Riverside County   | 1591  |
| <b>Palm Springs Pocket Mouse Total</b>                     | <b>5430</b>   |
|  |   |
| <b>Peninsular Bighorn Sheep</b>                            |   |
| Cathedral City   | 1   |
| Indian Wells   | 1   |
| La Quinta  | 37  |
| Palm Desert  | 156   |
| Palm Springs   | 0   |
| Rancho Mirage  | 1   |
| Riverside County   | 134   |
| <b>Peninsular Bighorn Sheep Total</b>                      | <b>330</b>  |
|  |   |

| Conservation Objective /<br>Jurisdiction                       | Estimated Acres Disturbed<br>Outside Conservation Areas |
|--|---|
| <b>Potential Flat-tailed Horned Lizard</b>                     |   |
| Cathedral City   | 0   |
| Desert Hot Springs   | 0   |
| Palm Springs   | 12  |
| Riverside County   | 7   |
| <b>Potential Flat-tailed Horned Lizard Total</b>               | <b>19</b>   |
|  |   |
| <b>Predicted Flat-tailed Horned Lizard</b>                     |   |
| Cathedral City   | 220   |
| Coachella  | 22  |
| Indian Wells   | 424   |
| Indio  | 401   |
| La Quinta  | 383   |
| Palm Desert  | 394   |
| Palm Springs   | 320   |
| Rancho Mirage  | 533   |
| Riverside County   | 395   |
| <b>Predicted Flat-tailed Horned Lizard Total</b>               | <b>3092</b>   |
|  |   |
| <b>Southern Yellow Bat</b>                                     |   |
| Cathedral City   | 0   |
| Desert Hot Springs   | 0   |
| Palm Springs   | 0   |
| Rancho Mirage  | 0   |
| Riverside County   | 0   |
| <b>Southern Yellow Bat Total</b>                               | <b>0</b>  |
|  |   |
| <b>Southwestern Willow Flycatcher - Breeding Habitat</b>       |   |
| Cathedral City   | 0   |
| Coachella  | 0   |
| Desert Hot Springs   | 0   |
| Indio  | 0   |
| Palm Springs   | 0   |
| Rancho Mirage  | 0   |
| Riverside County   | 0   |
| <b>Southwestern Willow Flycatcher - Breeding Habitat Total</b> | <b>0</b>  |

| Conservation Objective /<br>Jurisdiction                            | Estimated Acres Disturbed<br>Outside Conservation Areas |
|---|---|
| <b>Southwestern Willow Flycatcher -<br/>Migratory Habitat</b>       |   |
| Cathedral City  | 0   |
| Coachella   | 6   |
| Desert Hot Springs  | 0   |
| Indian Wells  | 209   |
| Indio   | 203   |
| La Quinta   | 86  |
| Palm Desert   | 167   |
| Palm Springs  | 0   |
| Rancho Mirage   | 45  |
| Riverside County  | 204   |
| <b>Southwestern Willow Flycatcher -<br/>Migratory Habitat Total</b> | <b>920</b>  |
|   |   |
| <b>Summer Tanager - Breeding<br/>Habitat</b>                        |   |
| Cathedral City  | 0   |
| Coachella   | 0   |
| Desert Hot Springs  | 0   |
| Indio   | 0   |
| Palm Springs  | 0   |
| Rancho Mirage   | 0   |
| Riverside County  | 0   |
| <b>Summer Tanager - Breeding<br/>Habitat Total</b>                  | <b>0</b>  |
|   |   |
| <b>Summer Tanager - Migratory<br/>Habitat</b>                       |   |
| Cathedral City  | 0   |
| Coachella   | 6   |
| Desert Hot Springs  | 0   |
| Indian Wells  | 209   |
| Indio   | 203   |
| La Quinta   | 86  |
| Palm Desert   | 167   |
| Palm Springs  | 0   |
| Rancho Mirage   | 45  |
| Riverside County  | 204   |
| <b>Summer Tanager - Migratory<br/>Habitat Total</b>                 | <b>920</b>  |

| Conservation Objective / Jurisdiction                | Estimated Acres Disturbed Outside Conservation Areas |
|--|--|
| <b>Triple-ribbed Milkvetch</b>                       |  |
| Palm Springs   | 0  |
| Riverside County                                     | 0  |
| <b>Triple-ribbed Milkvetch Total</b>                 | <b>0</b>   |
|  |  |
| <b>Yellow Warbler - Breeding Habitat</b>             |  |
| Cathedral City                                       | 0  |
| Coachella  | 0  |
| Desert Hot Springs                                   | 0  |
| Indio  | 0  |
| Palm Springs   | 0  |
| Rancho Mirage  | 0  |
| Riverside County                                     | 0  |
| <b>Yellow Warbler - Breeding Habitat Total</b>       | <b>0</b>   |
|  |  |
| <b>Yellow Warbler - Migratory Habitat</b>            |  |
| Cathedral City                                       | 0  |
| Coachella  | 6  |
| Desert Hot Springs                                   | 0  |
| Indian Wells   | 209  |
| Indio  | 203  |
| La Quinta  | 86   |
| Palm Desert  | 167  |
| Palm Springs   | 0  |
| Rancho Mirage  | 45   |
| Riverside County                                     | 204  |
| <b>Yellow Warbler - Migratory Habitat Total</b>      | <b>920</b>   |
|  |  |
| <b>Yellow-breasted Chat - Breeding Habitat</b>       |  |
| Cathedral City                                       | 0  |
| Coachella  | 0  |
| Desert Hot Springs                                   | 0  |
| Indio  | 0  |
| Palm Springs   | 0  |
| Rancho Mirage  | 0  |
| Riverside County                                     | 0  |
| <b>Yellow-breasted Chat - Breeding Habitat Total</b> | <b>0</b>   |
|  |  |

