



2018 Biennial Adaptive Management Report

Prepared for: Desert Conservation Program, Clark County, Nevada
December 15, 2017



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Acronyms and Abbreviations

AMMP	Adaptive Management and Monitoring Plan
AMP	Adaptive Management Program
AMR	Adaptive Management Report
Alta	Alta Science & Engineering, Inc.
BCCE	Boulder City Conservation Easement
BGO	Biological Goal and Objective
DCP	Desert Conservation Program
ECO	Enduring Conservation Outcomes
ESA	Endangered Species Act
IPB	Implementation Plan and Budget
MOA	Memorandum of Agreement
MSHCP	Multiple Species Habitat Conservation Plan
Permit	Incidental Take Permit #TE34927-0
Permittees	Clark County; cities of Boulder City, Henderson, Las Vegas, Mesquite, and North Las Vegas; and Nevada Department of Transportation
PIE	Public information, education, and outreach
USFWS	United States Fish and Wildlife Service

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Section 1 Introduction and background

This Biennial Adaptive Management Report (AMR) describes the analysis and subsequent recommendations from the Science Advisor Panel's review in accordance with the Clark County Multiple Species Habitat Conservation Plan (MSHCP) and associated Biological Opinion (USFWS 2000).

Clark County coordinates compliance with Incidental Take Permit #TE34927-0 (Permit) issued by the United States Fish and Wildlife Service (USFWS) in 2001, in accordance with Section 10(a)(1)(B) of the Endangered Species Act (ESA). The current Permit expires in February 2031. Permittees include Clark County; the cities of Boulder City, Henderson, Las Vegas, Mesquite, and North Las Vegas; and the Nevada Department of Transportation (Permittees). Clark County serves as the Plan Administrator for the MSHCP on behalf of the other Permittees, with the Desert Conservation Program (DCP) representing Clark County in this role. Compliance with the Permit requires implementation of the MSHCP and Implementing Agreement (Clark County 2000, USFWS et al. 2000).

The MSHCP and Permit consists of 78 species categorized as "covered" species, and includes 15 reptiles and amphibians, 8 birds, 4 mammals, 10 invertebrates, and 41 plants (USFWS 2001). Covered species include both listed and non-listed species under the ESA and are those species for which sufficient information was known and where management prescriptions could be implemented and supported by the Permit. At the time the MSHCP was finalized in 2000, the desert tortoise (*Gopherus agassizii*) and the southwestern willow flycatcher (*Empidonax traillii extimus*) were the only species listed under the ESA as threatened and endangered, respectively. Since 2000, after the MSHCP was finalized, the Mount Charleston blue butterfly (*Icaricia shasta charlestonensis*) and the western population of the yellow-billed cuckoo (*Coccyzus americanus*) have been listed as endangered and threatened, respectively.

The MSHCP plan area includes Clark County, as well as land in Nye, Lincoln, Mineral, and Esmeralda counties that lie below the 38th parallel, are less than 5,000 feet in elevation, and are in association with Nevada Department of Transportation activities (Figure 1). The Permit originally allowed for the incidental take of MSHCP-covered species from 145,000 acres within the plan area, which has since increased by 22,650 acres (due to the credit provided by the creation of the Tule Springs Fossil Beds National Monument) for a total of 167,650 acres. The area in which the MSHCP allows incidental take is a portion of the plan area, referred to as the "permit area", and includes (Figure 1):

- Non-federal lands in Clark County; and
- Any federal lands within Clark County that may be designated by a federal agency for disposal and eventual transfer to non-federal ownership (i.e., Federal Disposal Boundaries).

Additional introductory information, such as the history (including the background of the Adaptive Management Program [AMP]), function, and the proposed future amendment of the MSHCP and Permit is detailed in the 2016 Biennial AMR (Enduring Conservation Outcomes [ECO] 2016).

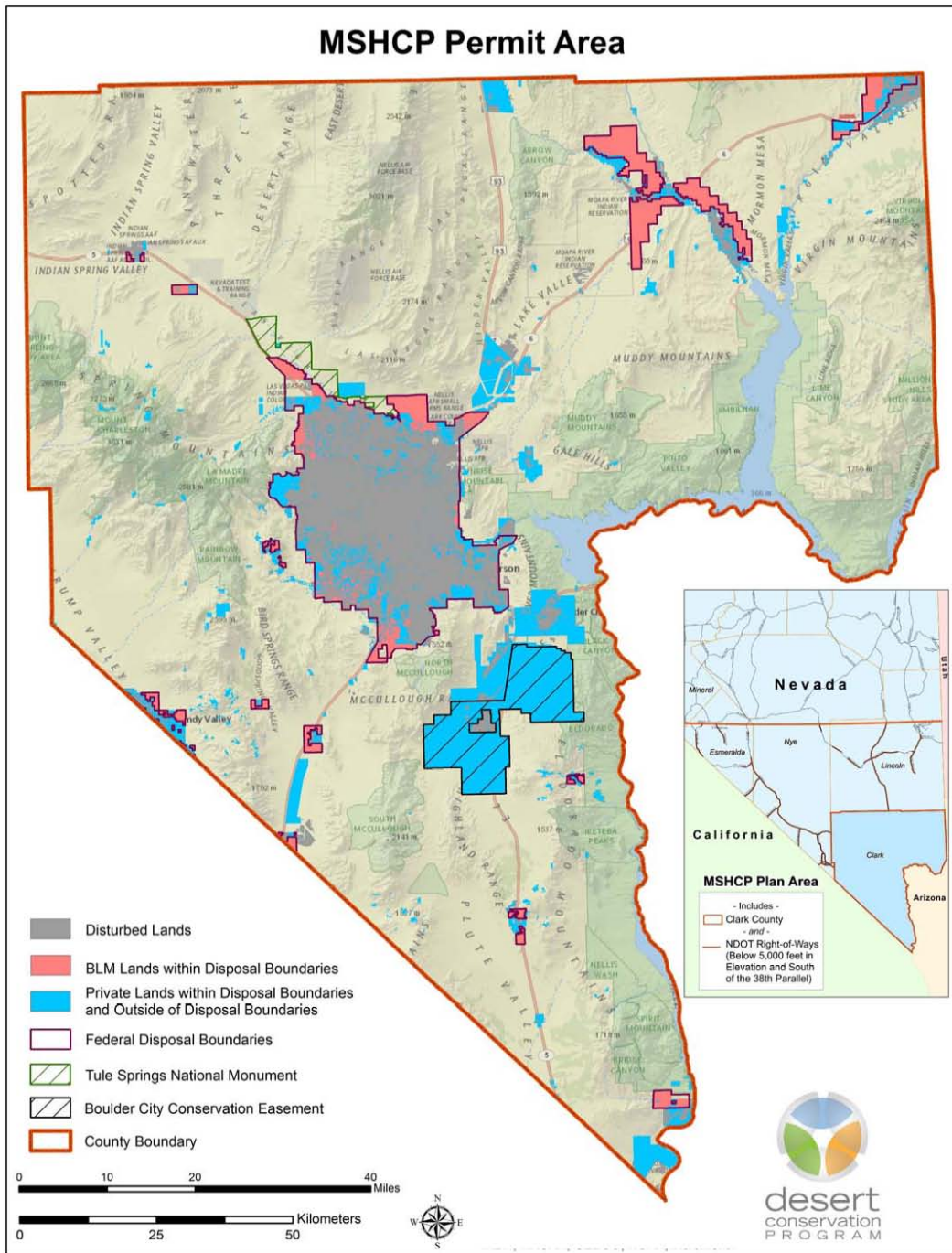


Figure 1. MSHCP plan area (inset) and permit area.

Note that the Boulder City Conservation Easement and the Tule Springs areas within the permit area are precluded from future development.

1.1 Purpose

The MSHCP and Permit required the development of a science-based adaptive management process, the AMP. Consequently, a Memorandum of Agreement (MOA) was prepared to describe the AMP, including specific goals and guiding principles to the AMP (Clark County 2000, USFWS 2001 and 2002). The AMP is designed to provide an objective, quantitative evaluation of the effectiveness of management actions in attaining program goals through the interpretation of inventory, monitoring, and research goals (USFWS 2000). The AMP thus provides objective data and analysis upon which to base management decisions, and a framework to evaluate those management decisions (USFWS 2000). The AMP is required to have an objective, science-based adaptive management contractor (i.e., Science Advisor Panel) to provide an independent assessment of MSHCP implementation. The Biennial AMR is the product of that independent assessment. The independent review is accomplished by obtaining information on recent projects, reports, and datasets, and performing the following four assessments (USFWS 2000):

1. Analyze all land-use trends in Clark County to ensure that take and habitat disturbance are balanced with conservation (Section 2).
2. Track habitat loss by ecosystem (Section 3).
3. Evaluate the effectiveness of management actions at meeting MSHCP goals of conservation and recovery (Section 4).
4. Monitor population trends and ecosystem health (Section 5).

The purpose of this Biennial AMR is to document the Science Advisor Panel's analyses, findings, and subsequent recommendations of the above four items to improve the DCP's AMP and the MSHCP implementation.

1.2 Previous Biennial AMR

Prior to this Biennial AMR, the most recent report was completed in 2016 and included data from 2001 through 2015 (ECO 2016). The 2016 report included assessments and updates to the 2010 AMR (ECO 2010). This Biennial AMR summarizes recommendations from the 2016 report and narrative from the DCP to evaluate how recommendations have been implemented (Appendix A). This Biennial AMR also summarizes new recommendations to assist the DCP in the upcoming biennium.

1.2.1 Summary of 2016 Biennial AMR recommendations

The 2016 Biennial AMR included 25 recommendations, and DCP staff comments for each are located in Appendix A. It is the Science Advisor Panel's opinion that (based on the responses from the DCP), all recommendations were either implemented successfully, were extraneous requests from the past Science Advisor, or demonstrate sufficient progression toward implementation.

1.3 Significant updates since the 2016 Biennial AMR

Since the Biennial AMR in 2016, the following significant updates to the DCP workflow and details of the MSHCP have been implemented:

- Generation of new Biological Goals and Objectives (BGOs; TerraGraphics 2016), and

- Formalization of an Adaptive Management and Monitoring Plan (AMMP; TerraGraphics 2017).

These two documents were implemented to provide a framework in which the DCP can select and design projects and where the type and extent of monitoring data can be analyzed and presented as a part of the Biennial AMR. These two documents are briefly described in the following sub-sections.

1.3.1 2016 Biological goals and objectives

The MSHCP included preliminary BGOs with the intention that they would be further refined throughout the adaptive management process. To further develop these broad BGOs, the Science Advisor Panel, in conjunction with DCP staff, developed BGOs intended to be biologically relevant, quantifiable, and achievable (TerraGraphics 2016). The BGOs developed in 2016 are meant to be integrated into the current DCP workflow and form the foundation of the AMMP. The BGOs are used to quantitatively gauge implementation and conservation success of projects conducted under the MSHCP.

1.3.2 Adaptive management and monitoring plan

An AMMP was developed based on the 2016 BGOs. It provides the technical direction for collecting and assessing monitoring data, determining the success of the conservation actions in achieving the BGOs, and maintaining or enhancing populations of MSHCP-covered species and their habitats through an adaptive management process. The incorporation of relevant and quantitative data and information obtained through systematic and consistent monitoring is a fundamental component of the AMMP. This information is used to periodically evaluate conservation success, with an emphasis on learning from past actions and making necessary changes. The AMMP applies to the entire suite of conservation actions conducted under the MSHCP to formalize adaptive management of the entire conservation program. Adaptive management of individual projects can also be important, but is not directly described in the main body of the AMMP; guidance is provided in Appendix B of the AMMP. Understanding the process and timing of adaptive management tasks will serve to streamline DCP workflow and maximize effectiveness toward permit requirements and biological goals.

A portion of the AMMP describes the evaluation timeline for both analyzing monitoring data and the adaptive management process (TerraGraphics 2017):

- The adaptive management evaluation process is a regular, systematic, recurring process to be performed every 4 years.
- The adaptive management action process occurs when necessary, beginning at the 4-year evaluation interval and continuing until the actions have met their stated goals.
- Analysis of monitoring data for reporting purposes can occur at any time as individual projects dictate, but at a minimum should be conducted every 2 years as part of the Biennial AMR to serve as a benchmark for conservation progress. Additionally, a more in-depth analysis should take place as part of the adaptive management evaluation (see first bullet).
- Quantification and reporting of project-level progress that leads to the achievement of BGOs should be part of the adaptive management evaluation (see first bullet).

Integration of concepts and analyses from the AMMP into DCP workflow should occur at an intentional pace. For example, projects are ongoing and begin at various times; therefore, it is unreasonable to expect that all projects have the required data for the adaptive management

evaluation at the first 4-year benchmark. Nevertheless, all data will be stored by the DCP and will be available to other MSHCP participants.

Section 2 Land use trends in Clark County – analysis and discussion

The first assessment tool of the AMR states “*Analyze all land-use trends in Clark County to ensure that take and habitat disturbance is balanced with conservation*” (USFWS 2000). Land use trends measure the change from a current land use to a different one. The Science Advisor Panel is particularly interested in the change from a natural habitat to a human land use, which represents a habitat loss for a covered species. In the MSHCP, permitted acres (i.e., the number of acres which are permitted to undergo land use change) and habitat loss are the primary measures of “take” for 78 covered species (Clark County 2000).

