California Energy Commission
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Audubon California
California Native Plant Society
California Wilderness Coalition
Center for Biological Diversity
Defenders of Wildlife
National Parks Conservation Association
Natural Resources Defense Council
Sierra Club

February 12, 2015

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Re: DRECP NEPA/CEQA; Comments on Draft Agreement by and between the Bureau of Land Management and the California Department of Fish and Wildlife

Dear Director Kenna and Deputy Director Hunting:

On behalf of the undersigned organizations, we are writing to comment on the Draft Agreement by and between the Bureau of Land Management (BLM) and the California Department of Fish and Wildlife (CDFW) (hereinafter "Durability MOU") issued in conjunction with the draft Desert Renewable Energy Conservation Plan ("DRECP"). We acknowledge the efforts by the BLM and CDFW in drafting this agreement and are supportive of the concept of ensuring lasting protections on BLM land to provide mitigation needed to off-set impacts to species from activities that would be covered under the DRECP and to meet federal and state endangered species conservation and recovery requirements for any California Natural Community Conservation Plan ("NCCP") and/or Federal Habitat Conservation Plan ("HCP") that would be adopted as part of the DRECP.

The current version of the Durability MOU represents an important step forward in the effort to provide lasting protections on BLM land, including a menu of tools the BLM may use to provide more "durable" protections on BLM Conservation Lands and a commitment to keep the protections for BLM Conservation Lands in place for the duration of the impacts for which those lands provide compensatory mitigation. Durability MOU at Section D.2.c.i. However, despite these significant steps forward, there are a number of issues in the Durability MOU that must be

addressed and resolved before this agreement is finalized if the agencies intend to rely on this agreement to satisfy state and federal legal requirements as part of the DRECP.[1]

I. The Need for Clear, Meaningful Integration of the Durability MOU with the Draft DRECP and Draft Implementation Agreement

The Durability MOU is essential for the DRECP to move forward. Most importantly, given the scale of the DRECP it is clear that mitigation, conservation and recovery actions will be needed on public lands in order to meet the requirements of a valid NCCP and HCP. Indeed, the DRECP cannot continue in the absence of strong, effective and enforceable protections for natural communities and covered species on public lands.

Unfortunately, the draft Durability MOU is written as if a revised final MOU would be signed at the time of the approval of the DRECP, and the document does not make it clear how the terms of the MOU will be integrated or used in the implementation of the DRECP. For example, this MOU and its commitments are not mentioned anywhere in the current draft of the DRECP and the draft MOU is not integrated with the recently released draft Implementation Agreement ("IA").

Recommendation: The relationship between the Durability MOU and the other DRECP decision documents including the IA should be clarified in a supplemental draft DRECP.

II. Relationship of the Durability MOU to the DRECP Plan-Wide Biological Goals and Objectives versus the Step-Down Biological Goals and Objectives

Throughout the Durability MOU, the responsibilities of the BLM and DFW as they pertain to "Plan-Wide Biological Goals and Objectives" and "Step-Down Biological Goals and Objectives" appear at different points in the agreement. In Sections 2 and 3, the BLM makes various commitments as they relate to "Biological Goals and Objectives," but the only discussion of "Plan-Wide Biological Goals and Objectives" appears in Section 3.d. In that section, CDFW states that it will confer with the BLM if the BLM proposes actions inconsistent with the Plan-Wide Biological Goals and Objectives. Thus, it appears that the use of the term "Biological Goals and Objectives" in the MOU in terms of the BLM's commitments actually means only the "Step-Down Biological Goals and Objectives" and not the "Plan-Wide Biological Goals and Objectives." As a result, the MOU is unclear and, as discussed more fully below, inadequate. Because the NCCPA requires that an NCCP plan must "provide for the conservation" of covered species within the Plan Area and not within only a portion of the plan area, the DRECP must be designed to meet all of the "Plan-Wide Biological Goals and Objectives" not only the "Step-Down Biological Goals and Objectives ." If the draft DRECP fails to provide for the conservation of covered species within the Plan Area by meeting all of the Plan-Wide Biological Goals and Objectives, then the Department of Fish and

[1] While the DRECP is structured to provide for the take of listed species under California law through an NCCP, the comments in this letter are just as relevant if the take of listed species under California law was sought through the issuance of a 2081 permit under the California Endangered Species Act.

Wildlife will be required to find that the draft DRECP does not meet NCCPA requirements and cannot be the basis for a take permit under the NCCPA.

Recommendation: The Durability MOU, and the Draft DRECP, must be revised to require the achievement of DRECP Plan-Wide Biological Goals and Objectives, not only to the Step-Down Biological Goals and Objectives; further, any commitments for conservation on BLM lands must be sufficiently robust and durable to meet those conservation and recovery goals as well.

III. The Durability MOU Will Not Support Achievement of the NCCP "Provides for Conservation" Standard.

The NCCP Act requires that an NCCP "provide for conservation" of all the covered species. California Fish and Game Code Section 2835. However, the Durability MOU appears to be based on a less than "provides for conservation" standard because it is designed only to meet the Step-Down Biological Goals and Objectives rather than Plan-Wide Biological Goals and Objectives.[2] Indeed, based on a review of the draft DRECP, the DRECP NCCP Reserve is not currently designed to achieve the conservation standard for covered species plan wide. Instead, the draft DRECP uses a novel concept of Step-Down Biological Goals and Objectives, which have been linked to be "proportional" to the Covered Activities.

The use of a "proportional" conservation standard in the draft DRECP (and the Durability MOU) is inconsistent with the "provides for conservation" standard in the NCCPA in two distinct ways. First, for a species that exists exclusively within the DRECP plan area, the DRECP must provide for all of the measures necessary for the species' recovery within the plan area. Merely contributing to the species' recovery is inadequate if the species occurs entirely within the plan area. Second, under the proposed step down/proportional framework, the magnitude of the contribution to the species' recovery is determined, primarily, by the impacts of covered activities within the DRECP plan area. However, the NCCPA does not limit conservation measures to address only the impacts of the covered activities. Rather, the NCCPA takes a far more expansive view of conservation measures, which includes, but is not limited to taking into account the impacts of covered activities on the covered species.

Under the plain text of the NCCPA, conservation means recovery, and an NCCP is required to contain measures that are sufficient to achieve recovery within the plan area. This requirement is clear from several statutory provisions that require the Department to make specific findings that establish recovery as the goal of an NCCP, and require the NCCP to contain specific measures to "conserve" the covered species within the plan area to achieve that goal. See Cal. Fish & Game Code §§ 2805(h) (Plan "shall identify and provide for those measures necessary to conserve . . . within the plan area"); 2805(d) (defining conservation as recovery); 2820(a)(4) (requiring Plan to contain "measures in the plan areas . . . "as needed for the conservation of species"); 2820(a)(6) (requiring plan to contain "specific conservation measures that meet the biological needs of covered

[2] This letter does not include any comments regarding the sufficiency of the DRECP's biological goals and objectives. Those comments will be submitted in separate letters.

species"); 2835 (authorizing the Department to issue a take permit for a covered species if they find that the covered species' "conservation and management is provided for in a [Plan]").

Because the NCCPA defines conservation with respect to species' status, as opposed to the covered activities' impacts, an NCCP's conservation measures must account for all reasonably foreseeable impacts, such as those associated with other activities in the plan area that threaten species and habitats, including climate change. The Draft DRECP suggests, however, that the plan will not provide for sufficient measures to achieve recovery if a species is imperiled by non-Plan impacts. This approach is not legally defensible because it ignores the NCCPA's focus on recovery. NCCPs cover species that are listed as endangered and threatened under the CESA, fully-protected species, and other imperiled species; non-plan factors will have always contributed to those species' decline because the species were already listed or otherwise in need of protection when the NCCP was created. If an NCCP does not account for non-plan impacts, the NCCPA's goal of conserving and recovering species would be impossible to achieve in most cases.

Recommendation: If the DRECP is intended to fulfill the requirements of the NCCPA, the concept of Step-Down Biological Goals and Objectives must be rejected in the Draft DRECP and the Durability MOU and a the draft DRECP must be revised to meet all Plan-Wide Biological Goals and Objectives. [3]

IV. Terms and Plan Elements Must Be Clarified

Throughout the Durability MOU, there are critical terms that are undefined. This leaves the reader questioning what the BLM and CDFW may be referring to in several sections and whether the two agencies have the same understanding of the terms of the MOU. These terms include, but are not limited to: "DRECP Natural Community Conservation Plan (NCCP)", "Step-Down Biological Goals and Objectives", "DRECP NCCP Reserve Design", "BLM lands used for compensatory mitigation", and "NCCP Conceptual Plan-Wide Reserve Design". When the reader refers to the draft DRECP for clarity of these terms, no such clarity is provided as these terms are used in an inconsistent manner. As noted above, while the Durability MOU is written as it if would be signed at the time of the approval of the DRECP, it is unclear how this MOU will be integrated or used in the DRECP. For example, this MOU and its commitments are not mentioned anywhere in the current draft of the DRECP. The recently released draft Implementing Agreement mentions the Durability MOU, but, unfortunately, also fails to clarify these issues or cure many of the shortcomings in the MOU. We intend to comment further on the draft Implementing Agreement as well as the need to integrate the IA, DRECP and a revised Durability MOU to meet the required legal standards.

Recommendations: The provision of various "errata" information at this stage, including a definition section for the draft MOU, would provide a better explanation of these terms, correct where these terms are used incorrectly in the MOU and draft DRECP, and would assist the public in

[3] The undersigned groups will provide specific comments on the substance of the Biological Goals and Objectives in subsequent comment letters.

commenting on the draft DRECP. However, due to the extensive irregularities and confusion created by the lack of definitions and inconsistent use of these terms, a revised supplemental draft MOU and Draft DRECP area needed.