| Conservation Objective /<br>Jurisdiction                  | Estimated Acres Disturbed<br>Outside Conservation Areas |
|---|---|
| <b>Yellow-breasted Chat - Migratory<br/>Habitat</b>       |   |
| Cathedral City  | 0   |
| Coachella   | 6   |
| Desert Hot Springs  | 0   |
| Indian Wells  | 209   |
| Indio   | 203   |
| La Quinta   | 86  |
| Palm Desert   | 167   |
| Palm Springs  | 0   |
| Rancho Mirage   | 45  |
| Riverside County  | 204   |
| <b>Yellow-breasted Chat - Migratory<br/>Habitat Total</b> | <b>920</b>  |
|   |   |
| <b>Yuma Clapper Rail</b>                                  |   |
| Coachella   | 0   |
| Indio   | 0   |
| Riverside County  | 0   |
| <b>Yuma Clapper Rail Total</b>                            | <b>0</b>  |
|   |   |
| <b>Active desert dunes</b>                                |   |
| Palm Springs  | 0   |
| Riverside County  | 2   |
| <b>Active desert dunes Total</b>                          | <b>2</b>  |
|   |   |
| <b>Active sand fields</b>                                 |   |
| Cathedral City  | 0   |
| Palm Springs  | 0   |
| Riverside County  | 121   |
| <b>Active sand fields Total</b>                           | <b>121</b>  |
|   |   |
| <b>Arrowweed scrub</b>                                    |   |
| Riverside County  | 0   |
| <b>Arrowweed scrub Total</b>                              | <b>0</b>  |
|   |   |
| <b>Chamise chaparral</b>                                  |   |
| Riverside County  | 0   |
| <b>Chamise chaparral Total</b>                            | <b>0</b>  |
|   |   |
| <b>Cismontane alkali marsh</b>                            |   |
| Riverside County  | 0   |
| <b>Cismontane alkali marsh Total</b>                      | <b>0</b>  |
|   |   |



| Conservation Objective /<br>Jurisdiction         | Estimated Acres Disturbed<br>Outside Conservation Areas |
|--|---|
| <b>Coastal and valley freshwater marsh</b>       |   |
| Coachella  | 0   |
| Indio  | 0   |
| Riverside County                                 | 0   |
| <b>Coastal and valley freshwater marsh Total</b> | <b>0</b>  |
|  |   |
| <b>Desert dry wash woodland</b>                  |   |
| Cathedral City                                   | 0   |
| Coachella  | 0   |
| Desert Hot Springs                               | 0   |
| Indian Wells                                     | 187   |
| Indio  | 0   |
| La Quinta  | 55  |
| Palm Desert                                      | 167   |
| Palm Springs                                     | 0   |
| Rancho Mirage                                    | 45  |
| Riverside County                                 | 88  |
| <b>Desert dry wash woodland Total</b>            | <b>542</b>  |
|  |   |
| <b>Desert fan palm oasis woodland</b>            |   |
| Cathedral City                                   | 0   |
| Desert Hot Springs                               | 0   |
| Palm Springs                                     | 0   |
| Rancho Mirage                                    | 0   |
| Riverside County                                 | 0   |
| <b>Desert fan palm oasis woodland Total</b>      | <b>0</b>  |
|  |   |
| <b>Desert saltbush scrub</b>                     |   |
| Coachella  | 4   |
| Indio  | 173   |
| La Quinta  | 0   |
| Riverside County                                 | 52  |
| <b>Desert saltbush scrub Total</b>               | <b>229</b>  |
|  |   |
| <b>Desert sink scrub</b>                         |   |
| Riverside County                                 | 60  |
| <b>Desert sink scrub Total</b>                   | <b>60</b>   |
|  |   |