The original MSHCP allowed for 145,000 acres to be developed between 2001 and 2031. The establishment of the Tule Springs Fossil Beds National Monument provided an amendment to the MSHCP, which allowed for an additional 22,650 acres of development within the original MSHCP timeframe. As acres are permitted for development, each of the Permittees provide monthly updates on expended permitted acres which are summarized in Quarterly Administrator Update reports. The Science Advisor Panel’s assessment used data from March 2015 through March 2017 (DCP 2017). The Science Advisor Panel assumed the data from the Permittees are accurate, complete, and current. Because mitigation fees are required to be paid prior to disturbing any habitat, the acres of actual habitat loss are expected to be less than expended permitted acres. Expended permitted acres are used to track the remaining permitted acres available for development under the MSHCP.

Habitat loss is determined from the total number of acres disturbed and acts as a surrogate for assessing impacts on covered species, with the assumption that any disturbed habitat results in habitat loss for covered species. Habitat loss is measured at the extent of non-federal lands and federal disposal areas within the county. Non-federal lands include lands in private, municipal (city and county), and state ownership.

This Section summarizes the number of acres permitted and habitat loss that have occurred since the last assessment from 2015 (ECO 2016) and cumulatively since the initiation of the MSHCP in 2001. Overall, the assessment is structured by two questions regarding habitat loss (ECO 2010). These assessment questions are discussed in the sub-section below and are:

- How many acres have been permitted for habitat loss?
- How many total acres of habitat loss have occurred?

2.1 Assessment of general habitat loss

The reported number of expended permitted acres was compared to county-wide aerial imagery collected in early March 2017 to determine actual habitat loss to date versus permitted disturbance acres to date (see ECO 2016 for a detailed description of the aerial imagery and spatial analysis). The results presented in this sub-section pertain to actual habitat loss, assuming that all development equates to habitat loss. Habitat loss discussed in this sub-section is irrespective of ecosystem. Habitat loss from currently undeveloped permitted acreage, if developed in the future, will be captured in the 2020 Biennial AMR.

As of March 2017, a total of 96,440 acres have been permitted under the MSHCP, including 15,000 municipal acres that were exempted from the original MSHCP. This is 57.5% of the total

permitted acres under the amended MSHCP (including the Tule Springs Fossil Beds National Monument; 167,650 acres total). Also, as of March 2017, a total of 91,655 acres of habitat have been developed (i.e., actual habitat loss; Table 1; Figure 2). This is 54.7% of the amended allowed acreage. From March 2015 to March 2017, 5,849 acres of development occurred, which is a habitat loss of 0.1% of all land in Clark County (Table 1, Figure 3a). Habitat loss from 2015-2017 was 52.3% less than the average habitat loss across all previous bienniums (5,849 acres versus 12,258 acres, on average; based on the overall total acreage developed between 2001 and 2015). Habitat loss from 2015-2017 was 2.1% of the total amount of developed land in Clark County (Figure 3b). Habitat loss was 3.5% of the total amended permitted acres (Figure 3c).

Table 1. Total area, developed area (habitat loss), and percent habitat loss prior to 2001, 2001-2015, and 2015-2017 in Clark County, Nevada.

Total acres in Clark County	Acres developed (habitat loss) within each time period ¹ (% total acres ² / % permitted acres ³)			Cumulative developed acres (% total acres / % permitted acres)
	Prior 2001	2001-2015	2015-2017	
5,159,738	180,754 (3.5% / NA ⁴)	85,806 (1.7% / 51.2%)	5,849 (0.1% / 3.5%)	272,410 (5.3% / 54.7% ⁵)

¹ Based on aerial imagery. The total developed acres are fewer than the number of acres permitted for development.

² Percent of total acres in Clark County developed within time period.

³ Percent of MSHCP-permitted acres developed within time period.

⁴ Not Applicable, as MSHCP began in 2001.

⁵ Cumulative percent of expended permitted acres developed is based on acres developed since the permit began in 2001 (91,655 acres).

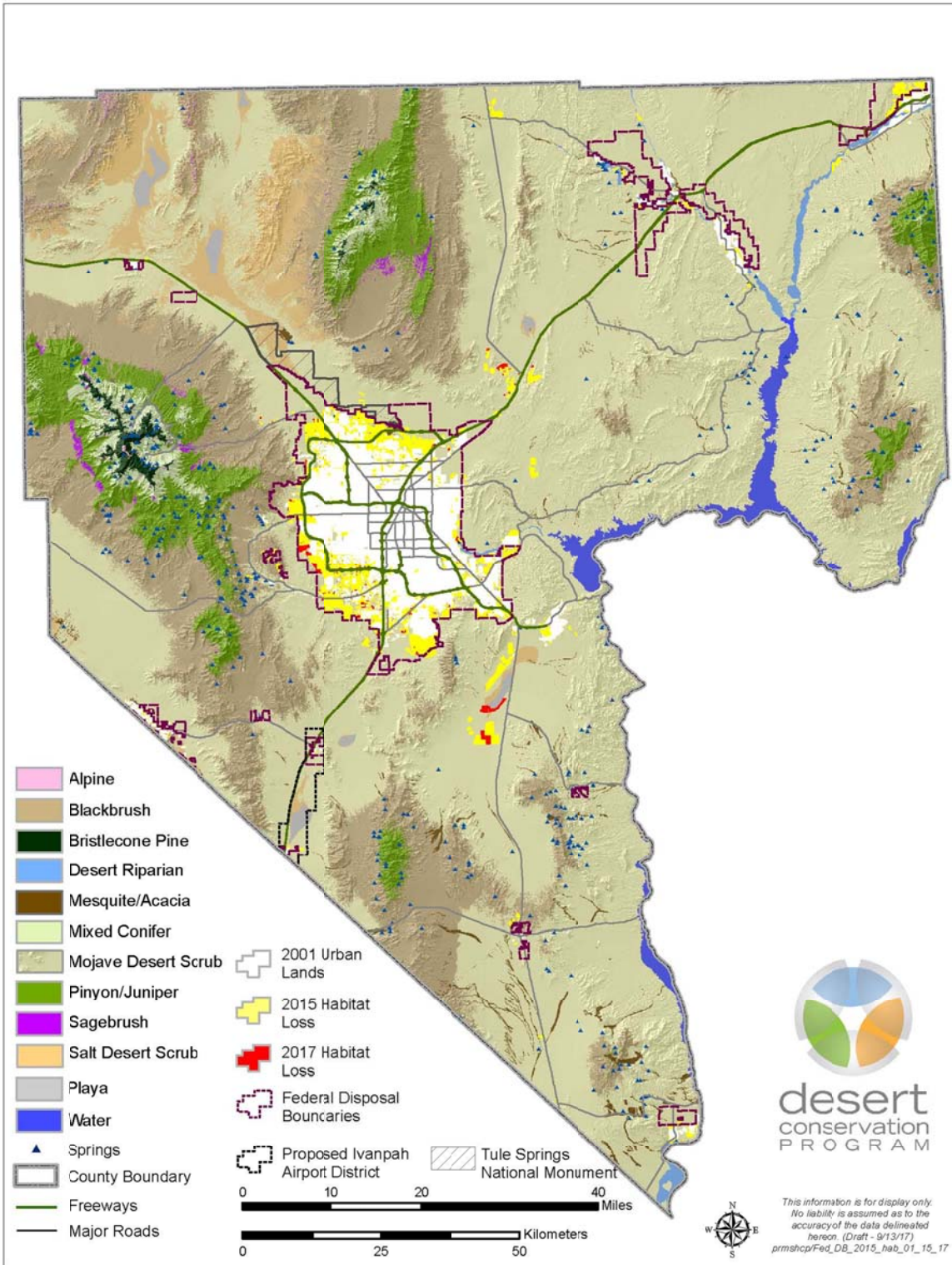


Figure 2. Map of ecosystems, habitat loss, and federal disposal boundaries within the MSHCP permit area.

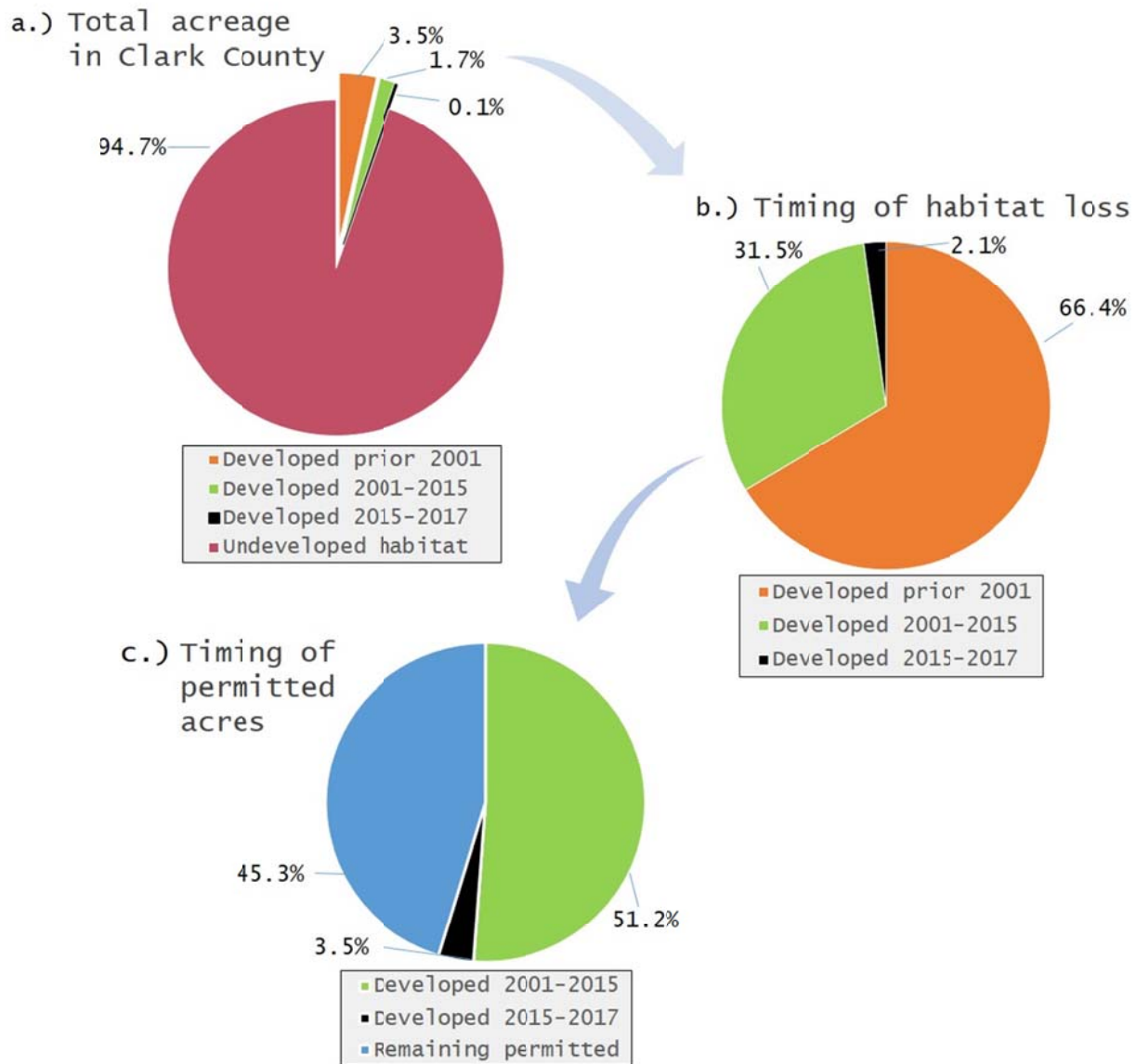


Figure 3. Percent habitat loss as a function of total habitat, time period, and development pace of permitted acreage.

(a) Habitat loss, by time period, compared to total habitat (i.e., total acreage) within Clark County.

(b) Distribution of habitat loss by time period.

(c) Proportion of total amended permitted acres developed per time period.

Note: Each color among pie charts represents the same calculated acreage and time period (e.g., orange slices are the amount of habitat developed prior to 2001 [180,754 ac] in both [a] and [b]).

2.2 Concluding thoughts and recommendations for land use trend analysis

Based on the Science Advisor Panel’s assessment of land use trends (i.e., general habitat loss), concluding thoughts are:

- General habitat loss is commensurate with what is expected given the percent of habitat loss at this point in the timeline of the MSHCP. However, annual rates of habitat take

have varied tremendously over the duration of the MSHCP and may increase or decrease with changing economic conditions in the region.

- In a general sense, current conservation actions are balancing habitat take (sensu USFWS 2000) because the Permit conditions are being met.

The following is a compilation of recommendations from the Science Advisor Panel:

- As part of analysis during the next Biennial AMR, the Science Advisor Panel should consider calculating habitat loss across similar time periods (i.e., each 2 years to correspond to the Biennial AMR) to make direct comparisons regarding the rate of habitat loss between 2-year time periods.
- As part of analysis during the next Biennial AMR, the Science Advisor Panel should consider projecting the rate of future expended permitted acres for the entire MSHCP period. This could forecast when all permitted acres will be developed.
- As part of analysis during the next Biennial AMR, the Science Advisor Panel should consider evaluating habitat quality of remaining habitat, with regards to the survival of covered species, as data on habitat quality becomes available.