V. The Length of the Durability Commitments Must Be Corrected

The Durability MOU contains conflicting and unclear statements about the duration of the durability tools to be used on BLM lands. In Sections D.2.a and D.2.B.i – iii, and Section 3.c.i – ii, the BLM appears to be stating the conservation commitments in land use designations will last only as long as the DRECP NCCP (e.g., "The DRECP NCCP expressly assumes that the current protective land use designations . . . for BLM Conservation Lands will remain in place for at least *the duration of the DRECP NCCP* . . .." (Section D.2.a.; emphasis added)). However, in Section D.2.c.i, the Durability MOU contains the statement that the "BLM intends that any such land use authorizations will, to the extent consistent with law and regulation, be valid for the *duration of the impacts* for which those lands provide compensatory mitigation." (Emphasis added.)

Under the NCCP Act, an NCCP must provide for "the creation of habitat reserves and long-term management of habitat reserves" or conservation measures. Cal. Fish & Game Code § 2820(a)(3); see also Cal. Fish & Game Code § 2810(b)(2) (An NCCP Implementation Agreement must contain "[p]rovisions for establishing the long-term protection of any habitat reserve or other measures that provide equivalent conservation of covered species.") This requirement is not limited to compensatory mitigation, but to all components of a conservation strategy in an NCCP, including the NCCP reserve. Under all previously approved NCCPs, CDFW has interpreted the NCCP Act to require "permanent" conservation of the reserves in the form of fee acquisition or permanent easements with endowments or other long-term commitments put in place to ensure adequate management of these reserves. Because the draft DRECP proposes to rely on conservation commitments on public land that are managed under a multiple use mandate, in order to meet the minimum state legal requirements, the durability commitments by the BLM must last *at least* as long as needed to ensure conservation and recovery of the covered species—not only the duration of the proposed Plan and not only the duration of the impacts of the covered activities.

Recommendation: The Durability MOU must be revised to clearly require that the BLM commitments for managing all conservation lands consistent with the DRECP NCCP must be valid for the duration needed to conserve and recover covered species within the Plan area.

VI. The MOU Is Inadequate because it Would Allow BLM to Remove Conservation Designations on Lands Needed to Meet the NCCP Conservation Standards

Sections D.2.a and D.2.b.iii state that protective land use designations on BLM lands (e.g., NLCS, ACEC, Wildlife Allocation, and wilderness) may only remain in place for the duration of the DRECP NCCP. As discussed above, in order to meet the NCCPA standard the duration of these designations on public land cannot be limited to the length of the DRECP NCCP permit, but must be linked to the conservation and recovery of covered species in the California Desert. While BLM has the authority to administratively change some land use designations (e.g., ACEC and Wildlife

Allocations)[4], the MOU needs to clarify that the BLM will only change land use designations of Conservation lands designated pursuant to DRECP in the future if those changes are consistent with the conservation purpose under NCCP Act and conservation and recovery of the covered species.

Recommendation: The Durability MOU should clarify that the BLM will only change land use designations of Conservation lands designated pursuant to DRECP in the future if those changes are consistent with the conservation purpose under NCCP Act and conservation and recovery of the covered species.

VII. The Description of the Use of the Durability Tools in Section 2.c. Need Refinement and Clarification

Section D.2.c.i outlines three "Durability Tools" that the BLM has stated it may use to ensure that BLM Conservation Lands will be provided with long-term protections: (1) Title V Rights of Way; (2) permits, leases or easements granted pursuant to 43 U.S.C. §2920; and (3) leases granted pursuant to the Recreation and Public Purposes Act (RPPA). The Durability MOU also currently limits the use of the Durability tools referred to in Section 2.c to only those BLM Conservation Lands used for "compensatory mitigation" (Section 2.c.) and for only those projects built on BLM land (Section 2.c.i). We appreciate that the BLM and CDFW have identified these tools as appropriate for providing more "durable" protections and agree that these tools have merit. Indeed, we believe that this section of the agreement represents significant progress in the effort to secure more lasting conservation commitments on BLM lands to address the impacts of projects.

However, in reviewing this section, there are a number of issues that need to be clarified in the next iteration of this draft MOU. First, the Durability MOU is unclear as to when the durability tools will be finalized in relation to the final decision on a specific renewable energy project. Section D.2.c.i. discusses the three durability tools, but it is silent as to when an individual durability tool would be finalized with respect to the approved Covered Activity. In order to ensure that the protections provided by these tools will be implemented in a timely manner, the durability tool and any associated analysis required under the National Environmental Policy Act (NEPA) should be completed at the same time that the Covered Activity is approved. Second, the Durability MOU also fails to articulate the specific terms and conditions associated with each durability tool. Third, for the use of Section 2920 permits, leases and easements, the Durability MOU should state that the use of easements under Section 2920 is explicitly authorized under Title III of the Federal Lands Policy and Management Act (FLMPA). Fourth, the MOU must clarify the conditions under which a land withdrawal will be sought from DOI for purposes of fulfilling the BLM's commitments to protect BLM Conservation Lands and identify a firm commitment from BLM and DOI to a timeline for implementing the withdrawal process. In Section D.2.c.i, the agreement states that in the event the DOI implements a land withdrawal, pursuant to Title 43 U.S.C. § 1714, for BLM

[4] BLM does not have the authority to administratively change other designations (e.g., existing wilderness, NLCS, and WSAs), but that is not at issue here given that the existing wilderness, NLCS, and WSA designations are part of the baseline and including them in the reserves does not provide any new or additional conservation within the DRECP.

Conservation Lands, the BLM may not need to use the above-discussed three durability tools. However, this section silent as to what uses the land withdrawal may apply to (e.g. mining, motorized recreation, transmission corridors, livestock grazing, etc.).

Recommendation: Section D.2.c.i. shall be revised to: (1) clarify that the implementation of the use of the various tools and any associated analysis required under NEPA should be completed at the same time that the Covered Activity is approved; (2) articulate the specific terms and conditions associated with each durability tool; (3) state explicitly that easements under Section 2920 are authorized under Title III of the Federal Lands Policy and Management Act (FLPMA; and (4) clarify that any DOI land withdrawal pursuant to Title 43 U.S.C. § 1714 for BLM Conservation Lands will include a withdrawal from all incompatible uses and, if used solely to provide for "compensatory mitigation" for project impacts to species and habitats on public lands, will include a commitment for renewal so that the withdrawal will last at least for the duration of the Covered Activity's impact to species and habitats on public lands.

VIII. Use of Durability Tools on BLM Conservation Lands For Some Projects Results in Inconsistent Commitments.

As noted above, currently the Durability MOU limits the use of the Durability tools referred to in Section 2.c to only those BLM Conservation Lands used for "compensatory mitigation" (Section 2.c.) and for only those projects built on BLM land (Section 2.c.i). With respect to the limitation on the use of the tools outlined in Section 2.c only for projects built on BLM land, that distinction greatly limits the utility of this MOU as most of the lands identified in the DRECP within the Development Focus Areas are private, not public lands. There does not appear to be any rationale for limiting the use of these tools to projects on BLM land only, and it results in inconsistent conservation commitments within the Reserve. However, the Durability MOU very specifically states that those tools are to be used for "BLM Conservation Lands included in the DRECP NCCP Reserve . . . [for] compensatory mitigation." Thus, the Durability MOU appears to divide BLM Conservation Lands into two categories: lands used for compensatory mitigation and DRECP NCCP Reserve lands **not** used for compensatory mitigation. The Durability MOU then provides that the longer-term protections apply only to the compensatory mitigation lands, leaving the non-compensatory mitigation lands in the DRECP NCCP Reserve open to changes in designation at any time and certainly after the NCCP permit expires in 2040.

The NCCPA does not provide a two-tiered standard for the length of commitments made for NCCP Reserve Lands. Indeed, the NCCPA does not distinguish between "compensatory mitigation" lands in a reserve and non-compensatory mitigation lands in a reserve. Instead, the length of the commitments made to protect NCCP reserve lands are applied equally to every acre in an NCCP Reserve.

Therefore, the current structure for utilizing the tools will not provide conservation commitments that meet the NCCP Act standards. While we would like to see the use of the tools expanded to cover impacts from projects on private lands within the DRECP, for those projects covered under

the NCCP Act standards the length of the conservation commitments must be tied to species conservation and BLM would need to commit to renewing these tools to ensure a longer duration for the use of these tools than is currently provided in the statutes and regulations. For example, if withdrawals are made to support conservation commitments on public lands, DOI and BLM would need to ensure that the withdrawals will continue to be renewed so long as the lands are needed to support conservation and recovery of covered species under the Plan.

Recommendation: The Durability MOU must be revised to clarify that BLM must apply the tools outlined in Section D.2.c to all BLM Conservation Lands within the DRECP NCCP Reserve and may use the durability tools in Section D.2.c to provide needed conservation for impacts of projects on both public and private lands within the DRECP Plan area. However, the Durability MOU must also clarify that if any of the tools or a DOI land withdrawal, pursuant to Title 43 U.S.C. § 1714, are relied on to fulfill the NCCP Act requirements for the DRECP, BLM and DOI must make a commitment to renew the tools and the withdrawals so long as the lands are needed to support conservation and recovery of covered species under the Plan.

IX. Clarify When the Protective Terms and Conditions in Section D.2.c.iii Will Be Used for Rights-of-Way

Section D.2.c.iii states that for rights-of-way granted on BLM Conservation Lands, these rights-of-way will include terms and conditions that will "minimize damage to scenic and esthetic values and fish and wildlife habitat and otherwise protect the environment" and "require compliance with State standards for public health and safety, environmental protection, and siting, construction and operation, and maintenance of rights-of-way for similar purposes if those standards are more stringent than the applicable Federal standards." Further, this section states that for purposes of achieving the above terms and conditions, the NCCPA's requirements under Fish and Game Code section 2820(a) and (b) and Fish and Game Code section 2801(b) "will be protected through appropriate terms and conditions on any subsequent rights-of-way granted." This section is important as it recognizes the California endangered species legal requirements as terms and conditions that must be followed in a BLM right-of-way. However, this section is confusing as to what "type" of right-of-way will include these terms and conditions. Is it all rights-of-way (both "conservation" rights-of-way and "development" rights-of-way) granted within BLM Conservation Lands within the DRECP NCCP Reserve? Is it only for "conservation" rights of way, as discussed in Section D.2.c.i.? Is it only for "development" rights-of-way? Clearly, the insertion of this type of term and condition into a conservation right-of-way granted, as discussed in Section 2.D.c.i., would make sense as it would prohibit actions on the land that would be inconsistent with the DRECP NCCP. However, it is unclear how such a term and condition would work for a development "right-of-way" granted on BLM Conservation Lands within the DRECP NCCP Reserve.