| Conservation Objective /<br>Jurisdiction                 | Estimated Acres Disturbed<br>Outside Conservation Areas |
|--|---|
| <b>Ephemeral sand fields</b>                             |   |
| Cathedral City   | 0   |
| Palm Springs   | 72  |
| Riverside County   | 7   |
| <b>Ephemeral sand fields Total</b>                       | <b>79</b>   |
|  |   |
| <b>Interior live oak chaparral</b>                       |   |
| Palm Springs   | 0   |
| Riverside County   | 0   |
| <b>Interior live oak chaparral Total</b>                 | <b>0</b>  |
|  |   |
| <b>Mesquite bosque</b>                                   |   |
| Riverside County   | 0   |
| <b>Mesquite bosque Total</b>                             | <b>0</b>  |
|  |   |
| <b>Mesquite hummocks</b>                                 |   |
| Cathedral City   | 0   |
| Coachella  | 2   |
| Desert Hot Springs                                       | 0   |
| Indian Wells   | 21  |
| Indio  | 30  |
| La Quinta  | 30  |
| Riverside County   | 3   |
| <b>Mesquite hummocks Total</b>                           | <b>86</b>   |
|  |   |
| <b>Mojave mixed woody scrub</b>                          |   |
| Desert Hot Springs                                       | 0   |
| Riverside County   | 0   |
| <b>Mojave mixed woody scrub Total</b>                    | <b>0</b>  |
|  |   |
| <b>Mojavean pinyon &amp; juniper<br/>woodland</b>        |   |
| Riverside County   | 0   |
| <b>Mojavean pinyon &amp; juniper<br/>woodland Total</b>  | <b>0</b>  |
|  |   |
| <b>Peninsular juniper woodland &amp;<br/>scrub</b>       |   |
| Palm Springs   | 0   |
| Riverside County   | 0   |
| <b>Peninsular juniper woodland &amp;<br/>scrub Total</b> | <b>0</b>  |

| Conservation Objective /<br>Jurisdiction                   | Estimated Acres Disturbed<br>Outside Conservation Areas |
|--|---|
| <b>Red shank chaparral</b>                                 |   |
| Riverside County   | 0   |
| <b>Red shank chaparral Total</b>                           | <b>0</b>  |
|  |   |
| <b>Semi-desert chaparral</b>                               |   |
| Palm Springs   | 0   |
| Riverside County   | 0   |
| <b>Semi-desert chaparral Total</b>                         | <b>0</b>  |
|  |   |
| <b>Sonoran cottonwood-willow<br/>riparian forest</b>       |   |
| Coachella  | 0   |
| Indio  | 0   |
| Palm Springs   | 0   |
| Riverside County   | 0   |
| <b>Sonoran cottonwood-willow<br/>riparian forest Total</b> | <b>0</b>  |
|  |   |
| <b>Sonoran creosote bush scrub</b>                         |   |
| 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   |
| <b>Sonoran creosote bush scrub<br/>Total</b>               | <b>1215</b>   |
|  |   |

| Conservation Objective / Jurisdiction                  | Estimated Acres Disturbed Outside Conservation Areas |
|--|--|
| <b>Sonoran mixed woody &amp; succulent scrub</b>       |  |
| Cathedral City   | 9  |
| Desert Hot Springs                                     | 0  |
| Indian Wells   | 0  |
| Indio  | 1  |
| La Quinta  | 7  |
| Palm Desert  | 0  |
| Palm Springs   | 12   |
| Rancho Mirage  | 0  |
| Riverside County                                       | 413  |
| <b>Sonoran mixed woody &amp; succulent scrub Total</b> | <b>442</b>   |
|  |  |
| <b>Southern arroyo willow riparian forest</b>          |  |
| Palm Springs   | 0  |
| Riverside County                                       | 0  |
| <b>Southern arroyo willow riparian forest Total</b>    | <b>0</b>   |
|  |  |
| <b>Southern sycamore-alder riparian woodland</b>       |  |
| Palm Springs   | 0  |
| Riverside County                                       | 0  |
| <b>Southern sycamore-alder riparian woodland Total</b> | <b>0</b>   |
|  |  |
| <b>Stabilized desert dunes</b>                         |  |
| Cathedral City   | 0  |
| Riverside County                                       | 0  |
| <b>Stabilized desert dunes Total</b>                   | <b>0</b>   |
|  |  |
| <b>Stabilized desert sand fields</b>                   |  |
| Cathedral City   | 0  |
| Indio  | 0  |
| Palm Springs   | 0  |
| Riverside County                                       | 0  |
| <b>Stabilized desert sand fields Total</b>             | <b>0</b>   |
|  |  |

| Conservation Objective /<br>Jurisdiction         | Estimated Acres Disturbed<br>Outside Conservation Areas |
|--|---|
| <b>Stabilized shielded sand fields</b>           |   |
| Cathedral City                                   | 237   |
| Coachella  | 0   |
| Indian Wells                                     | 424   |
| Indio  | 358   |
| La Quinta  | 402   |
| Palm Desert                                      | 315   |
| Palm Springs                                     | 260   |
| Rancho Mirage                                    | 534   |
| Riverside County                                 | 67  |
| <b>Stabilized shielded sand fields<br/>Total</b> | <b>2597</b>   |