The Science Advisor Panel does not have any specific recommendations for the DCP to implement in this section; however, the recommendations of additional analyses to be included in future Biennial AMRs may require the DCP's participation in a preliminary effort (i.e., data gathering, interim analyses, etc.) prior to the Science Advisor Panel preparing the next Biennial AMR.

Section 3 Habitat loss by ecosystem – analysis and discussion

The second assessment tool of the AMR states “*Track habitat loss by ecosystem*” (USFWS 2000). In addition to tracking total habitat loss, the DCP tracks habitat loss by ecosystems (i.e., habitat types) as an assessment of development impacts (i.e., “take”) on 78 covered species. There are 12 ecosystems described for Clark County, although not all ecosystems are impacted by development due to land ownership and land use patterns (Figure 2). Information describing each ecosystem was detailed in the 2016 Biennial AMR (ECO 2016). Table 2 summarizes acres of habitat that have been developed (i.e., habitat loss) in the most recent biennium (i.e., 2015-2017) and over the life of the Permit (i.e., since 2001). Table 2 also categorizes acres by ecosystem relative to that ecosystem's prevalence throughout Clark County.

In the most recent biennium (2015-2017), a total of 5,828 acres were developed, the majority of which were Mojave Desert Scrub (5,386 ac; 92.4% of development this biennium). Other ecosystems that were developed include Salt Desert Scrub, Mesquite/Acacia, Desert Riparian, and Playa. No other ecosystems lost acreage in the recent biennium, although several had existing developed acres (Table 2).

Table 2. Habitat loss by ecosystem during 2015-2017 and since 2001. These percentages are based on the total area of each ecosystem in Clark County, Nevada.

Ecosystem ¹	Total acres (% of Clark County ²)	Developed acres (i.e., Habitat Loss)			
		Prior 2001 ³	2001 -2015	2015 -2017 ⁴	Cumulative since Permit began (2001-2017) (% of ecosystem type ⁵)
Blackbrush	1,027,144 (19.9%)	1	629	0	629 (0.10%)
Desert Riparian	27,717 (0.5%)	3,005	420	50	470 (1.7%)
Mesquite/Acacia	50,008 (1.0%)	5,546	1,728	65	1,793 (3.6%)
Mixed Conifer	67,556 (1.3%)	31	6	0	6 (0.01%)
Mojave Desert Scrub	3,377,939 (65.5%)	165,412	76,789	5,386	82,175 (2.43%)
Pinyon/Juniper	286,400 (5.6%)	36	5	0	5 (<0.01%)
Sagebrush	11,632 (0.2%)	0	6	0	6 (0.05%)
Salt Desert Scrub	204,329 (4.0%)	6,723	6,223	280	13,226 (3.18%)
Playa	19180 (0.4%)	0	0	47	47 (0.25%)
Total	5,159,738	180,754	85,806	5,828	91,634 (1.78%)

¹Excludes 'Alpine', 'Bristlecone Pine', and 'Water', as these ecosystems total 1.7% of Clark County and 0 acres have been developed.

²Percent of Clark County comprised of each ecosystem. Calculation is for the entirety of Clark County, including federal land, and therefore reflects ecosystem acreages for the larger County-encompassed landscape.

³Existing development before Permit began.

⁴Habitat loss in acres. Note the slight discrepancy (< 0.4%) in total habitat loss in the 2015-2017 biennium presented here compared to Section 2, due to small unavoidable calculation errors in the spatial analysis of loss by ecosystem type.

⁵Cumulative percent developed rounded to nearest 0.01%.

In addition to quantifying the absolute area of habitat loss for each ecosystem, the Science Advisor Panel assessed the acreage loss in proportion to the total existing area of each ecosystem (i.e., prevalence, Figure 4). For example, if development within Clark County were spatially random, the proportion of Desert Riparian that is developed will be roughly equivalent to the proportion of Clark County that is Desert Riparian. This assessment can determine if specific ecosystems are being lost at a disproportionately higher rate than they occur, which could lead to specific recommendations for conservation actions (see Section 4 below). For example, a disproportionately high rate of loss of the Mesquite/Acacia ecosystem would indicate a need for conservation actions targeted at protecting or enhancing remaining Mesquite/Acacia habitats.

To illustrate the calculations performed to create Figure 4, the amount of all Desert Riparian that has been developed since the Permit began (2001 – 2017) is 1.696% whereas the acreage of all of Clark County that is Desert Riparian ecosystem is 0.537%. Therefore Desert Riparian has been developed at a rate disproportionately higher than expected loss of Desert Riparian by ~315.7% (i.e., $1.696 / 0.537 \approx 315.7\%$).

The proportional loss analysis (Figure 4) found that both the Desert Riparian and Mesquite/Acacia habitats have been developed at considerably higher rates (> 300%; Figure 4) than their general prevalence within Clark County, suggesting that these ecosystems may need a specific focus in terms of conservation actions (see Section 4 for analysis of this need). On the other hand, these ecosystems represented a small amount of the total habitat loss to date (prior to 2001 through 2017), with 90.9% of developed acres occurring in Mojave Desert Scrub (Table 2). The Mojave Desert Scrub may warrant conservation attention because of this large proportion undergoing development. However, Mojave Desert Scrub is also the most abundant ecosystem within Clark County (comprising 65.5% of total land in Clark County; Table 2) and the total amount of development in Mojave Desert Scrub is proportionally small relative to its occurrence (-96.3%; Figure 4). Therefore, it is not at risk relative to its occurrence. The other interpretation is that the disproportionate developments of Desert Riparian and Mesquite/Acacia are of concern precisely because of their relative rarity in Clark County (0.5% and 1.0% of land area, respectively; Table 2).

These examples highlight that there are multiple factors to balance when assessing whether the rate of disturbance to an ecosystem warrants additional conservation action. At the level of Clark County and over the life of the Permit to-date (2001-2017), the Desert Riparian and Mesquite/Acacia ecosystems warrant conservation attention because of their proportionally high historic rate of development, whereas Mojave Desert Scrub warrants conservation attention because of its high overall amount of development.

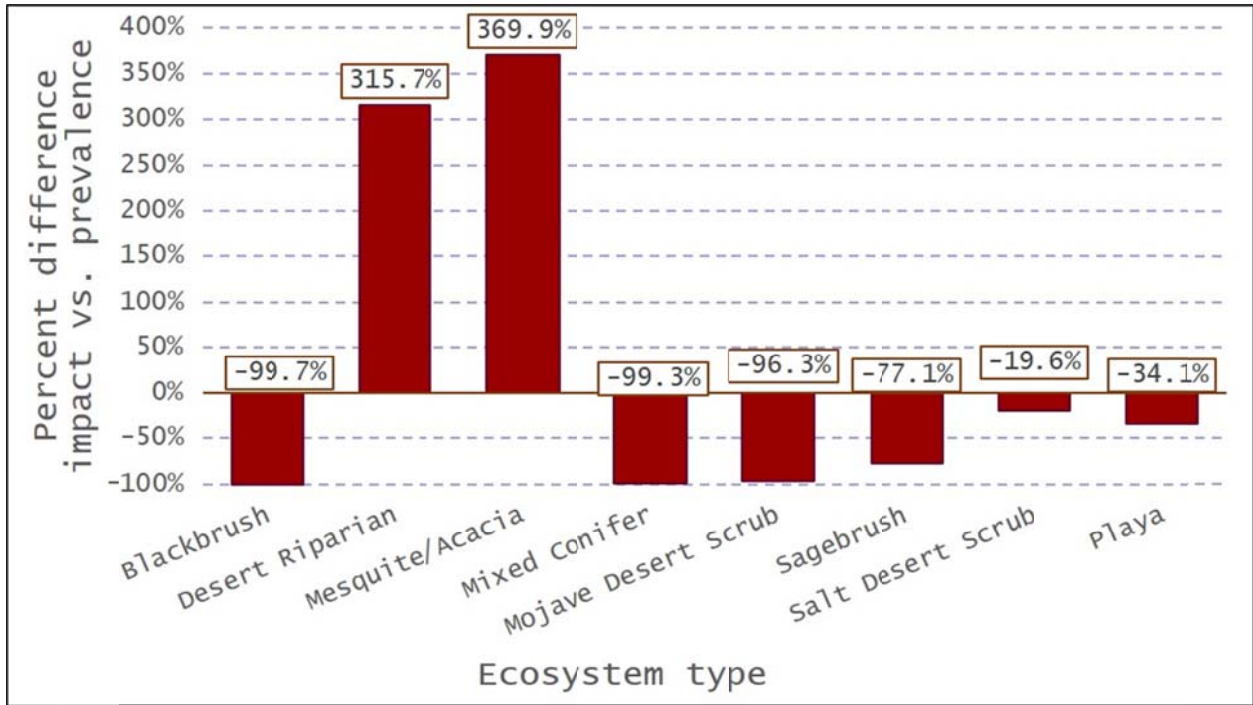


Figure 4. Proportionality of habitat loss since the Permit began (2001-2017) as a function of the amount of each ecosystem in Clark County, Nevada.

Values indicate the percentage rate at which an ecosystem is being developed relative to its occurrence. For example, the percent of Desert Riparian habitat that has been developed to date (rounded for display in Table 2 to 1.7% as of March 2017) is 315.7% greater than the proportion of Clark County that is Desert Riparian habitat (rounded for display in Table 2 to 0.5%; unrounded: $1.696 / 0.537 \approx 315.7\%$).

At the landscape level, the proportion of habitat loss in relation to ecosystem prevalence across the entirety of Clark County over all time periods is valuable (Figure 4). However, the MSHCP permit area, in which incidental take is allowed, does not cover the entirety of Clark County (see Section 1). An alternative relevant metric to track loss of ecosystem acreage is to focus on the areas that have been or could be developed under the MSHCP and to do so specific to the most recent biennium. This provides information on the proportionality of ecosystem loss relative to the total amount that could be lost under the MSHCP.

Using aerial imagery of existing disturbed acreage, property ownership GIS layers, and current federal designation of disposal boundaries, DCP staff calculated that 651,630 acres have been developed, or are potentially available to be developed, under the MSHCP as of October 2017 (i.e., private land or federal disposal lands not covered under conservation agreements; Figure 1). These are lands that, if developed, would fall under the administration of the MSHCP, although the total acreage of these lands that can ultimately be developed is limited by the MSHCP to 167,650 acres. As part of biennial tracking of habitat loss specific to ecosystem, the Science Advisor Panel calculated the proportion of undeveloped acreage by ecosystem in March 2015 and compared it to the proportion of ecosystem loss between March 2015 and March 2017 (Figure 5). This analysis focuses on the most recent AMR biennium and only the acres that could potentially be developed under the MSHCP.

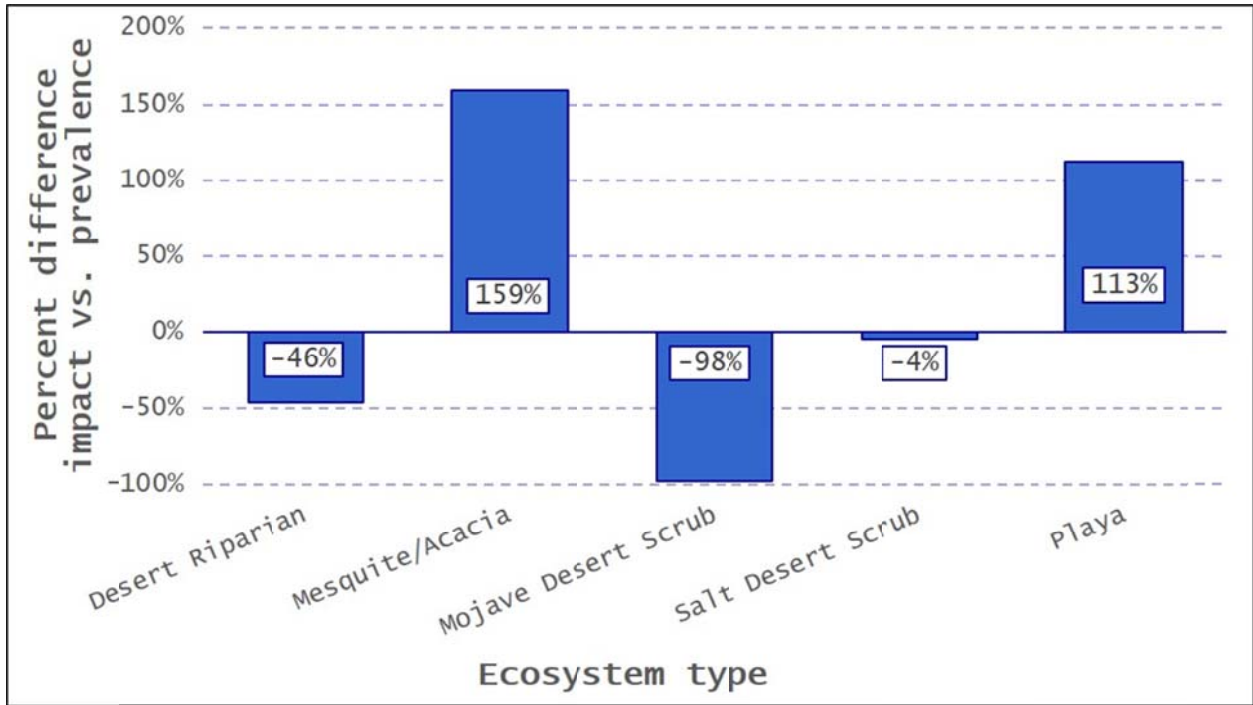


Figure 5. Recent biennium (2015-2017) habitat loss by ecosystem, proportional to its occurrence on acreage that could potentially be developed under the MSHCP (i.e., the permit area).