Recommendation: Section D.2.c.iii should be revised to clarify that all rights-of-way granted on BLM Conservation Lands with the DRECP NCCP Reserve include the above-discussed NCCP and California ESA language in the terms and conditions.

X. The Meet and Confer Requirements Undermine BLM's Conservation Commitments

Sections D.2.c.iv-v outline the process the BLM will follow when they receive an application for a project on BLM Conservation Land that is subject to one of the durability tools once they are implemented. Unfortunately, this process fails to provide any concrete commitments by BLM that they will either (1) deny an application that is inconsistent with unmitigable protected values or (2) for lands where the conservation values could potentially be mitigated, require mitigation ratios high enough to fully to replace the values lost by the approval of the project application—for example, at a minimum of 10:1—along with imposition of additional long-term protections on those substitute lands. For example, this section uses non-committal phrases such as: "BLM will confer with CDFW," "BLM, in its discretion . . ., will consider the mitigation value of the lands," BLM "may" use durability tools on substitute lands." Indeed, it appears that all the BLM is committing to do is confer with CDFW about the impacts of a project; maybe make changes in a project, deny a project, or approve a project with no changes; maybe require additional mitigation; and if new "offsetting actions" are required, maybe use the durability tools on those new lands. Thus, not only does this agreement provide BLM discretion to approve projects on BLM Conservation Lands even if they are inconsistent with the NCCP, it appears to state that "substitute" Conservation Lands may receive even less "durable" protection than the original conservation lands. This language and the discretion reserved to BLM undermines the certainty and enforceability of promised conservation under the DRECP and renders the DRECP unable to meet the NCCP Act standards.

Recommendation: Sections D.2.c.iv-v must be strengthened to clarify that BLM will commit to deny project applications on BLM Conservation Land inconsistent with the DRECP NCCP. Further, this section should be revised to clarify that in the event that BLM approves a project in the BLM Conservation Lands which is consistent with the DRECP NCCP, and needs to mitigate for impacts to those Conservation Lands, the BLM commits to requiring mitigation at a ratio of at least 10:1 and providing that new mitigation lands will be included within the Reserve and will have the same level of "durable" protection as the lands where development was allowed. Finally, this section must clarify that CDFW must find that the BLM's action(s) are consistent with the DRECP NCCP and in the event that CDFW finds that such actions are inconsistent, there is a permit suspension and revocation process in place consistent with the requirements of California Fish and Game Code Section 2820(c).

XI. Phase One Commitment Must Be Improved

Section D.2.d sets forth a provision in which the BLM agrees to apply the durability tools to a still-yet-to-be-decided amount of Conservation Lands as compensatory mitigation at some point after the approval of the DRECP Record of Decision and execution of the Durability MOU. We are very supportive of the concept of providing an upfront commitment of BLM Conservation Lands as a way of "jump-starting" or "front-loading" the DRECP Conservation Strategy and thus protecting against the DRECP falling behind in its conservation commitments. However, this section needs to be improved to require that the "front-loading" of Conservation Lands through the execution of the durability tools on these lands is not limited to only "compensatory" mitigation lands and instead

these tools apply to compensatory mitigation and non-compensatory mitigation Conservation Lands within the DRECP NCCP. In addition, this section must be revised to require that the agencies execute the durability tools on this set of "front-loaded" lands, including all associated completed NEPA, concurrent with the approval of the DRECP ROD and the execution of the Durability MOU. The current commitment by the BLM is simply that they will complete an Environmental Assessment for the tool(s) used on these "front-loaded" lands, not that they will actually complete the execution of the durability tools in any specific timeframe.

Recommendation: Section D.2.d must be revised to require that (1) the "front-loading" of Conservation Lands through the execution of the durability tools will occur on compensatory mitigation and non-compensatory mitigation Conservation Lands within the DRECP NCCP and (2) the durability tools on this set of "front-loaded" lands will be executed, including all associated completed NEPA, concurrent with the approval of the DRECP ROD and execution of the Durability MOU.

XII. Annual Reporting Must Be Expanded

Section D.4.b requires that BLM and CDFW provide annual written reports of all rights-of-way, permits, authorizations, and other approvals issued by BLM and CDFW for projects on and activities on or potentially affecting BLM Conservation Lands. While we appreciate that the agencies will make this information available, this is only one small part of the information necessary to ascertain whether or not the DRECP is achieving its intended outcomes and that the involved parties are carrying out their obligations under this plan. This section should be expanded to (1) include both quarterly reports and an annual report of all compliance and effectiveness monitoring of the DRECP and (2) ensure that such reports are made public by posting the information electronically.

Recommendation: Revise Section D.4.b to require both quarterly and annual reporting of compliance and effectiveness monitoring and to make the annual reports publicly available, including electronically.

XIII. The Dispute Resolution Section Must Be Clarified

Section D.5 sets forth a dispute resolution process that provides for disagreements to be incrementally elevated from the lowest level of the BLM and CDFW all the way to the BLM Director. According to Section D.5.b, the final "decider" of a dispute between the BLM and CDFW is the BLM Director. While it is clear that the ultimate decision-maker for the BLM would be the BLM Director, it is not appropriate for the BLM Director to make final determinations of issues involving interpretations of state law, particularly the NCCP Act. Indeed, the NCCP Act states that it is the decision of CDFW as to whether or not an NCCP permit should be suspended or revoked. Cal. Fish &Game Code § 2820(c). Further, CDFW must suspend or revoke an NCCPA permit if the continued take of a species would result in jeopardizing the continued existence of the species. Thus, Section D.5 must be revised to clarify that while the BLM shall be the final decision-maker for BLM issues, it is the Director of CDFW who makes the final decision regarding

compliance with the NCCP Act. Therefore, for issues involving compliance with the DRECP's NCCP, the final decision-maker, in the event of a dispute between BLM and CDFW, must be CDFW.

Recommendation: Section D.5 must be revised to clarify that for issues involving compliance with the DRECP's NCCP, the final decision-maker, in the event of a dispute between BLM and CDFW, must be CDFW.

XIV. Conclusion

Thank you for the opportunity to provide our analysis and recommendations for the draft Durability Agreement. If you have any questions, please do not hesitate to contact us. Our organizations will be providing further detailed comments on the Draft DRECP and its supporting documents either individually or collectively by the February 23rd deadline. If you have any questions or comments about this letter, please contact Kim Delfino, Defenders of Wildlife, at (916) 201-8276 or kdelfino@defenders.org.

Sincerely,

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Via Electronic Mail (with Hard Copy to follow)

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Re: Comment on DRECP NEPA/CEQA

Dear Commissioner Douglas, Director Bonham, Director Kenna and Director Lohoefener,

Our organizations strongly support the concept of the Desert Renewable Energy Conservation Plan (DRECP) as a way to facilitate responsible and sustainable renewable energy development in order to meet the state's renewable energy mandates and needs, while simultaneously providing lasting conservation for species, natural communities and ecological processes in the California deserts. For this reason we continue to invest significant resources into the DRECP process and are submitting this joint comment letter in addition to more detailed comment letters on behalf of our individual organizations.

This letter's purpose is to highlight the fundamental problems with the DRECP draft, and to propose solutions leading to a final DRECP that can better work for responsible renewable energy development and lasting conservation in the desert region. We appreciate the hard work that has been invested in this process and hope that these issues can be resolved through a Supplemental Draft EIS.

Key Issues

We recognize that the DRECP consists of three separate, but coordinated, planning efforts—a set of Bureau of Land Management (BLM) land use plan amendments, a U.S. Fish and Wildlife Service (USFWS) general conservation plan (GCP) and incidental take permit issued to the California Energy Commission (CEC) (and possibly other State agencies or subdivisions), and a California Natural Community Conservation Plan (NCCP). We also recognize that meshing these three separate planning processes is not a simple matter.

However, as we have conveyed previously in stakeholder webinars and public meetings with agency leaders and staff, we have found a pervasive lack of clarity in the draft DRECP documents that makes it very difficult to provide meaningful comments. Internal inconsistencies within the draft Plan, the absence of critical information, and errors in mapping and other key information, present significant obstacles to understanding the content of the document and providing accurate and meaningful comments, even for highly experienced professionals.

In an effort to move towards a DRECP that stakeholders and the public can support, we have identified below some of the key issues that require additional explanation, information, and opportunity for input.

Conservation Strategy

The Conservation Strategy, which is intended to meet state and federal endangered species requirements, is vague and does not appear to provide the level of conservation and/or mitigation for covered species upon which endangered species permits may be issued under the California Endangered Species Act or Natural Community Conservation Planning Act or the federal Endangered Species Act. In order to improve the conservation strategy and mitigation actions, the agencies need to do the following:

- Hire experts or assign dedicated California Department of Fish and Wildlife (CDFW) and/or USFWS staff to accurately describe the covered species and population levels with updated references and on the ground data.
- Make all biological goals and objectives SMART (Specific, Measurable, Achievable, Realistic and Time bound) and ensure that the overall DRECP Management Plan prioritizes monitoring to measure impacts from projects and progress toward meeting the conservation strategy, as well as defining meaningful adaptive management strategies and specific actions if objectives are not met.
- Define strategic conservation actions needed to maintain, increase or recover populations and species of all covered species and communities, including converting the conservation strategy into spatially explicit reserves, with connectivity as appropriate, for each species. Each reserve area should ultimately have its own measurable objectives for covered species.