Not all acreage in Clark County has the potential to be developed under the MSHCP. Therefore the prevalence of some ecosystems in potentially-developable land are not equal to their prevalence across the entire County. Positive values indicate disproportionately high rates (and negative values indicate disproportionately low rates) of habitat loss relative to prevalence, between March 2015 and March 2017 and therefore represent recent trends in proportional/disproportional loss.

All ecosystems that occur in the permit area lost acreage to development between March 2015 and March 2017, including Desert Riparian, Mesquite/Acacia, Mojave Desert Scrub, Salt Desert Scrub, and Playa (Figure 5). Of these, Mesquite/Acacia and Playa lost a disproportionately higher amount of acreage compared to prevalence, whereas the other ecosystems lost disproportionately less acreage (Mojave Desert Scrub and Desert Riparian) or equivalent acreage (Salt Desert Scrub) compared to prevalence (Figure 5). Total lost acreage between 2015 and 2017 was primarily Mojave Desert Scrub (92.4% calculated from Table 2). Based on GIS analysis by DCP staff, Mojave Desert Scrub is the dominant ecosystem (89.0% of undeveloped acres in March 2015; data available on request) on lands that potentially could be developed under the MSHCP.

3.1 Concluding thoughts and recommendations for habitat loss by ecosystem analysis

Based on the Science Advisor Panel’s assessment of habitat loss categorized by ecosystem, concluding thoughts are:

- At the level of Clark County and over the life of the Permit to-date, the Desert Riparian and Mesquite/Acacia ecosystems warrant conservation attention because of their proportionally high historic rate of development.

- Specific conservation of Mojave Desert Scrub is warranted due to the total amount of habitat loss of this ecosystem due to the high amount of development within this ecosystem as well as Mesquite/Acacia and Playa due to disproportionately high loss of these uncommon ecosystems.
- The calculated loss and consequent implied need for restoration of Mesquite/Acacia ecosystem warrants some caution in its interpretation. The GIS ecosystem model underlying this analysis had good accuracy performance for each MSHCP-relevant ecosystem type with the exception of Mesquite/Acacia (Heaton et al. 2011). According to field validation in Heaton et al. (2011), it is hard to differentiate a distinct “Mesquite/Acacia” ecosystem type even in the field. Therefore, calculated loss contains some uncertainty that may or may not reflect true loss. Similarly, conservation actions to restore poorly identifiable “Mesquite/Acacia” ecosystems will also be challenging.

The following is a compilation of recommendations from the Science Advisor Panel that are intended for DCP implementation:

- Develop conservation actions for those ecosystems undergoing the highest total loss and the highest proportional loss since both metrics could be important to the conservation and management of covered species.
 - Target future conservation actions specific to Desert Riparian, Mesquite/Acacia, and Playa ecosystems due to their low prevalence and high historic and recent relative rate of development. See Section 4 for discussion of current progress.
 - Target future conservation actions to Mojave Desert Scrub ecosystems due to the total high rate of habitat loss. Management of the Boulder City Conservation Easement (BCCE) and associated Mojave Desert Scrub restoration projects may already be sufficient to offset habitat loss.
- Assess available data and tools that may be used to update the ecosystem map every five years.
- Conduct an accuracy assessment of any future ecosystem mapping analyses to determine the uncertainty inherent in the calculations of ecosystem loss, rate of loss, and proportion of loss.

Section 4 Effectiveness of management actions – analysis and discussion

The third assessment tool in the AMR states “*Evaluate the effectiveness of management actions at meeting MSHCP goals of conservation and recovery*” (USFWS 2000). At this early stage (i.e., the first Biennial AMR after adoption of the new BGOs and implementation of the AAMP), the Science Advisor Panel analysis of the effectiveness of management actions is a semi-quantitative approach intended to begin integrating concepts from the AMMP with current DCP processes. The recent additions of the 2016 BGO document and 2017 AMMP document are expected to provide an objective, measurable framework in which to assess the projects the DCP is implementing and thus provide a more robust manner to assess the effectiveness of management actions for the entire program. This analysis is anticipated to differ for each Biennial AMR, as it is dependent on the administered projects at that time and the adaptive management tools utilized by the DCP. It is expected that future analyses will be increasingly quantitative, using data collected for each project as part of implementing the AMMP.

To evaluate the effectiveness of project-based management actions, the Science Advisor Panel tabulated the number of projects that address each biological goal. The biological goals are summarized below (see TerraGraphics 2016 for complete description and corresponding biological objectives):

Riparian Goals:

- Goal R1.** Maintain or expand habitat on riparian reserve lands;
- Goal R2.** Maintain stable or increasing populations of T&E listed species on riparian reserve lands;
- Goal R3.** Foster community engagement;
- Goal R4.** Promote ecological resilience;

Desert Goals:

- Goal D1.** Maintain or expand habitat on desert upland reserve system lands;
- Goal D2.** Maintain stable or increasing populations of T&E listed species on desert reserve lands;
- Goal D3.** Foster community engagement; and
- Goal D4.** Promote ecological resilience.

To facilitate this assessment, the DCP provided the Science Advisor Panel with a list of master projects as well as narratives describing each project, sub-projects, and accomplishments (Clark County 2017). All projects and sub-projects were assigned by the DCP to one of seven categories, summarized below and in Table 3.

1. *AMP*. Components include contracting an independent Science Advisor Panel, and design and implementation of research projects. Specific projects in this analysis include data collection, analysis, and development of covariates for the occupancy sampling effort, predation study, range-wide desert tortoise monitoring, federally listed bird surveys, and point-count surveys on riparian properties. There were 16 projects in this category that were assessed for addressing the Biological Goals; all 8 biological goals were addressed with the great majority of projects addressing goals R2, D1, and D2.
2. *BCCE* projects include property management and conservation, and research projects to benefit covered species. Specific projects in this category include weed surveys, fencing, site rehabilitation and cleanup, kiosk and signage, informative videos, and law enforcement. A total of 16 projects were assessed in meeting the biological goals; all projects addressed biological goals D1 and/or D3.
3. *Conservation* projects include general funding of conservation actions to provide for conservation and recovery of covered species which may include research, habitat protection, or species inventory. Specific projects include fencing installation and maintenance, trail restoration, Tule Springs Cultural Resource survey, and relict leopard frog conservation efforts. Five projects in this category addressed goals R4, D1, D3, and D4.
4. *Public information, education, and outreach (PIE)* projects aim to inform the public about the MSHCP, and includes programs to encourage people to respect and protect the desert. Specific projects include Mojave Max appearances, building a desert tortoise habitat at the Springs Preserve, Off Highway Vehicle (OHV) education, and development

of promotional materials. There were 14 projects in this category which addressed goal D3.

5. *Program administration and permit compliance* encompasses all aspects of implementing the MSHCP and complying with the incidental take permit. Specific projects include acquisition of supplies, data analysis, legal services, and consultants. The single project in this category addressed goals R1, R2, D1 and D2.
6. *Riparian reserves* projects focus on acquiring private lands in desert riparian habitats to conserve habitat for riparian birds covered by the MSHCP. Specific projects include grading plans, water rights consulting, land surveys, field supplies, fence and gate installation, and weed management and removal. There were 16 riparian projects that addressed biological goals R1 and R4.
7. *Wild desert tortoise assistance* projects include operation of the wild desert tortoise assistance line, implementation of a translocation program, maintenance of tortoise exclusion fencing, tortoise monitoring, and research projects. Specific projects that were assessed here include wild desert tortoise hotline, telemetry on the BCCE, tortoise monitoring, and a pet tortoise sterilization clinic. There were 9 projects that addressed goals D2 and D3.

Projects vary in magnitude (both in literal size and in monetary scale), duration, and overall potential impact in achieving BGOs. There were 54 master projects and 174 sub-projects, of which 77 were classified based on the Biological Goal to which they contributed (e.g. many sub-projects were for supply acquisition, or services that were administrative in nature, and were thereby excluded from analysis) (Table 3 and Appendix B).

Table 3. Categories of projects tallied by which biological goals they support.

Project Category	Number of projects and sub-projects assessed	R1	R2	R3	R4	D1	D2	D3	D4
AMP	16	1	3	1	1	7	8	1	1
BCCE	16	-	-	-	-	7	-	10	-
Conservation	5	-	-	-	2	2	-	1	3
PIE	14	-	-	-	-	-	-	14	-
Administration	1	1	1	-	-	1	1	-	-
Riparian	16	16	-	-	1	-	-	-	-
Wild desert tortoise	9	-	-	-	-	-	7	4	-

The Science Advisor Panel also assessed the list of in-progress or recently completed projects in Appendix B in light of the calculation of disproportional habitat loss described in Section 3. The ecosystems of particular concern are Mojave Desert Scrub (due to a high amount of total development occurring in this ecosystem) and Mesquite/Acacia, Playa, and Desert Riparian (due to disproportionately high rates of development in these uncommon ecosystems). There were 12 projects on the list directly contributing to the conservation of Mojave Desert Scrub, all within the BCCE. The Science Advisor Panel identified 10 projects benefiting Mesquite/Acacia ecosystems and 9 projects benefiting Playa ecosystems. The BCCE contains small portions of Mesquite/Acacia and Playa ecosystems; therefore, projects with a broad level of habitat

protection across the BCCE (e.g., restoration or visitor use and management) will generally contribute a small amount of conservation to these two ecosystems.

Desert Riparian ecosystems also had 12 projects directly contributing to their conservation, all of them related to acquisition, restoration, and management of riparian properties. From 2001 to 2017, 470 acres of Desert Riparian ecosystem were developed (50 of these acres were developed between 2015 and 2017; Table 2). To offset this development the DCP made notably large acquisitions of riparian properties in this biennium, bringing the total acreage of DCP riparian properties from 286 acres in 2015 to 486 acres in 2017. However, not all acreage within riparian property boundaries is Desert Riparian ecosystem, as the boundaries also include adjacent upland ecosystems. Analysis by the DCP found that ~327.4 acres of Desert Riparian was contained within the riparian properties, with the remainder of the acreage being Mesquite/Acacia (~3.6 acres) and Mojave Desert Scrub (~161.6 acres). The amount of Desert Riparian ecosystem (~327.4 acres) contained within the riparian properties is 30% lower than the amount of Desert Riparian ecosystem that was lost to development from 2001 - 2017 (470 acres). Of note is that the DCP has another 145 riparian acres in the process of acquisition, with expected completion in 2017 or 2018. If acquired, these additional acres would bring the total acreage of conserved Desert Riparian ecosystem to approximately 472 acres, which is close to the total amount lost.

Also of note is that the DCP has planned/ongoing restoration projects for Mesquite/Acacia on some of the riparian properties, which is a step towards offsetting the disproportionate loss of Mesquite/Acacia. Quantification of how much Mesquite/Acacia ecosystem loss is being offset is not available at this time.

4.1 Concluding thoughts and recommendations for management action effectiveness

Based on the Science Advisor Panel's assessment of management action effectiveness, concluding thoughts are:

- Overall, the assessment of the effectiveness of the DCP's management actions is positive because all Biological Goals have projects that are either recently completed and/or are in progress.
- Of those specific ecosystems that have experienced overall high or disproportionately high habitat loss, Mojave Desert Scrub and Desert Riparian are being sufficiently balanced with recently completed and ongoing conservation projects. In contrast, Mesquite/Acacia and Playa ecosystems, while potentially benefited by general BCCE projects, could use more directed conservation attention if and where possible in the future.
- Classification of projects was conducted post-hoc and was based on information provided by the DCP. For future implementation of concepts from the AMMP, each project should be cross-referenced with its applicable BGOs during project inception and should be validated during project close-out (TerraGraphics 2017). This will provide more consistent (and quantitative) data on which BGOs are applicable to each project and will be based on DCP staff's knowledge of each project. This recommendation is more a limitation of the current analysis rather than a recommendation for the DCP to change any practices. Additionally, this recommendation is expected to occur with the already-scheduled integration of the AMMP and other adaptive management actions/worksheets. Subject-matter knowledge should be used to ensure that ecosystem-specific conservation actions are beneficial to covered species.

The following is a compilation of recommendations from the Science Advisor Panel that are intended for DCP implementation:

- Implement all effectiveness worksheets (Appendix B of the AMMP). By doing so, and collating in a spreadsheet, direct quantitative assessment within the next Biennial AMR will be possible. This recommendation is likely already being implemented; however, the Science Advisor Panel stresses its importance here.
- When the Science Advisor Panel is providing recommendations during the Implementation Plan and Budget (IPB) process, they should link projects and/or concepts to specific recommendations from the most recent Biennial AMR. For example, this Biennial AMR recommends specific conservation focus on Mesquite/Acacia and Playa habitats. This provides direction and justification for project types in the next IPB and can serve to demonstrate management action effectiveness.

Section 5 Species status and population trends – analysis and discussion

The final assessment tool in the AMR states “*Monitor population trends and ecosystem health*” (USFWS 2000). The MSHCP directs the DCP to monitor the status and trends of covered species and their habitat to prevent loss or fragmentation of habitat for the benefit of stabilizing or increasing population numbers within Clark County (Clark County 2000, USFWS 2002). No quantitative goals were established at the initiation of the MSHCP; however, goals were to be developed over time through surveys, monitoring, and adaptive management.

Monitoring the status of populations and the habitats of MSHCP-covered species provides information on the benefits of conservation actions conducted by the DCP as part the MSHCP implementation. Additionally, monitoring can serve as a safeguard against failing to detect MSHCP-covered species population declines in spite of successful implementation of the MSHCP.

The recently completed AMMP outlines the rationale and general methodology for monitoring species’ status and population trends for all MSHCP-covered species (TerraGraphics 2017). Monitoring will be used to record and evaluate species’ population and habitat trends, and potentially to demonstrate the impact of conservation actions on the populations of MSHCP-covered species. Furthermore, the AMMP outlines how monitoring data will be used to conduct the new program-level adaptive management process. The adaptive management process for population and habitat of MSHCP-covered species is to be completed every 4 years and is separate from the Biennial AMR (see Section 1.3.2). The AMMP also requires all monitoring data to be synthesized and disseminated in the Biennial AMR.

While the recently-completed AMMP outlines a comprehensive monitoring plan, the IPB funding process cannot provide immediate implementation for all species and habitats. Thus, while future Biennial AMRs will disseminate all monitoring data, this Biennial AMR is limited to a partial dissemination of existing monitoring data. These data are presented below, and are categorized by surveys related to desert tortoise and other reptiles and riparian birds. Interested readers are directed to each project’s summary reports for specific sampling and result details (see Section 7, References).

5.1 Desert tortoise

Multiple MSHCP-funded projects are collecting data on desert tortoise populations, such as the desert tortoise occupancy monitoring project (DCP 2011), range-wide desert tortoise monitoring

(GBI 2017), and radio-telemetry of wild and translocated desert tortoises (GBI 2016). The Science Advisor Panel summarized results for two of these projects (i.e., occupancy and range-wide monitoring) below as a template for comprehensive dissemination of formal monitoring results in the 2020 Biennial AMR. The Science Advisor Panel did not provide interpretation of these data because the goal of most of these projects was not to collect long-term species monitoring data. However, these projects collected data similar to that which might be collected under a monitoring plan; therefore, they serve as a useful example for the type of data that should be disseminated in the 2020 Biennial AMR. The AMMP provides specific guidance on which long-term data should be collected for monitoring purposes.

5.1.1 *Occupancy monitoring*

The goal of this project has been two-fold: first, to develop a predictive map for the BCCE of spatial variation in the relative probability of desert tortoise occurrence as a function of landscape features, and second, to evaluate the utility of occupancy sampling for long-term monitoring of desert tortoise populations. Occupancy monitoring is a powerful tool because it samples the most important state variable of a wildlife population (presence vs. absence) and does so while explicitly incorporating imperfect detection during a single survey (DCP 2011). A detailed description of the project initiation can be found in DCP (2011) and a detailed description of the methods and results from 2015-2017 can be found in the project's annual report (KLA 2017). Field effort and seasonal timing of surveys were consistent across years. A portion of the results from the annual report are presented in Table 4 (KLA 2017).

Table 4. Summary results of desert tortoise occupancy monitoring in BCCE, Clark County, Nevada.

Observation	2015	2016	2017
No. tortoise observations ¹	63	52	79
No. unique tortoises observed	41	33	49
No. tortoise carcass observations ¹	223	210	236

¹Includes re-sightings

During the field surveys for the tortoise occupancy monitoring, the field crew also recorded incidental observations of other MSHCP-covered reptile species (Table 5).

Table 5. Summary of non-unique encounters of MSHCP-covered reptiles (not including desert tortoise; see Table 4) in BCCE, Clark County, Nevada.

Species	2015	2016	2017
Glossy snake	2	1	1
Sidewinder	4	8	2
Speckled rattlesnake	1	0	1
Mojave rattlesnake	0	0	2
Great Basin collared lizard	0	1	1
Desert iguana	24	46	22
Large-spotted leopard lizard	19	25	15

5.1.2 *Range-wide monitoring*

The goal of a range-wide monitoring project is to generate desert tortoise density estimates in the eastern Mojave Desert. Standardized USFWS desert tortoise line-distance sampling methods were used following training from USFWS staff. Detailed methods and results can be found in the project's annual reports (GBI 2016 and 2017). Field personnel recorded detections of live desert tortoises encountered during line-distance surveys during 2016 and 2017 (Table 6).

Table 6. Number of live desert tortoise encounters during line-distance sampling surveys, eastern Mojave Desert, Clark County, Nevada.

Tortoise Conservation Area	Number of live desert tortoise encounters	
	2016	2017
Piute Valley	27	30
Eldorado Valley	27	49
Coyote Springs	34	-
Mormon Mesa	8	-
Beaver Dam Slope	8	4
Gold Butte	-	12
Total	104	95

5.2 *Riparian birds*

Point count surveys for MSHCP-covered riparian birds, including established protocol surveys for federally-listed yellow-billed cuckoo and southwestern willow flycatcher, are the only monitoring surveys described in the recent AMMP that have been implemented to date. There is only one year of monitoring results to present; however, they will serve as the initial data for yearly monitoring surveys to be included in future Biennial AMRs.

Field methods followed established protocols for both federally-listed species and general avian point counts. The project annual report details the field methods used in the surveys (SWCA 2017). Surveys were conducted in May and June 2017. The number of detections of MSHCP-covered riparian birds were recorded for each riparian reserve unit and are presented in Table 7 (see SWCA [2017] for more details).

Table 7. Number of individual bird detections in each riparian reserve unit, Clark County, Nevada, 2017 (SWCA 2017).

Common name	Riparian reserve unit		
	<i>Bunkerville</i>	<i>Mormon Mesa</i>	<i>Muddy River</i>
Southwestern willow flycatcher	- ¹	5	-
Yellow-billed cuckoo	-	-	-
American peregrine falcon	1	-	X ²
Blue grosbeak	5 (PO) ³	1	X (PO)
Phainopepla	-	-	13 (PO)
Summer tanager	-	2 (PO)	-
Arizona Bell's vireo	-	9 (PO)	3 (PO)

¹"-" = no detections

²X = present in the area but more than 100m from survey point

³PO = potentially a breeding pair

5.3 Conclusions and recommendations for species status and trends analysis

Based on the Science Advisor Panel's assessment of species status and trends, concluding thoughts are:

- Ideally, each future Biennial AMR will update the monitoring results from the previous Biennial AMR with two new years of survey results, resulting in a growing understanding of species' status and population trends over time. It would be useful to treat this section as a boilerplate to which new data/discussions are added with each Biennial AMR. Because the AMMP was completed after the most recent IPB process (the 2017-2019 IPB cycle), there is a time lag before projects can be fully implemented. Full monitoring projects described in the AMMP are not expected to occur until the 2020-2022 IPB cycle.
- The Biennial AMRs are useful for disseminating the results from species' status and population trends monitoring. They provide more frequent dissemination of the data than the 4-year adaptive management process. The Biennial AMRs also allow for assessing monitoring trends over time, which is the fundamental goal of the monitoring plan described in the AMMP. Because comprehensive monitoring and reporting is part of the recently-completed AMMP and has not been implemented in the DCP's regular workflow, the assessment presented in this Biennial AMR is intended to demonstrate how monitoring data can be disseminated in future Biennial AMRs.

The following is a compilation of recommendations from the Science Advisor Panel that are intended for DCP implementation and for the Science Advisor Panel to include as analysis in the next Biennial AMR:

- Calculate population growth rates for desert tortoise and riparian bird populations when sufficient data have been collected.

- Identify a fragmentation metric(s) to monitor fragmentation in order to address the general goal of “allow no net unmitigated loss or fragmentation of habitat...” listed in Section 2.1.6 of the MSHCP (Clark County 2000).

Section 6 Conclusions and Summary

This Biennial AMR describes the independent analysis and subsequent conclusions and recommendations from the Science Advisor Panel’s assessment of land use trends, habitat loss by ecosystem, the effectiveness of management actions at meeting MSHCP goals, and population trends and ecosystem health (see Table 8 for a summary). Subsequent subsections summarize recommendations for each assessment as well as general recommendations not tied to specific assessments.

Table 8. Summary of conclusions for all assessments performed by the Science Advisor Panel for the 2018 Biennial AMR.

Assessment section	Summary of conclusions
Section 2—Analyze all land-use trends in Clark County to ensure that take and habitat disturbance are balanced with conservation.	<ul style="list-style-type: none"> • General habitat loss is commensurate with what is expected given the timeline of the Permit and in a general sense, current conservation actions reflect a focus that is appropriate given the rates and patterns of habitat take.
Section 3—Track habitat loss by ecosystem.	<ul style="list-style-type: none"> • Desert Riparian, Mesquite/Acacia, Mojave Desert Scrub, and Playa ecosystems may warrant conservation attention because of either their total habitat loss, or proportionally high historic rate of development (but see next section, below).
Section 4—Evaluate the effectiveness of management actions at meeting MSHCP goals of conservation and recovery	<ul style="list-style-type: none"> • All Biological Goals have projects that are either recently completed and/or are in progress. • To address specific ecosystems from Section 3, above— Mojave Desert Scrub and Desert Riparian are being sufficiently addressed with recently completed and ongoing conservation projects; however, Mesquite/Acacia and Playa ecosystems could benefit from more directed conservation attention.
Section 5—Monitor population trends and ecosystem health.	<ul style="list-style-type: none"> • It is useful to treat this section as a template to which new data/discussions are added with each Biennial AMR. Future Biennial AMRs should append the monitoring results from the previous Biennial AMRs, presenting a picture of species’ status and population trends over time. • Because comprehensive monitoring and reporting is part of the recently-completed AMMP and has not been fully implemented in the DCP’s regular workflow, the assessment presented in this Biennial AMR is intended to demonstrate how monitoring data can be disseminated in future Biennial AMRs.

There have been significant updates to the DCP since the previous Biennial AMR was completed in 2016, most notably including the development of new BGOs and the AMMP. The Science Advisor Panel's assessment incorporated elements from both the BGOs and AMMP and many of the resulting recommendations are intended to facilitate further incorporation of them into the DCP workflow and the next Biennial AMR to be completed in 2020.

6.1 General recommendations

Sections 2, 3, 4, and 5 of this Biennial AMR include analyses and specific recommendations relating to each assessment; however, the Science Advisor Panel has compiled additional recommendations that either affect more than one of the assessments, or are only generally related to the assessments, but will affect future Biennial AMRs and other reporting mechanisms. General recommendations include:

1. The BGOs and AMMP affect future analyses for the Biennial AMR and calls for a separate in-depth adaptive management analysis to be conducted every 4 years. The concepts, data requirements, and analyses described in them are intended to move the DCP forward and be at least partially transferrable to a future Permit amendment. As such, the Science Advisor Panel anticipates that implementing the BGOs and AMMP may have a significant impact on the workflow and internal processes of the DCP.

The concepts from the BGOs and AMMP should be carefully integrated into the current DCP workflow to have the maximum impact and effectiveness on the DCP program as a whole. Integrating the BGOs and AMMP into current workflow is a task that is not explicitly addressed in a proposed project or upcoming deliverable. The Science Advisor Panel recommends a planning level task that includes both:

- Detailing the current DCP workflow, which generally includes mapping the steps and processes from beginning to end—ranging from project selection (e.g., the IPB) to key data entry and retention for individual projects, to reporting and feedback loops; and
- Reorganizing the workflow (if necessary) to explicitly include data needs described in the AMMP for both the Biennial AMR and the more in-depth quadrennial report. The AMMP describes the types of data required, but does not provide specifics on data fields, etc., or how the data will be stored to accommodate common analysis between projects.

If the above planning-level task is not implemented, the risk is that the DCP continues to collect and store data (including adaptive management feedback loops) that may not be able to translate into meaningful analysis within the framework of the AMMP. The Science Advisor Panel encourages the DCP to periodically review their processes to ensure their effort and track is efficient.

2. The Science Advisor Panel recommends that DCP continue to do the monitoring that is needed to conduct the analyses included in this report, including continuing to monitor habitat loss by evaluating total loss and rate of loss (Section 2), continuing to monitor habitat loss by ecosystem by evaluating total loss, rate of loss, and proportion of loss (Section 3), continuing to evaluate ecosystem loss within the county and within the MSHCP area (Section 3), continuing to monitor the desert tortoise and riparian bird populations and habitat (Section 5), and continuing to record reptile species observed during monitoring data collection for other species (Section 5).

6.2 Summary of recommendations

Recommendations for each assessment are described in their corresponding sections and are summarized in Table 9, below. Only recommendations intended for DCP implementation are included in this summary table (other recommendations such as those suggested for the next Biennial AMR in 2018 are discussed in each assessment’s section [Sections 2-5]).

Table 9. Summary of conclusions for all assessments performed by the Science Advisor Panel for the 2018 Biennial AMR.