Durability of Conservation

The environmental community has been engaged with the issue of durable conservation on public lands as it relates to the DRECP for a number of years. To ensure lasting protections for natural resources covered under the DRECP, the plan and its implementing agreement(s) must provide for enduring and durable conservation on public and private lands. In particular, the issue of durability

of conservation designations on public lands needs to be adequately resolved for the DRECP to meet the standards of the NCCP Act and the California Endangered Species Act. As currently drafted, the conservation designations on BLM lands are not consistent in the nature or duration of protections. They also lack clear, measurable commitments as to either necessary durability or as to the specific contributions areas make to the conservation strategy and/or the mitigation actions. Improvements needed to ensure durable conservation on public lands include:

- Clarify and strengthen management prescriptions for National Landscape Conservation System (NLCS) lands and Areas of Critical Environmental Concern (ACECs).
- Each conservation area, whether ACEC, National Conservation Lands (NCL) unit, or other designation should identify the species, landscape processes, communities, and other features for which it is being conserved.
- Each conservation area should also have its own set of biological objectives tied to the overall biological goals.
- Analyze in detail the various durability tools available to BLM and the Durability Memorandum Of Understanding (MOU) and clarify where and under what circumstances various tools will be applied when utilizing them to meet the conservation strategy objectives or mitigation actions.
    - In order to meet Plan Wide Biological Goals and Objectives for the duration needed to conserve covered species, the DRECP should require adoption of specific durability tools and commitments to ensure lasting protections for all conservation lands, including the full extent of BLM Conservation Lands.

Special Recreation Management Areas/Extensive Recreation Management Areas

The DRECP creates over three million acres of new “Special Recreation Management Areas” (SRMAs) and “Extensive Recreation Management Areas” (ERMAs). We request that the BLM:

- Clarify/emphasize that in the event of overlap, the more ecologically protective management prescriptions dominate (e.g., ACEC or NCL provisions over SRMAs/ERMAs).
- Address the need for stronger recreation/travel management prescriptions at the DRECP Plan level to ensure that conservation goals and other resource protection goals are met and impacts from recreation are minimized in the SRMA and ERMA areas. These prescriptions will also help to guide revisions to future Transportation Management Plans and/or Recreation Area Management Plans.

- Ensure that the Desert Tortoise Natural Area is maintained for conservation purposes, and not recreation. It should therefore be removed from any proposed SRMAs.

- Exclude from proposed SRMAs/ERMAs all areas where recreation, particularly OHV recreation, may prevent the DRECP from meeting its species conservation objectives.

Groundwater

The groundwater resource protection provisions in the draft DRECP (including Conservation Management Action (CMA) standards) are insufficient—they are unclear and appear to be largely optional. As such, the conclusion in the DRECP Executive Summary (page 48) that there will be less than significant impacts to groundwater from solar energy development in all but the no action alternative is incorrect. Renewable facilities will invariably rely on groundwater pumped from stressed aquifers that support vital desert springs and wetlands.

The final DRECP must clearly state mandatory requirements to protect groundwater-dependent resources to ensure that flows are maintained and that critical aquatic and riparian resources will survive, especially over the long term. These requirements must include imposing modeling, stringent monitoring, triggers based on modeled impacts and compensation conditions on groundwater use by renewable energy facilities. In places that support vital groundwater-dependent resources and where groundwater is already over-utilized, net reductions in basin water use must be required. If net reductions cannot be assured, the DRECP should avoid development (including elimination of Development Focus Areas (DFAs), Future Assessment Areas (FAAs), Special Study Areas (SAAs), variance areas and undesignated lands) in these areas.

Refine DFAs, SSAs, FAAs and Undesignated Lands

Many of the DFAs are inconsistent with regional and local land use designations and fail to exclude conservation lands or other designations within the DFAs and therefore it is unclear which lands are actually available for development. In order to provide a more accurate picture of lands open for development and to ensure that development in the DFAs will not undermine the biological goals and objectives for covered species, the DRECP must do the following:

- Refine DFAs to eliminate designated conservation lands (such as the Desert Tortoise Natural Area), as well as non-designated lands with important conservation values (such as microphyll woodlands, sand transport corridors, lands adjacent to conservation investments, and critical habitat and wildlife linkages).

- Provide more specificity about how conservation for species will be provided in the DFAs.

More detail is also needed regarding SSAs, FAAs, and Undesignated Lands. There are 1.3 million acres of Undesignated Lands under the Preferred Alternative, including 709,000 acres of public lands. The criteria for establishing these lands are unclear and many of the areas in this category include important biological, scenic, recreational and cultural resources. The DRECP must conduct further analysis on these lands and determine whether they are suitable for inclusion into the conservation reserve, renewable energy development, or other designation.

County Engagement

Implementation of the DRECP is dependent on the counties agreeing to designations for both conservation and development on private land that the DRECP establishes through its planning process. Without county participation, the permits and assurances for development under the DRECP will be limited to public lands, thus missing opportunities to incentivize renewable energy development on disturbed and degraded private lands. While we anticipate that a majority of conservation will occur on public land to meet the DRECP's conservation strategy, we believe that the DRECP will need to ensure that counties will implement conservation on private lands identified as essential for meeting specific species' conservation goals within the conservation strategy. Thus, it is critical that, depending upon the location of development and conservation areas, the DRECP secure legally-binding commitments from specific counties in order for CDFW to make the appropriate legal findings regarding implementation of the DRECP.

Governance and Funding

The DRECP is a complicated plan that requires a very detailed and clear implementation and governance plan to assure proper implementation and funding over the decades in which the DRECP is in place. The analysis of funding in the draft Plan is neither transparent nor adequate, and fails to provide assurance of sufficient funding for Plan implementation. Additionally, the decision-making process and governance structure must be clearly articulated so the public can understand how the plan will be managed and how decisions will be made in a transparent and timely manner. The public must have a means to provide input into the plan as it evolves, through an advisory committee as well as through public reports, meetings, comment processes and other relevant mechanisms.

Since the adaptive management program in this plan will need to be very robust in order to address complex issues as new information about specific species and impacts come to light, it is critical that this plan have a reliable funding component for adaptive management. The adaptive management program must also include a specific mechanism for ongoing regular scientific input from independent science advisors in addition to a clear line of authority for decision-making. Given the fact that the plan will rely extensively on public land management for the conservation strategy, it is critical that there be a robust, stable and reliable funding plan along with transparent accounting of funds so that the public and private companies alike know where

the DRECP is spending both public funds and the fees paid by the developers. Finally, the plan should also have clear triggers for initiation of any plan amendments.

Transmission

Access to transmission with available capacity within DFAs is one of the major benefits that could come from the DRECP and a key incentive to development within DFAs. Conversely, failing to plan for transmission serving the DFAs could have significant impacts on the success of the DRECP.

Currently, the DRECP is not incorporated into California's energy or transmission planning processes or utility decision-making. Full engagement and cooperation from the California Public Utilities Commission (CPUC), the California Independent System Operator (CAISO) and utilities is pivotal to incorporating the DRECP into California's energy and transmission planning processes. The CEC and BLM, as lead agencies, should recommend appropriate DRECP DFAs for a priority policy-driven scenario for transmission planning through the CPUC and CAISO.

More importantly, as written the DRECP has no substantive analysis of transmission that is currently available to proposed DFAs, what would be required to provide transmission access in each of the DFAs, or analysis of what this actual transmission build-out would look like across a range of alternatives, and what the impacts would be, both environmental and economic. A place-based analysis of transmission and related infrastructure required for DFAs is essential to understanding the impacts of the DRECP and must be remedied in the next iteration of the Plan.

Energy Calculations

The analysis of the energy needed to reach the target 58% carbon reduction from 1990 levels by 2040 is not adequate or transparent. In order to provide further clarity, the CEC should:

- Provide the "ultimate revised July 2012" calculator excel spreadsheet and assumptions upon which the DRECP relied to determine its estimated need for 17K to 19K MW of new renewable energy in the Plan area.
- Provide the bases for assumptions regarding the amount of customer side distributed generation, existing renewable generation, zero carbon imports, and other inputs to the calculator.
- Ensure that the energy calculator and analysis uses the best available information, including but not limited to, the most current official state demand and population forecast.

- Adjust the megawatt target to account for renewable energy projects that have become operational or under construction since the calculator cutoff date of December 31, 2010, as well as those already approved in the Plan area.

Coordination with the Las Vegas RMP Revision

The DRECP provides the BLM a unique opportunity to demonstrate its commitment to plan at a landscape scale, particularly in light of the planning effort underway through the Las Vegas Resource Management Plan (RMP) revision. Our groups support proposed conservation designations in the region adjoining the Nevada border, but remain concerned that linked and cumulative effects of development have not been analyzed and addressed. To the east of the DRECP, the Las Vegas RMP will establish land use designations for conservation, renewable energy development and recreation, actions that will affect resources in the DRECP plan area. For overall species conservation across their entire range, the two plans should make every effort to align conservation designations so that development on either side of the plan would not undermine conservation on the other side.

Conclusion

In conclusion, we would like to reiterate our continued support for this complex planning effort. The task at hand is monumental, and we appreciate the tremendous amount of work that is being done by the agencies and their staff to develop a plan to balance renewable energy generation with conservation of pristine landscapes and species' habitats. We continue to believe the DRECP can help California transition to renewable energy without sacrificing our state's rich and diverse desert ecosystems and wildlife. As stakeholders to the DRECP, we intend the comments in this letter to assist in strengthening the credibility of the DRECP as a conservation plan. We look forward to working with you to ensure that the above recommendations are incorporated into a final DRECP.

Sincerely,

Barbara Boyle
Senior Representative, Beyond Coal Campaign
Sierra Club

Laura Crane
Associate Director, Land Conservation Program
California Chapter
The Nature Conservancy

Kim Delfino
California Program Director
Defenders of Wildlife

Garry George
Director, Chapter Network
Audubon California

David Lamfrom
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National Parks Conservation Association

Helen O'Shea
Director, Western Renewable Energy Project
NRDC

April Sall
Conservation Director
The Wildlands Conservancy

Greg Suba
Conservation Program Director
California Native Plant Society

Cc: Elizabeth Klein, Associate Deputy Secretary
Ken Alex, Senior Policy Advisor

April 10, 2013

Dear DRECP Stakeholders:

As part of our commitment to foster transparency, the DRECP team is releasing four sets of draft Biological Goals and Objectives (BGOs) representing the first subset of draft BGOs for the Desert Renewable Energy Conservation Plan (DRECP) "driver" species. Driver species are considered, for purposes of the DRECP, as representing the range and scope of conservation actions that will become part of the overall conservation strategy and approach for the DRECP. We anticipate release of the remaining five sets of driver BGOs soon.