Assessment section	Summary of recommendations
Section 2—Analyze all land-use trends in Clark County to ensure that take and habitat disturbance are balanced with conservation.	<ul style="list-style-type: none"> The Science Advisor Panel does not have any specific recommendations for the DCP to implement in this section; See Section 2.2 for analysis recommendations to be included in future Biennial AMRs
Section 3—Track habitat loss by ecosystem.	<ul style="list-style-type: none"> Develop conservation actions for ecosystems undergoing the highest total habitat loss and the highest proportional habitat loss. Assess available data and tools that may be used to update the ecosystem map every five years. Conduct an accuracy assessment of future ecosystem mapping analyses to determine the inherent uncertainty in calculations.
Section 4—Evaluate the effectiveness of management actions at meeting MSHCP goals of conservation and recovery	<ul style="list-style-type: none"> Implement all effectiveness worksheets (AMMP, Appendix B). Recommendations during the IPB process should link projects /concepts to specific recommendations from the Biennial AMR.
Section 5—Monitor population trends and ecosystem health.	<ul style="list-style-type: none"> Calculate population growth rates for desert tortoise and riparian bird populations when sufficient data have been collected. Identify a fragmentation metric(s) to monitor fragmentation to address the general biological goal “Allow no net unmitigated loss or fragmentation of habitat...” as listed in the MSHCP.

The Science Advisor Panel’s overall appraisal, based on the above four primary assessments (summarized in Table 8 and Table 9), is that the DCP is successfully implementing the current MSHCP. In addition, the updates and improvements in tracking, program-level analysis, and reporting is expected to allow for more quantitative rigor in future assessments.

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Appendix A
Summary of Recommendations from previous biennial AMR

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Comment Number	Document Section, Page and paragraph	Recommendation text from 2016 AMR	DCP comments; description of how recommendation has been addressed
1	Sec 3.2.1 Pg 17/pp 1	"The management plans were released in early 2015; however, there are sections of each plan that already should be updated. The BCCE plan does not reflect the recent translocation of desert tortoises to the reserve or the subsequent translocation monitoring study. Additions to the text and table of management actions should refer to the specific study designs developed for each project. Additionally, any actions reported in quarterly reports should be included in the management plan; for example, the periodic review of the BLM LR2000 land use authorization system for new right-of- way applications that could affect the BCCE."	Management plans will be revised and updated every two years and all data that is deemed relevant to carry forward in the management plan will be added at that time.
2	Sec 3.2.1 Pg 17, par 2-3	"The riparian reserve unit plan does not reflect the changes in management actions due to property damage sustained from large 2014 and 2015 flood events along the Muddy River and Virgin River." (Implied recommendation to incorporate flood damage into management planning) "The Muddy River floodwaters damaged the groundwater source to Perkins Pond, expanded the floodplain below the pond, and interrupted habitat restoration activities in Parcels A, B, and E. The flooding provided an opportunity to reassess the relict leopard frog restoration project and develop a new habitat restoration project in the area below Perkins Pond. In addition to flooding, other access and safety issues have restricted monitoring and further restoration at the Virgin River 1 site." Next paragraph, also. "Updating both the BCCE and Riparian Reserve Unit plans would require additions to the management action tables and additions to the text , with more effort anticipated to update the Riparian Reserves Unit Management Plan to address the changes due to the flooding damage."	Management plans and the corresponding tables will be revised and updated every two years.
3	Sec 3.2.1 Pg 17, par 4	"The current schedule of reviewing and revising management plans, as necessary, every two years in conjunction with the Implementation Plan and Budget process is adequate. However, the plans should include guidance as to what would trigger an interim update. Management plans should be updated when significant new information is available that modifies or adds to the list of management actions , including new projects (e.g., translocation, restoration), significant changes in ecological condition (e.g., flood, fire), changes to internal and surrounding land use (e.g., solar facilities, right-of-ways, roads), and when additional properties are acquired. Consistent terminology should also be used to describe the maintenance and revision of management plans, to ensure clear communication of intent." Proposed terminology includes: 1) Review: scheduled quarterly with the completion of the quarterly report, assessing only the action table and making recommendations for updates, as is already being done. 2) Update: editing of selected components of the plan, including the action table and limited sections of the text. 3) Revise: reviewing and editing all components of the plan on a two-year schedule." (some formatting changed to accommodate bulleted points - CGR)	The DCP feels that revisions every two years are adequate to meet the needs of the program and to incorporate new information in a timely manner. However, if the DCP decides an interim update is warranted, revision of management plans can be initiated without the need to develop/define specific criteria for doing so. Interim updates would also need to consider factors such as staff time investment and available funding.
4	Sec 3.2.1 Pg 17 par 5	A specific DCP staff position and/or person should be assigned the responsibility for reviewing, updating, and revising each management plan, with assistance from the Science Advisor Panel.	Management Plans are updated by the science advisor with help from appropriate staff members.
5	Sec 3.2.3 Pg 18, par 4	"The DCP should consider using the qualitative ranking to establish a criteria-based matrix based on the management objectives for reviewing and (re)assigning priorities to management actions, and for projects that fulfill specific actions. It is envisioned that a matrix would be in a context similar to what DCP developed for acquiring riparian properties. Development of a criteria-based matrix prior to the 2017-2019 Implementation Plan and Budget and revision to the management plans should be the goal.	We currently have a ranking system within the management plans and do not feel that a more in-depth matrix would yield better results.
6	Sec 3.2.4 Pg 19, par 3	"The DCP has been inconsistent in measuring the effectiveness of management actions or integrating the results into the reporting on management actions. An annual summary of effectiveness measures, similar to the quarterly reporting, should be included with the tracking table for each management plan. The annual summary should include fields for the effectiveness measurement used (e.g., number of citations, survivorship success rate of plants in restoration project), selected measurement time period (e.g., monthly, annually), results of the measurements (e.g., a listing of the number citations over the selected time period, success rate or percent cover), an interpretation of the results, and recommended actions. This review of effectiveness would best be completed by the DCP staff assigned to the reserve unit, with assistance and oversight by the Adaptive Management Review Team."	Effectiveness monitoring for conservation projects has been addressed in Appendix B of the AMMP. DCP is working to incorporate these new processes into our project implementation methods. A discussion of effectiveness of conservation projects will be included in future Biennial AMR reports.

Comment Number	Document Section, Page and paragraph	Recommendation text from 2016 AMR	DCP comments; description of how recommendation has been addressed
7	Sec 3.3 Pg 20, par 6 Pg 21, par 1	"The expectations of an implementation database have changed since its conception as a tool that would be responsive to the tasks outlined in the Biological Opinion (see Section 1.3). However, with the recent web-based conversion and anticipation of clearing the project backlog for data entry, the Implementation Database will likely be the best available information to use in evaluating and negotiating an amendment to the Permit. The advantage of an Access® database is its capability to create queries of different data fields to analyze the data from different perspectives. As currently configured, the web-based Implementation Database can provide "linear" data from the different matrices, elements, and sub-elements. For example, the miles of tortoise fencing can be reviewed, but this data cannot be combined or overlapped with any other matrix or data field for combined or intersecting review of the results. The DCP should consider improving the functionality of the database to create queries from more than one matrix or tab, similar to the functionality of an Access® database. "	We are planning on re-evaluating the usefulness of this database in the near future
8	Sec 3.3 Pg 21, par 2	"The Adaptive Management Coordinator should permit access to the database for DCP project managers or support staff to enter project data from the Project Metrics Form after review and approval by the Coordinator."	Only the adaptive management coordinator and biologist have been allowed to upload data since 2014
9	Sec 4.4 Pg 27, par 3	"Assessing the status and trends of covered species is a core directive of the MSHCP. Currently, status and trend are primarily assessed through habitat loss in ecosystems, and for a few species by the qualitative or quantitative monitoring of populations. Science Advisor recommends that DCP develop a structured approach to select the most appropriate method for each covered species under the proposed permit amendment. One method of assessing status and trend does not fit all species. To determine the most appropriate method, criteria need to be developed to assess both the priority of the covered species and a feasible method for assessing status and trend."	This comment is very premature, as the proposed list of covered species for the amendment is still under development. Until the proposed list of covered species is finalized and we have a conservation strategy framework, it would be inappropriate to begin work on developing monitoring protocols.
10	Sec 4.4 Pg 27, par 4	"Science Advisor recommends that DCP develop a structured approach to select the most appropriate method for each covered species under the proposed permit amendment. One method of assessing status and trend does not fit all species. To determine the most appropriate method, criteria need to be developed to assess both the priority of the covered species and a feasible method for assessing status and trend. The priority of a covered species could include criteria based on legal status (a federally listed species would be a high priority), historic decline, current population numbers and sizes, uncertainty about status, and stakeholders' interest. Feasibility could be based on characteristics of the species biology (detectability, difficulty in identifying, number of populations) and location (type of habitat and accessibility of populations). Science Advisor recommends that the assumptions of the methods selected be explicitly communicated in summaries of status and trends. "	This was completed as part of the Adaptive Management and Monitoring Plan
11	Sec 5.2.2 Pg 33, par 3	"Learning and adaptation does not exist in a formal process within the DCP. The AMP has initiated work on a simple, effective, and efficient method of assessing and retaining lessons learned from completed projects. The draft document assesses whether the objectives of the project were met, lists a number of questions to be answered if the objectives were not met, and summarizes the assessment with recommendations and lessons learned. Science Advisor previously recommended specific fields and questions for the document, along with the recommendation that the information be recorded in a standardized database. "	A summary of lessons learned from completed conservation projects will be included in future Biennial AMRs as we continue to perform these assessments for more projects.
12	Sec 5.2.2 Pg 32, par 3	"The management of the Occupancy Sampling Pilot Study and the Covariates Monitoring Project has ensured that the data collected are accurate, repeatable, and managed correctly. These study designs integrate many aspects of data quality and data management through training, collection and instrument standards, file naming standards, and quality control of data during and post collection (Sutter et al. 2015). Other projects should use the standards set by these projects. "	The management and quality control of data is addressed in the DCP's Data Management Guidelines, which are made available to every contractor. Furthermore, the development of project-specific data management plans and work plans are a requirement for any data-intensive project implemented by DCP. These procedures have been in place for several years.

Comment Number	Document Section, Page and paragraph	Recommendation text from 2016 AMR	DCP comments; description of how recommendation has been addressed
13	Sec 5.2.2 Pg 32, par 4 Pg 33, par 1	"The projects reviewed for this assessment do not provide many insights into how the DCP ensures the repeatability and understanding of analysis routines (Sutter et al 2015). The analysis of project data is done both by contractors and, in the future, DCP staff. Contractors are required to provide a summary of their analysis of the data. A record of the analysis routine is needed for all projects to document when and how analyses were done. "	We are unaware of any analysis completed in recent years where proper documentation of analytical methods has not been provided. In most cases, contractors are not asked to provide analysis of the data they collect - data analyses are generally conducted by DCP staff in collaboration with the Science Advisor following project completion. In those cases where data analysis is part of the contracted scope of work, contractors are required to provide a detailed write-up of analytical methods in the final project report.
14	Sec 5.2.2 Pg 33, par 3	"Learning and adaptation does not exist in a formal process within the DCP. The AMP has initiated work on a simple, effective, and efficient method of assessing and retaining lessons learned from completed projects. The draft document assesses whether the objectives of the project were met, lists a number of questions to be answered if the objectives were not met, and summarizes the assessment with recommendations and lessons learned. Science Advisor previously recommended specific fields and questions for the document, along with the recommendation that the information be recorded in a standardized database. "	Given the nature of information provided in the Lessons Learned worksheet we do not feel a database approach would add any value to our processes. However, we do agree that more could be done to make sure that learning and adaptation is a formalized part of the project implementation process and are still working to address this.
15	Sec 5.3 Pg 34, last par Pg 35, par 1	"Develop a simple review sheet to determine if an adaptive management approach is appropriate for a new project that would address where: (1) measurable objectives can be established; (2) management options exist; (3) scientific uncertainty about the selection and outcomes of management options is significant and the value of reducing it is high; (4) consequential decisions are necessary for the future of the species or system; (5) there is an opportunity to learn; and (6) a monitoring system can be established to assess outcomes and learn. Addressing these issues should ensure that adaptive management is implemented for the appropriate projects."	DCP developed an Adaptive Management Review Worksheet that is now completed for each project during the biennial implementation plan and budget process. This was first rolled out when developing the implementation plan and budget for the 2015-2017 biennium.
16	Sec 5.3 Pg 35, par 2	"Develop a structured review process for the evaluation of proposals and projects that are appropriate for an adaptive management approach, including appropriate staff assigned to the project, a process of review, and guiding questions."	DCP has had a structured review process for proposals and projects for several years; this comment is unwarranted.
17	Sec 5.3, par 3 Pg35	"Strengthen the role of the adaptive management coordinator to coordinate and lead the review of all proposals, projects, and programmatic functions to ensure that they address adaptive management. The adaptive management coordinator should have the authority to ensure that all the components of adaptive management are implemented for a project."	The DCP feels that under the current structure the adaptive management coordinator has ample authority to ensure that all components of adaptive management are implemented when it is appropriate.
18	Sec 5.3 Pg 35, par 4	"Ensure that all staff understands what adaptive management is and how it is implemented by developing a teaching module on adaptive management for program staff using information from this document, USFWS National Conservation Training Center courses, and other sources."	This comment is unwarranted. All new DCP staff are provided with training on the Adaptive Management Program as part of on-boarding. This has been standard practice in the program for several years. Furthermore, project management staff are provided with additional training on the completion of Adaptive Management Worksheets during development of the biennial implementation plan and budget; additional training will be provided as more worksheets are incorporated into the project implementation process.

Comment Number	Document Section, Page and paragraph	Recommendation text from 2016 AMR	DCP comments; description of how recommendation has been addressed
19	Sec 5.3 Pg 35, par 5	"Strengthen the structured decision making for projects by developing conceptual models and threat assessments for each covered species and ecosystem. Conceptual models and threat assessments are valuable in providing decision support for selecting project objectives and the development of conceptual models compiles and increases knowledge of the species or system."	This is something that could be done under permit amendment when the list of species is reduced to a more manageable number but has not been started at this point.
20	Sec 5.3 Pg 35, par 6	"Strengthen management and monitoring plans by building on the standards set by the Occupancy Sampling Pilot Study and the Covariates Monitoring Project. Science Advisor recommends that the program ensure that the current and future management and monitoring plans equal or improve on those prepared recently."	Noted.
21	Sec 5.3 Pg 35 par 7	"Provide guidance in Requests for Proposals for the desired detail for study designs to better assess proposals and streamline the initiation of fieldwork."	We feel that we include as much detail as we are comfortable with which can vary from project to project. This leaves room for experts to add ideas and find novel approaches that we may not have thought of and would be prohibiting had we had a more rigid study design.
22	Sec 5.3 Pg 35, par 8	Maintain the standards for the accuracy, repeatability, and management of data set by Occupancy Sampling Pilot Study and the Covariates Monitoring Project.	Noted.
23	Sec 5.3. Pg 33, par 9	"Maintain a record of analysis methodology and modifications for project data."	We are unaware of any analysis completed in recent years where proper documentation of analytical methods has not been provided. In most cases, contractors are not asked to provide analysis of the data they collect - data analyses are generally conducted by DCP staff in collaboration with the Science Advisor following project completion. In those cases where data analysis is part of the contracted scope of work, contractors are required to provide a detailed write-up of analytical methods in the final project report. [This response is the same as for Comment #16]
24	Sec 5.3, par 10	"Complete documentation and implement a lessons learned review of projects to capture what is learned and how it will be used to adapt conservation and management projects."	A summary of lessons learned from completed conservation projects will be included in future Biennial AMRs as we continue to perform these assessments for more projects.
25	Sec 5.3. Pg 33, par 11	"Develop a more active effort at sharing and communicating the results of projects including an expanded mailing list to include appropriate researchers outside of southern Nevada and land managers whose work is in the Mojave Desert, desert riparian systems, and with covered species; presentations at the Desert Tortoise Council Symposium and other appropriate venues; and publication of projects. It is recommended the DCP tailor the summaries of programs and projects for different audiences, such as the Permittees, Board of County Commissioners, agency partners, public, and others. A recent adaptive management paper recommends developing communication plans for the primary stakeholders and decision-makers (Montambault et al. 2015)."	While we feel that our current efforts to disseminate results fully meets our reporting requirements and that we are doing a number of the things (past and present) mentioned already; we do plan to include the potential for publication on select projects (as warranted). As to the rest, our small staff size limits our ability to tailor to different audiences more than we already do with the website, symposium, and reporting that already occurs.

Appendix B
Current projects linked to applicable BGOs

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Project Number	Project Title	Status as of 06/30/2017	Biological Goal								Comment
			R1	R2	R3	R4	D1	D2	D3	D4	
<i>2007-CC-714</i> 2007-NPS-714K	<i>Boulder City Conservation Easement Management Plan</i> BCCE Weed Survey	<i>Completed</i> Completed						1			
<i>2007-CC-719</i> 2007-LVVWD-719Q 2007-KLA-719S 2007-GBI-719X	<i>Desert Tortoise Pickup Service, Transfer & Holding</i> Desert Tortoise Habitat Hotline, Pick-Up Service and Outreach Sessions for Wild Desert Tortoises Desert Tortoise Telemetry on the BCCE	<i>In Progress</i> Completed Completed Completed								1 1 1	
<i>2007-CC-722</i> 2007-BERGER-722K	<i>Management of Acquired Land & Water Rights</i> Muddy River Grading Plan	<i>Completed</i> Completed	1								
<i>2009-CC-801</i> 2009-ECO-801D 2009-HERON-801H 2009-TSG-801J	<i>Adaptive Management Program</i> Science Advisor Statistical Consultant Occupancy Covaritate Creation	<i>Completed</i> Completed Completed Completed						1 1			Not Assessed
<i>2009-CC-802</i> 2009-ROBERTSON-802M	<i>BCCE Management, Maintenance & Law Enforcement</i> DCP Branding Project	<i>Completed</i> Completed								1	
<i>2009-CC-803</i> 2009-BOARMAN-803D 2009-KLA-803E	<i>Desert Tortoise Hotline and Pick-Up Service</i> BCCE DT Predation Study - Phase 2 Hotline and Processing of Wild DTs	<i>In Progress</i> Completed In Progress							1 1	1	
<i>2009-CC-804</i> 2009-NDF-804A 2009-AMER-804C 2009-JJLA-804D 2009-TIBERTI-804E 2009-MULLER-804F 2009-JJLA-804G 2009-AMER-804H	<i>Desert Tortoise Fencing</i> Fencing Installation & Maintenance Fencing Materials SW Gas Line Civil Plans MR Reserve Fence & Gate Installation Energy Zone Fencing SW Gas Civil Plans Revisions Fencing Materials	<i>In Progress</i> In Progress Completed Completed Completed Completed Completed Completed						1 1		1	Not Assessed Not Assessed Not Assessed Not Assessed
<i>2009-CC-805</i> 2009-BUSCH-805Q 2009-NDF-805AC 2009-BERGER-805AD 2009-FARRWEST-805AE	<i>Management of Acquired Properties & Water Rights</i> Water Rights Consulting MR Fire Control - Weed Removal Muddy River Grading Plan Water Rights Consulting	<i>In Progress</i> Completed Completed Completed In Progress		1 1							Not Assessed Not Assessed

*Master projects are *italicized* and were not assessed

Project Number	Project Title	Status as of 06/30/2017	Biological Goal								Comment
			R1	R2	R3	R4	D1	D2	D3	D4	
<i>2009-CC-807</i>	<i>OHV Education</i>	<i>In Progress</i>									
2009-PIC-807B	OHV Education	Completed								1	
2009-RADIO-807C	OHV Education	Completed								1	
2009-RADIO-807D	OHV Registration Program Marketing	Completed								1	
2009-POKORNY-807E	OHV Education - Story Map	Completed								1	
<i>2009-CC-808</i>	<i>Assessment of Post-Fire Rehabilitation of Desert Tortoise Habitat in Clark County</i>	<i>In Progress</i>									
<i>2009-CC-809</i>	<i>Restoration of Desert Tortoise & Gypsum Habitat</i>	<i>In Progress</i>									
2009-FORESTRY-809K	Supplies Acquisition	Completed									Not Assessed
<i>2009-CC-810</i>	<i>Relict Leopard Frog Conservation</i>	<i>Completed</i>									
2009-NPS-810A	Relict Leopard Frog Conservation	Completed				1				1	
<i>2009-CC-811</i>	<i>Desert Tortoise Monitoring</i>	<i>Completed</i>									
2009-KLA-811H	Vegetation Data for Desert Tortoise Covariate Monitoring	Completed						1			
2009-KLA-811J	Vegetation Data for DT Occ Cov Mon Project II	Completed						1			
2009-UTX-811K	LiDAR/Aerial Imagery Data Analysis	Completed									Not Assessed
<i>2009-CC-813</i>	<i>BCCE Expansion</i>	<i>In Progress</i>									
<i>2011-CC PA Amend-901</i>	<i>Permit Amendment Transition</i>	<i>In Progress</i>									
2011-SWECO-901B	Covered Species Analysis Support	In Progress	1	1				1	1		
2011-TSG-901C	GIS Data Management and Needs	Completed									Not Assessed
2011-ROBERTSON-901D	DCP Branding Project	Completed									Not Assessed
2011-JJLA-901E	DT Culvert Engineering Specifications	Completed									Not Assessed
2011-TERRA-901F	Science Advisor	Completed									Not Assessed
2011-EMS-901G	Legal Services for DCP	Completed									Not Assessed
2011-WRA-201H	HCP Consultant for the MSHCP Amendment	In Progress									Not Assessed

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Project Number	Project Title	Status as of 06/30/2017	Biological Goal								Comment
			R1	R2	R3	R4	D1	D2	D3	D4	
<i>2011-CCBCCE-910</i>	<i>BCCE Management, Maintenance & Law Enforcement</i>	<i>In Progress</i>									
2011-NDF-910B	BCCE Site Rehabilitation & Cleanup	Completed						1			
2011-MAILE-910I	Gabion Style Kiosk Build & Install	Completed								1	
2011-KVO-910J	Gabion Kiosk Signage	Completed								1	
2011-MAILE-910K	Gabion Kiosk Connectors & Supports	Completed									Not Assessed
2011-POWER-910L	BCCE Trans Line Alt Route Feasibility	Completed									Not Assessed
2011-RADIO-910M	BCCE Informative Video	Completed								1	
2011-MAILE-910N	Cattleguard Clean, Erosion Prev & C.B	Completed						1			
2011-VISTA-910O	Erosion Restoration Rock	Completed									Not Assessed
2011-PICTO-910P	Updated Limited Use Signs	Completed									Not Assessed
2011-COPPER-910Q	Acquisition of Nuts & Bolts	Completed									Not Assessed
2011-NPS-910R	BCCE Weed Survey	In Progress						1			
2011-MULLER-910S	BCCE Restore & Repair	In Progress						1			
<i>2011-CC PROPMGMT-915</i>	<i>Property & Water Rights Management</i>	<i>Completed</i>									
2011-NPS-915A	Muddy River Weed Management	Completed	1								
2011-PIC-915L	Muddy River Weed Removal	Completed	1								
<i>2011-CC INFO&ED-916</i>	<i>Information & Education</i>	<i>In Progress</i>									
2011-STEVENKIDS-916Q	Mojave Max Mascot Appearances	In Progress								1	
2011-ZEE-916ZC	Mojave Max Assemble Application	Completed									Not Assessed
<i>2011-CC RIPAQ-917</i>	<i>Riparian Property Acquisition</i>	<i>In Progress</i>									Not Assessed
2011-VARIOUS-917AA:MC	Boundary Surveys	Completed									Not Assessed
2011-VARIOUS-917AA:MC	Appraisal Reports	Completed									Not Assessed
<i>2011-CC-920</i>	<i>BCCE Visitor & Use Management</i>	<i>Completed</i>									
2011-MAILE-920D	Gabion Style Kiosk Build & Install	Completed								1	
<i>2011-CC-921</i>	<i>Desert Use Media Campaign</i>	<i>Completed</i>									
<i>2007-CC-1012A</i>	<i>Desert Tortoise Monitoring</i>	<i>In Progress</i>									
2007-KLA-1012D	Desert Tortoise Occupancy Sampling Crews II	In Progress							1		
<i>2007-CC-1014</i>	<i>Permit Amendment Administration</i>	<i>In Progress</i>									Not Assessed
2007-EMS-1014B	Permit Amendment Legal Counsel	Completed									Not Assessed
2007-EMS-1014J	Legal Services for DCP	In Progress									Not Assessed
<i>2013-CC FEECONS-1405</i>	<i>MSHCP Fee Consolidation</i>	<i>In Progress</i>									Not Assessed
<i>2013-CC AMP-1410</i>	<i>Adaptive Management Program</i>	<i>In Progress</i>									Not Assessed
2013-TERRA-1410B	Science Advisor Panel for the DCP	In Progress									Not Assessed

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Project Number	Project Title	Status as of 06/30/2017	Biological Goal								Comment
			R1	R2	R3	R4	D1	D2	D3	D4	
<i>2013-CC AMPMOD-1411</i> 2013-TERRA-1411A	<i>Adaptive Management Program - Desert Tortoise Modeling</i> Science Advisor	<i>Completed</i> Completed	1	1	1	1	1	1	1	1	
<i>2013-CC AMPMON-1412</i> 2013-GBI-1412A 2013-QUANTUM-1412B 2013-TSG-1412C	<i>Adaptive Management Program - Desert Tortoise Monitoring</i> Eldorado DT Monitoring Year 2 Aerial Photography Occupancy Covariate	<i>In Progress</i> Completed Completed Completed							1		
<i>2013-CC BCCE-1420</i> 2013-BC-1420A 2013-AMEX-1420D 2013-BC-1420E 2013-AMEX-1420F 2013-BERNTSEN-1420G 2013-SIGNARAMA-1420H	<i>BCCE Management</i> BCCE Law Enforcement Reserves Maintenance & Tools BCCE Law Enforcement Reserves Maintenance & Tools Acquisition of Signs for the BCCE BCCE 25 mph Decals for Route Signage	<i>In Progress</i> Completed Completed Completed Completed Completed								1	Not Assessed
<i>2013-CC BCCEREST-1421</i> 2013-ROBERTSON-1421A 2013-BOARMAN-1421B	<i>BCCE Restoration</i> DCP Branding Project BCCE DT Predation Study -Phase 2 Amendment	<i>In Progress</i> Completed In Progress								1	
<i>2013-CC IEO-1430</i> 2013-LVTACTICAL-1430V 2013-GIFTCO-1430W 2013-PAPER-1430X 2013-BLUETRACK-1430Y 2013-GIFTCO-1430Z 2013-PAPER-1430AA 2013-JACKSON-1430AB	<i>Information, Education & Outreach</i> Acquisition of Mojave Max Patches Acquisition of Mojave Max Backpacks Mojave Max Brochure Acquisition of Desert Tortoise Stress Acquisition of Mojave Max Backpacks Graphics Design for Interpretive Acquisition of Air Fresheners	<i>Completed</i> Completed Completed Completed Completed Completed Completed							1		Not Assessed Not Assessed Not Assessed Not Assessed Not Assessed
<i>2013-CC PRPMGT-1440</i> 2013-NV-1440B 2013-NV-1440C	<i>Other Property Management</i> Water Rights Permit Fees Water Rights Permit Fees	<i>In Progress</i> Completed Completed									Not Assessed Not Assessed Not Assessed
<i>2013-CC FENCING-1442</i> 2013-MULLER-1442A	<i>Fencing</i> Energy Zone Fencing	<i>Completed</i> Completed							1		