As with other recent DRECP draft documents, there is no formal comment period and, while we are happy to receive comments, we do not anticipate responding to comments other than reflecting our evaluation of comments in the draft DRECP document. The draft DRECP is scheduled for public review later this year.

Thanks again for your participation in the planning process. Please free to call or email if you have any questions.

Best regards,
David L. Harlow
Director
Desert Renewable Energy Conservation Plan
(916) 418-4397

Burrowing owl – Athene cunicularia
BUOW

Pertinent landscape and natural communities biological goals and objectives:

Goal BUOW 1. Conserve natural and agricultural habitats that support burrowing owls at a landscape scale (CDFG 2012a).

- **Objective BUOW 1.1.** Conserve high-quality suitable habitat in the areas of concentrated burrowing owl occurrences within the Plan Area of sufficient size and configuration to maintain and expand burrowing owl populations. Known population concentrations are divided into five Conservation Areas (CA) (Shuford and Gardali 2008, Wilkerson and Siegel, 2010, 2011) that correspond to the DRECP Subareas (Dudek and Recon) in the following way:
    - (1) Imperial Valley: Imperial Borrego Valley Subarea.
    - (2) Palo Verde Valley: Cadiz Valley and Chocolate Mountains Subarea (though the Palo Verde Valley is only a small portion in the east of this subarea.
    - (3) West Mojave Desert: West Mojave and Eastern Slopes Subarea, Pinto Lucerne Valley and Eastern Slopes Subarea. Burrowing owls are found primarily west of Barstow and north to Ridgecrest in the West Mojave and concentrations of owls are found around residential and agricultural areas in the Lucerne Valley, Apple Valley, and the Antelope Valley.
    - (4) North Mojave Desert: Panamint Death Valley Subarea, Owens River Valley Subarea
    - (5) East Mojave and Sonoran Deserts: Kingston and Funeral Mountains Subarea, Mojave and Silurian Valley Subarea, Providence and Bullion Mountains Subarea, and Piute Valley and Sacramento Mountains Subarea.

Goal BUOW 2. Maintain a stable population in the Imperial Valley Conservation Area (CA1) in the face of a changing water irrigation regime through the Colorado River Quantification Settlement Agreement (QSA).

- **Objective BUOW 2.1.** Maintain a minimum population of 5,100 pairs of burrowing owls in the Imperial Valley agricultural matrix (Manning 2009, Wilkerson and Siegel, 2010, 2011), with at least 500 pairs on conserved irrigated lands in the Imperial Valley by the end of the DRECP plan period.
- **Objective BUOW 2.2.** Maintain approximately 421,000 acres of agricultural matrix habitat in its current state for burrowing owl to achieve a minimum population of 5,100 pairs of birds.

Goal BUOW 3. Maintain size and distribution of extant burrowing owl populations in the other burrowing owl Conservation Areas.

- **Objective BUOW 3.1.** Maintain a minimum population of 180 pairs of burrowing owls in the Palo Verde Valley (CA2) agricultural areas (Wilkerson and Siegel, 2010, 2011) by maintaining 122,000 acres of agricultural matrix habitat in its current state through the end of the DRECP plan period.
- **Objective BUOW 3.2.** Maintain a minimum population of 560 pairs (Wilkerson and Siegel 2011) of burrowing owls in the West Mojave Desert (CA3) agricultural/natural desert matrix by the end of the DRECP plan period.
- **Objective BUOW 3.3.** Maintain existing population of burrowing owls in the North Mojave Desert (CA4) agricultural/natural desert matrix by the end of the DRECP plan period.
- **Objective BUOW 3.4.** Maintain existing population of burrowing owls in the East Mojave Desert (CA5) natural desert areas by the end of the DRECP plan period.

References

CDFG 2012a. Staff Report on burrowing owl mitigation. March 7, 2012. Sacramento, California. California Department of Fish and Game. Available online at: http://www.dfg.ca.gov/wildlife/nongame/docs/BUOWStaffReport.pdf. Downloaded on March 8, 2012.

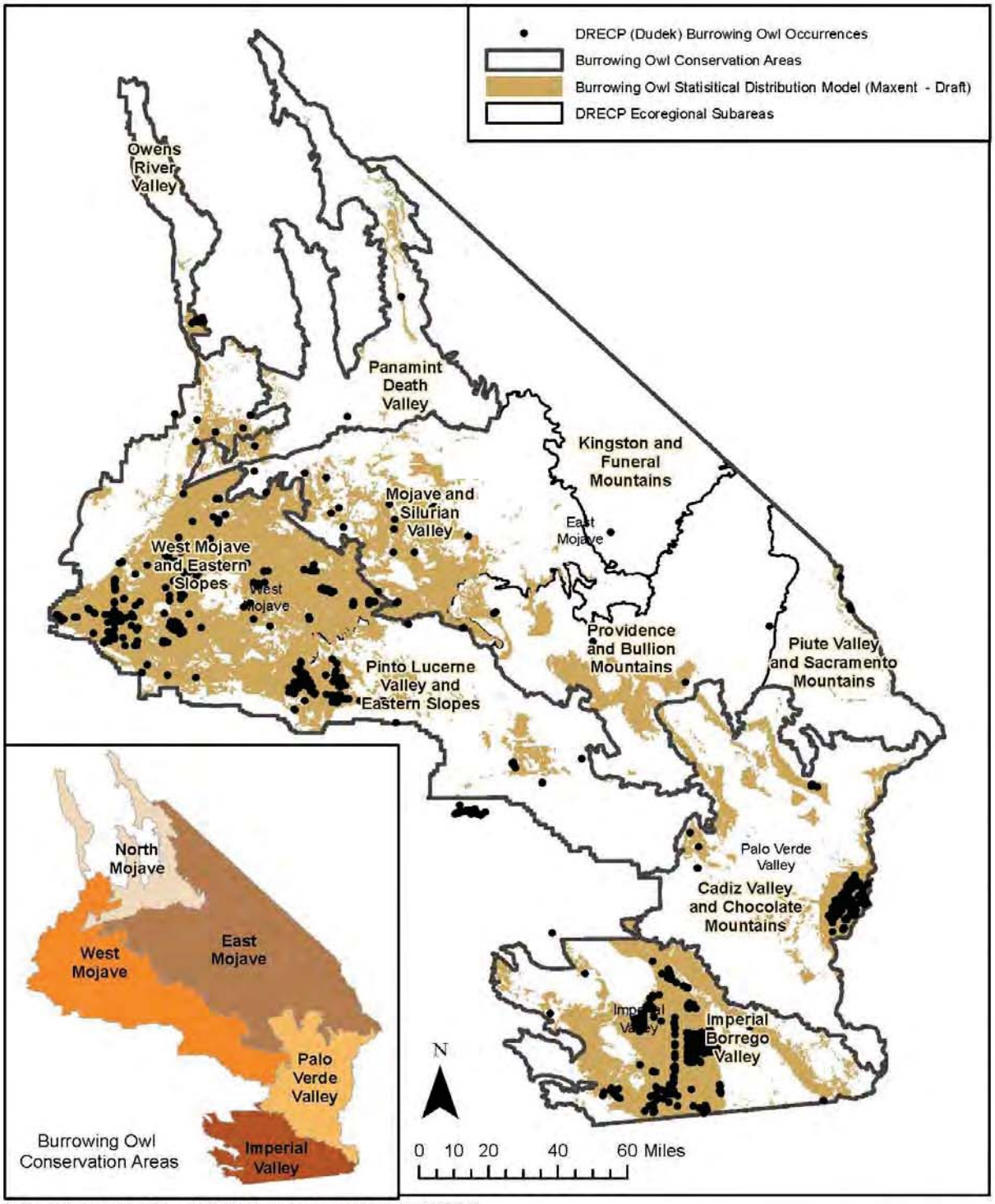
Manning, J.A. 2009. Burrowing owl population size in the Imperial Valley, California: survey and sampling methodologies for estimation. Final report to the Imperial Irrigation District, Imperial, California, USA, April 15, 2009. Pgs 193.

Shuford, W. D. and T. Gardali, editors. 2008. California Bird Species of Special Concern: a ranked assessment of species, subspecies, and distinct populations of birds of immediate conservation concern in California. Studies of Western Birds 1. Western Field Ornithologists, Camarillo, California, and California Department of Fish and Game, Sacramento. Gervais, J. A., D. K. Rosenberg, and L. Comrack. 2008. Burrowing Owl (Athene cunicularia).

Wilkerson, Robert L. and Rodney B. Siegel. 2010. Assessing Changes in the Distribution and Abudance of Burrowing Owls in California, 1993-2007. The Institute for Bird Populations. Bird Populations, A journal of global avian biogeography, California. Downloaded February 2013 from http://www.birdpop.org/DownloadDocuments/V10_001_036_BUOW.pdf

Wilkerson, Robert L. and Rodney B. Siegel. 2011. Distribution and Abundance of Western Burrowing Owls (*Athene Cunicularia Hypugaea*) in Southeastern California, September 2011. "The Southwestern Naturalist". Downloaded February 2013 from http://www.birdpop.org/DownloadDocuments/Wilkerson_and_Siegel_2011.pdf

Map



California Department of Fish and Wildlife Renewable Energy. D.Mastalir. 20130321.

Desert Renewable Energy Conservation Plan (DRECP) Ecoregional Subareas, Burrowing Owl Habitat from Maxent Models, and Burrowing Owl Conservation Areas

Desert bighorn sheep *Ovis canadensis nelsoni*
BISHI

Pertinent Natural Community Goal/Objective:
See MW, Goal MW3, Objective MW3.2

Goal BISH1: Conserve the desert bighorn sheep Sonoran-Mojave desert metapopulation and the Peninsular Ranges Distinct Population Segment (DPS) across the DRECP area within well-distributed habitat areas in mountain ranges and intermountain linkages. Emphasize conservation in areas where herds are most likely to be adaptive and resilient in response to the effects of changes within their metapopulations, including, range shifts, contractions, expansions, local extirpation and recolonization; as well as environmental changes in climate, temperature and precipitation.