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Project Number	Project Title	Status as of 06/30/2017	Biological Goal								Comment
			R1	R2	R3	R4	D1	D2	D3	D4	
<i>2013-CC RIPMGT-1445</i>	<i>Riparian Property Management</i>	<i>In Progress</i>									
2013-NANCE-1445A	Muddy River Property Maintenance	Completed	1								
2013-BERGER-1445C	Muddy River Grading Plan	Completed	1								
2013-FARRWEST-1445E	Water Rights Consulting	In Progress									Not Assessed
2013-TNC-1445F	Lower Virgin River Integrated Watershed Plan	In Progress	1			1					
2013-FORESTRY-1445G	Acquisition of Field Supplies	Completed									Not Assessed
<i>2013-CC RIPREST-1446</i>	<i>Riparian Prop Restoration - Phase II</i>	<i>In Progress</i>									
2013-STILLWATER-1446A	Geotech & Conceptual Grading Plan	Completed	1								
2013-PHILLIPS-1446C	Muddy River Restoration Plan	In Progress	1								
<i>2013-FWSTRANSS10-1450</i>	<i>USFWS Desert Tortoise Translocation</i>	<i>Completed</i>									
2013-GBI-1450B	Desert Tortoise Telemetry on the BCCE	Completed							1		
<i>2013-FWSTRANSR14-1451</i>	<i>USFWS Desert Tortoise Translocation</i>	<i>Completed</i>									
2013-GBI-1451A	Eldorado Desert Tortoise Monitoring (Year 1 & 2)	Completed							1		
<i>2013-CC WILDDT-1455</i>	<i>Wild Desert Tortoise Assistance</i>	<i>In Progress</i>									
2013-EARTHCAM-1455A	Desert Tortoise Habitat Camera	Completed									Not Assessed
2013-CENTURY-1455B	Low Voltage for DT Habitat Camera	Completed									Not Assessed
<i>2013-CC PAMEND-1460</i>	<i>Permit Amendment</i>	<i>In Progress</i>									Not Assessed
2013-WRA-1460A	HCP Consultant for the MSHCP Amendment	In Progress									Not Assessed
2013-AA-1460B	Economic Analysis of a Regional HCP	In Progress									Not Assessed

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Project Number	Project Title	Status as of 06/30/2017	Biological Goal								Comment
			R1	R2	R3	R4	D1	D2	D3	D4	
<i>2015-CC ADMIN-1500</i>	<i>MSHCP ADMINISTRATION 15-17</i>	<i>Completed</i>									Not Assessed
2015-STAPLES-1500A	Office Supplies - FY16	Completed									Not Assessed
2015-CINTAS-1500B	First Aid & Safety Supplies - FY16	Completed									Not Assessed
2015-LOGO-1500C	Uniform Apparel - FY16	Completed									Not Assessed
2015-OV-1500D	Document Shredding & Container - FY16	Completed									Not Assessed
2015-REDWING-1500E	Safety Shoes - FY16	Completed									Not Assessed
2015-JACKSON-1500G	2013-2015 BPR Editing & Printing	Completed									Not Assessed
2015-RADIO-1500H	15 Yr Anniversary MSHCP Video	Completed								1	Not Assessed
2015-PURDUE-1500J	15 YR Anniversary MSHCP	Completed									Not Assessed
2015-SMITH-1500K	15th Anniversary Invite Design	Completed									Not Assessed
2015-JSTOR-1500L	JSTOR Subscription	Completed									Not Assessed
2015-DELL-1500M	Laptop Acquisition	Completed									Not Assessed
2015-ACE-1500N	Move to Air Quality Russell Building	Completed									Not Assessed
2015-BOUNDLESS-1500P	Acquisition of Gift Bags & Flash Drives	Completed									Not Assessed
2015-NSM-1500Q	Event Room for 15th Anniversary Event	Completed									Not Assessed
2015-DIVINE-1500R	Catering for 15th Anniversary	Completed									Not Assessed
2015-BOUNDLESS-1500S	Acquisition of Journals and Pens	Completed									Not Assessed
2015-STAPLES-1500T	Office Supplies - FY17	Completed									Not Assessed
2015-OV-1500U	Document Shredding & Container - FY17	Completed									Not Assessed
2015-LOGO-1500V	Uniform Apparel - FY17	Completed									Not Assessed
2015-REDWING-1500W	Safety shoes - FY17	Completed									Not Assessed
2015-CINTAS-1500X	First Aid & Safety Supplies - FY17	Completed									Not Assessed
2015-REBEL-1500Y	Wet-hose Contract for Unleaded	Completed									Not Assessed
2015-REBEL-1500Z	Wet-hose Contract for Unleaded Fuel	Completed									Not Assessed
2015-SAHARAJEEP-1500A	Acquisition of Jeep Rubicon	Completed									Not Assessed
2015-DELL-1500AB	Acquisition of Computers & Monitors	Completed									Not Assessed
2015-SHI-1500AC	Acquisition of Adobe Creative Cloud	Completed									Not Assessed
2015-DELL-1500AD	Acquisition of VLA Project 2016	Completed									Not Assessed
2015-CDWG-1500AE	Acquisition of Desktop Printer	Completed									Not Assessed
2015-GIS-1500AF	Fujitsu Scanner Maintenance	Completed									Not Assessed

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			R1	R2	R3	R4	D1	D2	D3	D4		
<i>2015-CC BCCE-1510</i> 2015-BC-1510A	<i>BCCE MGMT & LAW ENFORCEMENT</i> BCCE Law Enforcement	<i>In Progress</i> In Progress								1		
<i>2015-CC IEO-1515</i> 2015-SNC-1515A	<i>INFORMATION, EDUCATION & OUTREACH</i> Mojave Max Education Program	<i>In Progress</i> In Progress									1	
2015-ZEE-1515B	Mojave Max Website Support Services	Completed										Not Assessed
2015-ROBERTSON-1515C	DCP Branding Project	Completed									1	
2015-SKYHIGH-1515D	Acquisition of Tortoise Paper Clips	Completed										Not Assessed
2015-JACKSON-1515E	Acquisition of Air Fresheners	Completed										Not Assessed
2015-PAPER-1515F	Graphics Design for MM Emerg	Completed										Not Assessed
2015-ZEE-1515G	Mojave Max Secure Server License	Completed										Not Assessed
2015-ZEE-1515H	Mojave Max Contest Portal	Completed										Not Assessed
2015-ZEE-1515J	2017 Mojave Max Website Support	Completed										Not Assessed
2015-ZEE-1515K	Live Video Feed	Completed										Not Assessed
2015-ZEE-1515L	Assembly Application	Completed										Not Assessed
2015-ZEE-1515M	Mojave Max Assemble Application	Completed										Not Assessed
2015-SKYHIGH-1515N	Acquisition of Lip Moisturizer Balls	Completed										Not Assessed
2015-GIFTCO-1515P	Acquisition of Temporary Tattoos	Completed										Not Assessed
2015-SKYHIGH-1515Q	Acquisition of LED Flashlights	Completed										Not Assessed
2015-MORGAN-1515R	Acquisition of Tortoise Paper Clips	Completed										Not Assessed
2015-ABUNLIMITED-1515S	Acquisition of Learn to the Max Patches	Completed										Not Assessed
2015-ZEE-1515T	Mojave Max Verification Page	Completed										Not Assessed
2015-EARTHCAM-1515U	Incr Archiving Time on Mojave Max	Completed										Not Assessed
2015-LOGO-1515V	Acquisition of Learn to the Max Conf	Completed										Not Assessed
2015-ROBERTSON-1515W	Mojave Max Website Support Services	Completed										Not Assessed
2015-LOGO-1515X	Acquisition of Learn to the Max	Completed										Not Assessed
2015-ROBERTSON-1515Y	Mojave Max Assembly Power-Point Presentation	In Progress									1	
2015-ALINCO-1515Z	Acquisition of Tortoise Costumes	Completed										Not Assessed

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			R1	R2	R3	R4	D1	D2	D3	D4	
<i>2015-CC PRPMGMT-1520</i>	<i>RIPARIAN PROPERTY MANAGEMENT</i>	<i>In Progress</i>									
2015-NPS-1520B	Muddy River Weed Management	In Progress	1								
2015-PIC-1520C	Muddy River Weed Removal	Completed	1								
2015-REPUBLIC-1520D	Dumpster Rental for MR Weed	Completed									Not Assessed
2015-WHITNEY-1520E	Muddy River Backflow Test	Completed									Not Assessed
2015-FORESTRY-1520F	Acquisition of Hip Waders	Completed									Not Assessed
2015-WHITNEY-1520G	Muddy River Pump Diagnostic	Completed									Not Assessed
2015-STILLWATER-1520H	VR Baseline Conditions Assessment	Completed	1								
2015-MCCOR-1520J	Riparian Property Maintenance	Completed	1								
2015-WHITNEY-1520K	Muddy River Pump	Completed									Not Assessed
2015-WHITNEY-1520L	Backflow Test and Repair	Completed									Not Assessed
<i>2015-CC RIPREST-1521</i>	<i>RIPARIAN RESTORATION RSV</i>	<i>In Progress</i>									
2015-STILLWATER-1521A	VR Baseline Conditions Assessment	Completed	1								
<i>2015-CC FENCE-1525</i>	<i>WILDLIFE FENCING</i>	<i>In Progress</i>									
2015-MULLER-1525A	Energy Zone Fencing	In Progress									Not Assessed
	Tule Springs Cultural Resource Survey	In Progress							1		
<i>2015-CC SLOOP REST-1530</i>	<i>SOUTH LOOP TRAIL RESTORATION</i>	<i>Completed</i>									
2015-GBI-1530A	South Loop Trail Restoration	Completed						1		1	
<i>2015-CC BIRD SURVEYS-1535</i>	<i>RIPARIAN RSV UNITS BASELINE BIRD SURVEYS</i>	<i>In Progress</i>									
2015-SWCA-1535A	Federally Listed Bird Surveys	In Progress			1						
2015-SWCA-1535B	Point Count Surveys on Riparian Properties	In Progress			1						
<i>2015-CC DTMONS10-1540</i>	<i>DESERT TORTOISE MONITORING</i>	<i>In Progress</i>									
2015-GBI-1540A	Desert Tortoise Range-Wide Monitoring	In Progress							1		
2015-USFWS-1540B	DT Monitoring Data Management	In Progress							1		
<i>2015-CC DTMONSNPLMA-1541</i>	<i>DESERT TORTOISE MONITORING-SNPLMA</i>	<i>In Progress</i>									
2015-USFWS-1541A	DT Monitoring Data Management Year 2-5	In Progress							1		
2015-GBI-1541B	Desert Tortoise Range-Wide Monitoring	In Progress							1		
<i>2015-CC POST DTMON-1545</i>	<i>POST-TRANSLOCATION DT MONITORING</i>	<i>In Progress</i>									
2015-GBI-1545A	DT Telemetry on the BCCE (Yr 2 & 3)	In Progress							1		
<i>2015-CC FROG-1550</i>	<i>RELICT LEOPARD FROG CNSV PLAN & IMPLEMENTATION</i>	<i>In Progress</i>									
2015-UNLV-1550A	Relict Leopard Frog Consv Plan and Implementation	In Progress						1		1	

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			R1	R2	R3	R4	D1	D2	D3	D4		
<i>2015-CC DT CLINICS-1555</i>	<i>DT STERILIZATION CLINICS & OUTREACH</i>	<i>Completed</i>										
2015-USFWS-1555A	Pet Tortoise Sterilization Clinic	Completed									1	
2015-USFWS-1555B	Tortoise Sterilization Clinic	Completed									1	
<i>2015-CC DTHOLD-1560</i>	<i>TEMP HOLDING FACILITY FOR DISPLACED DT</i>	<i>In Progress</i>										
<i>2015-CC RIPREST-1570</i>	<i>RESTORATION ON THE CLARK COUNTY MUDDY RIVER</i>	<i>In Progress</i>										
<i>2015-CC DTCONN-1580</i>	<i>TORTOISE CONNECTIVITY</i>	<i>In Progress</i>										

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