- **Objective BISH1.1:** In each desert bighorn sheep metapopulation fragment conserve occupied habitat supporting well-distributed desert bighorn sheep mountain range herd units. Include the following four metapopulation fragments and the Peninsular Ranges DPS (individual mountain range herd units are presented in Appendix 1):
    - Northern Metapopulation Fragment
    - North-Central Metapopulation Fragment
    - South-Central Metapopulation Fragment
    - Southern Metapopulation Fragment
    - Peninsular Ranges DPS.
- **Objective BISH1.2:** Conserve high-priority intermountain habitat as functional dispersal and migration linkages connecting desert bighorn sheep mountain range herd units within metapopulation fragments (individual desert bighorn sheep range herd unit intermountain linkages are presented in Appendix 2).
- **Objective BISH1.3**: Promote unimpeded movement of desert bighorn sheep across highway infrastructure at high-priority inter-metapopulation fragment corridors to help maintain genetic exchange between herds in mountain range herd units and access to seasonally available water and forage opportunities:

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- Crossing of Interstate 15 (I-15) at Soda Mountains-South Soda Mountains and Cronese Mountains-Cady Mountains habitat connection
- Crossings of I-15 at Clark Mountains-Mescal Range habitat connection and/or Clark Mountains-Ivanpah Mountains habitat connection
- Crossing of I-40 at the Cady Mountains-Bullion Mountains habitat connection east of Ludlow
- Crossing of I-40 in the western portion of the Bristol Mountains
- Crossing of I-40 in the eastern portion of the Bristol Mountains and Old Dad Mountains area
- Crossing of I-40 at the Granite Mountains-Marble Mountains habitat connection
- Crossing of I-40 at the Dead Mountain-Sacramento Mountains habitat connection
- Crossing of I-10 at the Eagle Mountains-Chuckwalla Mountains habitat connection via Chuckwalla Valley.

- **Objective BISH1.4:** Conserve desert bighorn sheep mountain habitat and associated intermountain habitat for the Peninsular Ranges bighorn sheep (PRBS) DPS within the Plan Area in three or more of the following areas consistent with the 2000 USFWS Recovery Plan:
    - Along the lower slopes of the Fish Creek Mountains and Coyote Mountains and in the Carrizo Wash area connecting the two ranges.
    - Along the eastern slopes of the Jacumba Mountains and Tierra Blanca Mountains.
    - Along the lower slopes of the Vallecito Mountains.
    - Along the lower slopes of the Santa Rosa Mountains.
    - Federally designated PRBS critical habitat and other areas where PRBS have been documented to forage.
- **Objective BISH1.5:** Increase the number of desert bighorn sheep mountain range herd units in the metapopulation fragments by restoring bighorn sheep in the following suitable but currently vacant mountain ranges that are connected to occupied areas by functional intermountain linkages or inter-metapopulation fragment corridors:
    - Big Maria Mountains
    - Cache Peak Mountains
    - Chimney Peak Mountains
    - Riverside Mountains
    - Sacramento Mountains
    - Slate Mountains-North half of range, outside of China Lake

- El Paso Mountains
- McCoy Mountains
- Pinto Mountains-North half of range, outside of Joshua Tree National Monument
- Quail Mountains-Northwest portion of range, outside of Fort Irwin Military Reservation Naval Weapons Center-East
- Soda Mountains
- Mescal Mountains
- Owlshead Mountains-Southern half of range, outside of Death Valley National Monument.

- **Objective BISH1.6:** Establish and maintain for targeted desert bighorn sheep mountain range herd units within metapopulation fragments and the Peninsular Ranges DPS at least 25 adult ewes or the existing number of adult ewes, whichever is greater.
- **Objective BISH1.7:** Maintain, enhance or re-establish desert bighorn sheep access to water sources in high-priority mountain and intermountain habitats, including perennial and seasonal (i.e., winter storm-monsoonal runoff) streams and rivers, springs, oases, and tinajas (potholes in rocks), or artificial water catchments (guzzlers) to improve habitat use and connectivity.

Goal BISH2: Remove or reduce potential threats and environmental stressors to maintain and enhance bighorn sheep mountain range herd units.

- **Objective BISH2.1:** Increase relative to existing conditions desert bighorn sheep access to more water sources, and forage and lambing areas currently constrained by competition between bighorn sheep, domestic and feral livestock, feral burros and anthropogenic uses and disturbance (e.g. recreation).
- **Objective BISH2.2:** Control transmission of livestock diseases to desert bighorn sheep by minimizing direct contact in locations between bighorn sheep and cattle, domestic sheep, and domestic and feral goats.
- **Objective BISH2.3:** Manage mountain lion predation where it affects growth and stability of high-priority individual desert bighorn sheep mountain range herd units.
- **Objective BISH2.4:** Maintain or enhance desert bighorn sheep movement to overcome anthropogenic barriers (e.g., fences) between high-priority mountain ranges.

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References

Epps, C. W., J. D. Wehausen, et al. (2007). “Optimizing dispersal and corridor models using landscape genetics.” Journal of Applied Ecology 44(4): 714-724.

USFWS. 2000. Recovery Plan for bighorn sheep in the Peninsular Ranges, California. United States Fish and Wildlife Service, Portland, OR. 251 pp

Wehausen, J. D. (2012). “A conservation plan for desert bighorn sheep in California”. February 2012 draft prepared for the California Department of Fish and Wildlife.

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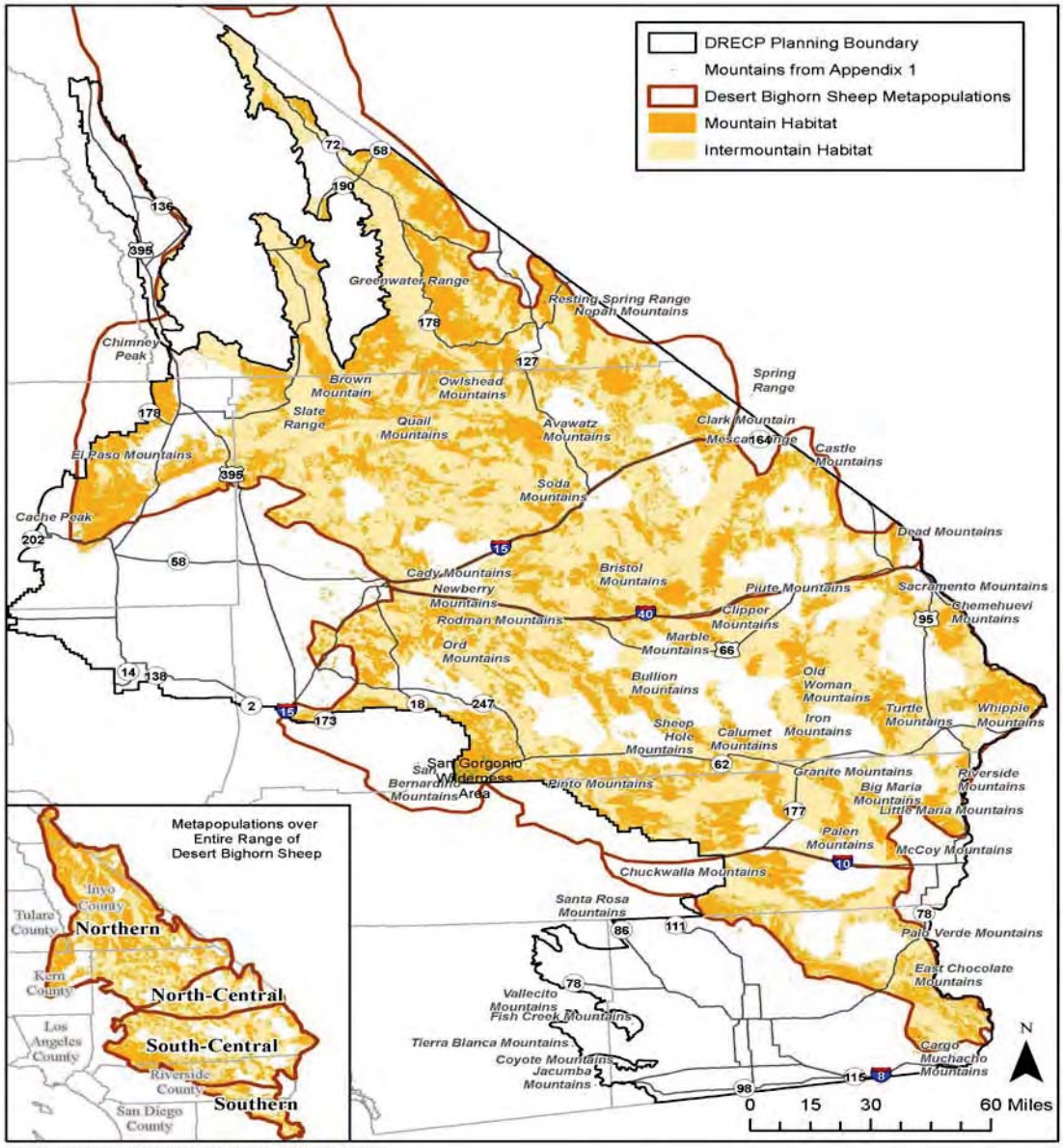
Map



California Department of Fish and Wildlife Renewable Energy. D.Mastalir. 20130312.

Desert Bighorn Sheep Metapopulations and
Desert Renewable Energy Conservation Plan (DRECP) Boundary

DRAFT BIGHORN SHEEP METAPOPULATIONS

Appendices

Appendix 1: Desert Bighorn Sheep Mountain Range Herd Units including Peninsular Ranges Distinct Population Segment within the DRECP Outside of Department of Defense and National Park Service Lands

Northern Metapopulation Fragment

- Avawatz Mountains
- Greenwater Range
- Brown and Quail Mountains
- Cache Peak and El Paso Mountains
- Chimney Peak
- North half of Clark Mountain Range and Spring Range
- Nopah Mountains and Resting Spring Range
- Owlshead Mountain
- Slate Range
- Soda Mountains

Northern-Central Metapopulation Fragment

- Cady Mountains
- Castle Mountains
- Dead Mountains
- Mescal Mountains
- North Bristol Mountains

South-Central Metapopulation Fragment

- Big Maria Mountains
- Bullion Mountains
- Chemehuevi Mountains
- Clipper Mountains
- Granite Mountains (Riverside County) and Palen Mountains
- Iron Mountains
- Little Maria Mountains
- Marble Mountains
- McCoy Mountains
- Newberry, Ord, and Rodman Mountains
- North San Bernardino Mountains (Cushenbury)
- Old Woman and Piute Mountains
- Pinto Mountains
- Riverside Mountains
- Sacramento Mountains
- San Gorgonio Wilderness Area (eastern portion within Plan Area)

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- Sheephole Mountains and Calumet Mountains
- South Bristol Mountains
- Turtle Mountains
- Whipple Mountains

Southern Metapopulation Fragment

- Chuckwalla Mountains
- East Chocolate Mountains and Cargo Muchacho Mountains
- Palo Verde Mountains

Peninsular Ranges Distinct Population Segment (DPS)

- Coyote Mountains
- Fish Creek Mountains
- Jacumba Mountains
- Santa Rosa Mountains
- Vallecito Mountains
- Tierra Blanca

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Appendix 2 Desert Bighorn Sheep Mountain Range Herd Unit Intermountain Linkages within each Metapopulation Fragment within the DRECP Outside of Department of Defense and National Park Service

Northern Metapopulation Fragment

- Panamint Valley between Argus Range and Panamint Range
- Searles Valley between the Argus Range and Slate Range
- Greenwater Valley between the Black Mountains and Greenwater Range
- Amargosa Valley between the Greenwater Range and Resting Spring Range
- Chicago Valley between the Resting Spring Range and Nopah Range
- California Valley between the Nopah Range and the Kingston Range
- Silurian Valley between the Avawatz Mountains and the Silurian Hills
- Valley habitat between Soda and Cronese Mountains (adjacent to and stops at I-15; does not extend to Cady Mountains)
- Habitat between Soda and Cronese Mountains and Cady Mountains (also in North-Central Metapopulation Fragment) (merged with dispersal/migration corridor between Cady Mountains and Mojave National Preserve)
- Dispersal and migration corridors between the Avawatz Mountains and the Kingston Range to the Clark Mountain Range
- Habitat between Shadow Mountain and Turquoise Mountain (also in North-Central Metapopulation Fragment) to the northwest boundary of Mojave National Preserve

Northern-Central Metapopulation Fragment

- Habitat between Soda and Cronese Mountains and Cady Mountains (also in Northern Metapopulation Fragment)
- Dispersal and migration corridors between the Cady Mountains and Mojave National Preserve

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- Mojave River Wash and Devil's Playground between the Cady Mountains and Bristol Mountains to the western boundary of Mojave National Preserve
- Piute Valley between Piute Range and Dead Mountains east of Mojave National Preserve

South-Central Metapopulation Fragment

- Dispersal and migration corridors between the North San Bernardino Mountains (Cushenbury) and Newberry Mountains to the western boundary of Twentynine Palms Marine Corps Base
- Dispersal and migration corridors between the southern tip of the Bullion Mountains at the southeast boundary of Twentynine Palms Marine Corps Base and Sheephole Mountains to the northern extremity of the Coxcomb Mountains
- Dispersal and migration corridors between the San Gorgonio Wilderness Area and the western extremity of the Little San Bernardino Mountains
- Dispersal and migration corridors between the South Bristol Mountains and Marble/Clipper Mountains to the Old Woman, Turtle, Whipple, and Chemehuevi Mountains
- Fenner Valley between Clipper Mountains and Old Woman Mountains to the southern boundary of Mojave National Preserve
- Habitat in Amboy area between Bristol Mountains and Bullion Mountains north of Twentynine Palms Marine Corps Base
- Johnson Valley between the Rodman Mountains and Lava Bed Mountains and the San Bernardino Mountains
- Valley habitats between the Palen-McCoy Mountains, Little Maria and Big Maria Mountains, and the Riverside Mountains
- Chuckwalla Valley between the Eagle Mountains and the Chuckwalla Mountains (also in Southern Metapopulation Fragment)
- Valley habitats between the Little Chuckwalla Mountains, Palo Verde Mountains, McCoy Mountains, Mule Mountains, Little Mule Mountains, and the northern boundary of the Chocolate Mountains Aerial Gunnery Range (also in Southern Metapopulation Fragment)
- Dispersal and migration corridors between the Old Woman Mountains and Iron Mountains to the Granite (Riverside County) and Coxcomb Mountains east of Joshua Tree National Monument

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- Valley habitats between the Sacramento and Chemehuevi Mountains
- Valley habitats between the Chemehuevi and Whipple Mountains
- Valley habitats between San Gorgonio Wilderness Area (eastern portion within Plan Area) and the Little San Bernardino Mountains

Southern Metapopulation Fragment

- Chuckwalla Valley between the Eagle Mountains and the Chuckwalla Mountains (also in South-Central Metapopulation Fragment)
- Valley habitats between the Little Chuckwalla Mountains, Palo Verde Mountains, Mule Mountains, Little Mule Mountains, and the northern boundary of the Chocolate Mountains Aerial Gunnery Range
- Valley habitats between the northern boundary of the Chocolate Mountains Aerial Gunnery Range, Chuckwalla Mountains, and the Orocopia Mountains
- Valley habitats between the Cargo Muchacho, Trigo, and Picacho Mountains
- Dispersal and migration corridors between the Chuckwalla Mountains and the Orocopia Mountains

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Mohave Ground Squirrel Xerospermophilus mohavensis MGS

Pertinent species biological goals and objectives:

Goal MGS1: Conserve suitable habitat (see Appendix A – Glossary of Terms) required for the long-term management and conservation of MGS, excluding habitat within Department of Defense (DOD) installations. Emphasize conservation in 1) MGS key population centers; 2) habitat linkages and corridors; 3) expansion areas; and 4) areas where MGS are most likely to be adaptive and resilient in response to the effects of changes within their metapopulation, including range shifts, contractions, or expansions; local extirpation and recolonization; as well as environmental changes in climate, temperature, and precipitation (climate change extensions) (all referred to as important areas, see Maps 1 and 2). Emphasize conservation of habitat adjacent to already existing conserved habitat but not within habitat already conserved in perpetuity. Examples of habitat conservation are presented in Appendix B.

- **Objective MGS1.1:** Conserve at least 474,013 total acres of suitable habitat in specific geographic regions that are required for MGS population viability, identified as key population centers. This includes conservation of 337,482 acres of public land (*i.e.,* land managed by Bureau of Land Management (BLM) and other public agencies) and 135,253 acres of private land (*i.e.*, privately owned parcels). Key population centers are presented in Maps 1 and 2, described by Leitner (2008, 2013), and are listed below:[1,2]
    - Coso Range-Olancha, portion within the DRECP boundary
    - Little Dixie Wash
    - Coolgardie Mesa-Superior Valley, portion outside of the DOD installations (Naval Air Weapons Station China Lake (China Lake) and National Training Center at Fort Irwin (Fort Irwin))
    - Edwards Air Force Base (EAFB), portion outside of the DOD installation
    - Desert Tortoise Natural Area (DTNA)
    - Boron/Kramer Junction, originally described by Leitner (2008) and extended by the Kramer-Red Mountain study area detections in Leitner (2013)
    - Pilot Knob

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- Ridgecrest, eastern portion of the population originally described in Leitner (2008) (outside Ridgecrest city limits), and the portion outside of the DOD installation (China Lake)
- North Searles Valley
- Harper Lake
- Fremont Valley/Spangler, described by Leitner (2013) as Fremont Valley/Teagle

- **Objective MGS1.2:** Conserve population expansion areas consisting of suitable habitat within 5 miles of key population centers listed in Objective MGS1.1 to provide for dispersal or migration, additional connectivity between populations, and preservation of contiguous habitat[3] (approximately 561,865 acres total). This includes conservation of 259,234 acres of public land and 227,966 acres of private land.).

- **Objective MGS1.3:** Conserve at least 415,879 acres of high-priority habitat linkages and corridors important to genetic exchange[4] between key population centers or for shifts in the MGS range in response to climatic changes. Conserve linkages in suitable habitat or valleys, passes, or minimally rocky terrain under 5,000 feet. Conserve linkages that are at least 3 miles wide or wider as noted below[5]. These linkages are presented in Maps 1 and 2, described below, and based on modeled habitat[6], detection data[7,8,9], hypothesized linkages and detections described by Leitner (2008, 2013), and expert opinion[3,10,11]. This includes conservation of 293,607 acres of public land and 106,259 acres of private land.).
  - Owens East and Owens West, connecting Coso Range-Olancha to north Owens Valley, on the east and west sides of Owens Lake
  - West of China Lake, connecting Coso Range-Olancha to Little Dixie Wash
  - South of Ridgecrest, at least 6 miles of habitat south of the town of Ridgecrest connecting Little Dixie Wash with Fremont Valley/Spangler and Ridgecrest population centers
  - Ridgecrest-Searles, at least 6 miles of habitat south of the Ridgecrest population center connecting the South of Ridgecrest linkage and the Ridgecrest population center to North Searles Valley, along State Route 178 and through Spangler Hills, and including the strip of habitat east of Searles Lake and west of China Lake

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- Central, a 6-mile-wide north-south linkage connecting Fremont Valley/Spangler to Boron/Kramer Junction, along U.S. 395, with 3-mile-wide linkages extending east through the Almond Cove/Cuddeback Lake area to Pilot Knob and west to DTNA, and a 3-mile wide linkage connecting Fremont Valley/Spangler southeast to Pilot Knob.
- DTNA-Edwards, connecting the southwestern edge of DTNA to the town of North Edwards, east of California City
- Pilot-Coolgardie, connecting Pilot Knob to Coolgardie Mesa-Superior Valley, through Superior Valley
- Harper-Coolgardie, connecting Harper Lake to Coolgardie Mesa-Superior Valley through habitat north of Harper Lake and south of the Black Hills
- Kramer-Harper-Edwards, connecting EAFB to Boron/Kramer Junction and Harper Lake, along the north and east borders of the EAFB installation, on both sides of U.S. 395 and State Route 58.

- **Objective MGS1.4:** Identify disturbances that cause barriers to MGS movement within linkages and corridors described in Objective MGS1.3, and under the plan of a desert restoration specialist, identify and restore barriers as feasible to facilitate movement.
- **Objective MGS1.5:** Conserve at least 217,761 acres of suitable habitat, within or outside of the historic range of MGS, that is considered by the best available science and habitat models to be suitable for MGS occupancy[6, 9, 10] in the event of range and distribution shifts in response to climate change (climate change extensions). This includes conservation of 194,926 acres of public land and 22,836 acres of private land. Climate change extensions are presented in Maps 1 and 2 and are described below:
    - Habitat and potential future habitat in Owens Valley, up to 40 miles north of Owens Lake (to the northwest boundary of the DRECP)
    - Habitat and potential future habitat west of the Little Dixie Wash population, including low foothills and valleys, from the Scodie Mountains to the north, to the Piute Mountains to the west, to the mountains south of Jawbone Canyon Road
- **Objective MGS1.6:** Complement DOD efforts to protect MGS populations and linkages within military installations by conserving suitable habitat adjacent to DOD lands with MGS populations.

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References

[1] Leitner, P. 2008. Current status of the Mohave ground squirrel. Transactions of the Western Section of the Wildlife Society 44:11-29.

[2] Leitner, P. 2013. MGS camera study 2011-2012. Report to California Department of Fish and Wildlife, second draft.

[3] Mohave Ground Squirrel Technical Advisory Group. 2010. Mohave ground squirrel conservation priorities. Unpublished white paper for the Mohave Ground Squirrel Working Group.

[4] Bell, K.C. and M.D. Matocq. 2011. Regional genetic subdivision in the Mohave ground squirrel: evidence of historic isolation and ongoing connectivity in a Mojave Desert endemic. Animal Conservation 14(4):371-381.

[5] Penrod, K., P. Beier, E. Garding, and C. Cabañero. 2012. A Linkage Network for the California Deserts. Produced for the Bureau of Land Management and The Wildlands Conservancy. Produced by Science and Collaboration for Connected Wildlands, Fair Oaks, CA. www.scwildlands.org and Northern Arizona University, Flagstaff, Arizona, http://oak.ucc.nau.edu/pb1/.

[6] Inman, R.D., T.C. Esque, K.E. Nussear, P. Leitner, M. Matocq, P. Weisberg, T. Dilts, and A. Vandergast.. 2013. Is there room for all of us? Renewable energy and Xerospermophilus mohavensis. Endangered Species Research. DOI 10.3354/esr00487, Vol. 20:1-18.

[7] California Natural Diversity Database, California Department of Fish and Wildlife Biogeographic Data Branch, http://www.dfg.ca.gov/biogeodata/cnddb/.

[8] California Department of Fish and Wildlife GIS data for the Desert Renewable Energy Conservation Plan. See Appendix C.

[9] Aardahl, J.B. and P. Roush. 1985. Distribution, relative density, habitat preference and seasonal activity levels of the Mohave ground squirrel (Spermophilus mohavensis) and antelope squirrel (Ammospermophilus leucurus) in the western Mojave Desert, California. U.S. Bureau of Land Management. Rep., California Desert District (Riverside, CA), 24 pp + append

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[10] Mohave ground squirrel workshop, Barstow, CA, July 17-24, 2012. Presentations and discussions.

[11] Dr. Phil Leitner, CSU Stanislaus, personal communication.

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Appendices

Appendix A – Glossary of Terms

Corridor – Land that is not suitable habitat for residency but is suitable for movement (does not present a movement barrier) between key population centers.

Disturbance - Graded or cleared top soil, and removed or crushed shrubs and associated grasses and forbs; an area generally denuded of vegetation, hardscaped, or otherwise a barrier to MGS movement or occupancy.

Habitat Model or Modeled Habitat – MGS habitat suitability model data prepared by the U.S. Geological Survey (USGS) for Inman, *et. al.* (2013), and the Department of Fish and Wildlife (DFW) Renewable Energy Program disturbance layer analysis (See Appendix C). This definition includes any future habitat suitability model or model revision approved by the Department of Fish and Wildlife and U.S. Fish and Wildlife Service (Wildlife Agencies).

Key population centers – Known areas of contiguous habitat with high detection rates and evidence of breeding or juvenile recruitment, including populations that have been persistent over time.

Linkage - Suitable habitat (up to six miles wide) that connects key population centers and/or other contiguous blocks of suitable habitat.

Suitable Habitat – Habitat within the MGS range that includes undisturbed or partially disturbed desert communities suitable for MGS occupancy and movement, determined through suitability models (0.6 or higher in the USGS habitat model developed for Inman et. al. (2013)), and/or as determined by a method approved by the Wildlife Agencies (*e.g.*, ground surveys and detection data). Examples of suitable habitat characteristics include: medium textured gravelly soil in flat, level terrain or in an alluvial fan, with native shrubs and an understory of native forbs and grasses. Suitable habitat is commonly associated with creosote bush (*Larrea tridantata*) scrub or desert saltbush (*Atriplex* sp.) scrub communities, with the presence of burrobush (*Ambrosia dumosa*), spiny hopsage (*Grayia spinosa*), winterfat (*Krascheninnikovia lanata*), Cooper's boxthorn (*Lycium cooperi*), or Cooper's goldenbush (*Ericameria cooperi*). Suitable habitat can also include Mojave mixed woody scrub, Mojave mixed steppe, blackbush scrub, and Joshua tree (*Yucca brevifolia*) woodland communities.

Appendix B – Examples of Habitat Conservation

Examples of habitat conservation include but are not limited to the following types of land, including funds to manage the properties for effective conservation:

- Acquired mitigation property through California Endangered Species Act incidental take permits, the California Environmental Quality Act, National Environmental Policy Act, Lake and Streambed Alteration Agreements, California Energy Commission, Natural Community Conservation Planning Act, Habitat Conservation Plans, U.S. Fish and Wildlife Service (USFWS) incidental take authorizations, or other regulatory mechanisms, generally managed for the resource in perpetuity
- Mitigation property through conservation easements, generally managed for the resource in perpetuity
- Mitigation property on land managed by the California Department of Fish and Wildlife (CDFW) (Habitat Management land), generally managed for the resource in perpetuity
- Legally or legislatively protected parks, reserves, or wilderness areas (State or federal)
- CDFW wildlife areas or ecological areas
- BLM designated ACECs, NLCS, wildlife lands, or other lands managed for uses compatible with conservation of natural resources
- County lands designated as open space or for natural resource protection, managed for uses compatible with conservation of natural resources
- USFWS critical habitat units for desert tortoise (*Gopherus agassizii*) or Lane Mountain milk-vetch (*Astragalus jaegerianus),* managed for endangered species conservation
- Lands purchased and/or managed by regional conservation districts, non-profit groups, counties, land trusts, conservancy programs, or environmental associations, including but not limited to:
  - Mojave Desert Resource Conservation
  - Desert Tortoise Preserve Committee
  - Mojave Desert Land Trust
  - Wildlands Conservancy
  - Transition Habitat Conservancy
  - Williamson Act open space lands (not used for tilled agriculture)
  - Significant Ecological Areas (Los Angeles County)
  - Antelope Valley Conservancy lands

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Appendix C – CDFW Metadata for Maps of MGS Important Areas

Purpose: Data for the maps originated with the California Department of Fish and Wildlife (CDFW) (formerly the California Department of Fish and Game). They were created for the purpose of defining the most important areas of suitable habitat to focus on for conservation of the Mohave Ground Squirrel (MGS) within the Desert Renewable Conservation Plan (DRECP) boundary. Habitat on Department of Defense Land and outside of the DRECP boundary was excluded from the analysis.

Methodology: The MGS Important Areas data set combined detection data, Leitner (2008, 2013), disturbance data, topography, and suitable habitat modeled by USGS for Inman, *et al.* (2013) (USGS model), in order to identify areas of high priority for the conservation of the MGS.

A disturbance model was derived by combining disturbance data from the following sources:

- The Department of Conservation Farmland Mapping and Monitoring Program (FMMP) data set (used to identify vacant or disturbed lands, urban, water, or farmland). Source: Department of Conservation, downloaded September 2012.
- National Vegetation Classification System (NVCS) data, used to identify herbaceous, agricultural, developed/disturbed, and rocky or barren lands. Source: Dudek Consulting DRECP landcover dataset.
- The Nature Conservancy Disturbance Data from the Mojave Desert Ecological Assessment, accessed 9/14/2012. Source: The Nature Conservancy. Used to identify land conversion status.
- The Department of Fish and Wildlife VegCAMP (Vegetation Classification and Mapping Program) data. Accessed September, 2012. Used to identify anthropogenically disturbed areas and areas with high incidence of exotics.

These data sets were combined using ArcGIS geoprocessing to create a raster with values ranging from 0 to 8. Any area with a value of 3 or lower was classified as not disturbed for the purposes of MGS habitation. Note: some areas may have been disturbed by OHV use, but MGS is able to adapt to OHV use so these areas were not considered disturbed within the context of this model. Only areas disturbed relative to MGS usage were defined as disturbed by this model.

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This model was combined with the USGS model (Draft version from October, 2012) in order to classify habitats as suitable or non-viable. Non-viable habitat was not included in the maps. Suitable habitat was undisturbed, based on the derived disturbance model described above, and suitability values greater than 0.7 in the USGS model. Additionally, “biogeographic islands” which were isolated geographically from connecting habitat, terrain over 5,000 feet, and habitat outside of the DRECP were manually removed.

Processing Date: February 11, 2013.
Currency Date: February 11, 2013.
Update Frequency: No updates are planned
Creator: California Department of Fish and Wildlife Renewable Energy Program.
Contact: Diane Mastalir
Contact e-mail: diane.mastalir@wildlife.ca.gov

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Maps:

1) Draft Mohave ground squirrel Important Areas, labeled.
2) Draft Mohave ground squirrel Important Areas with terrain.

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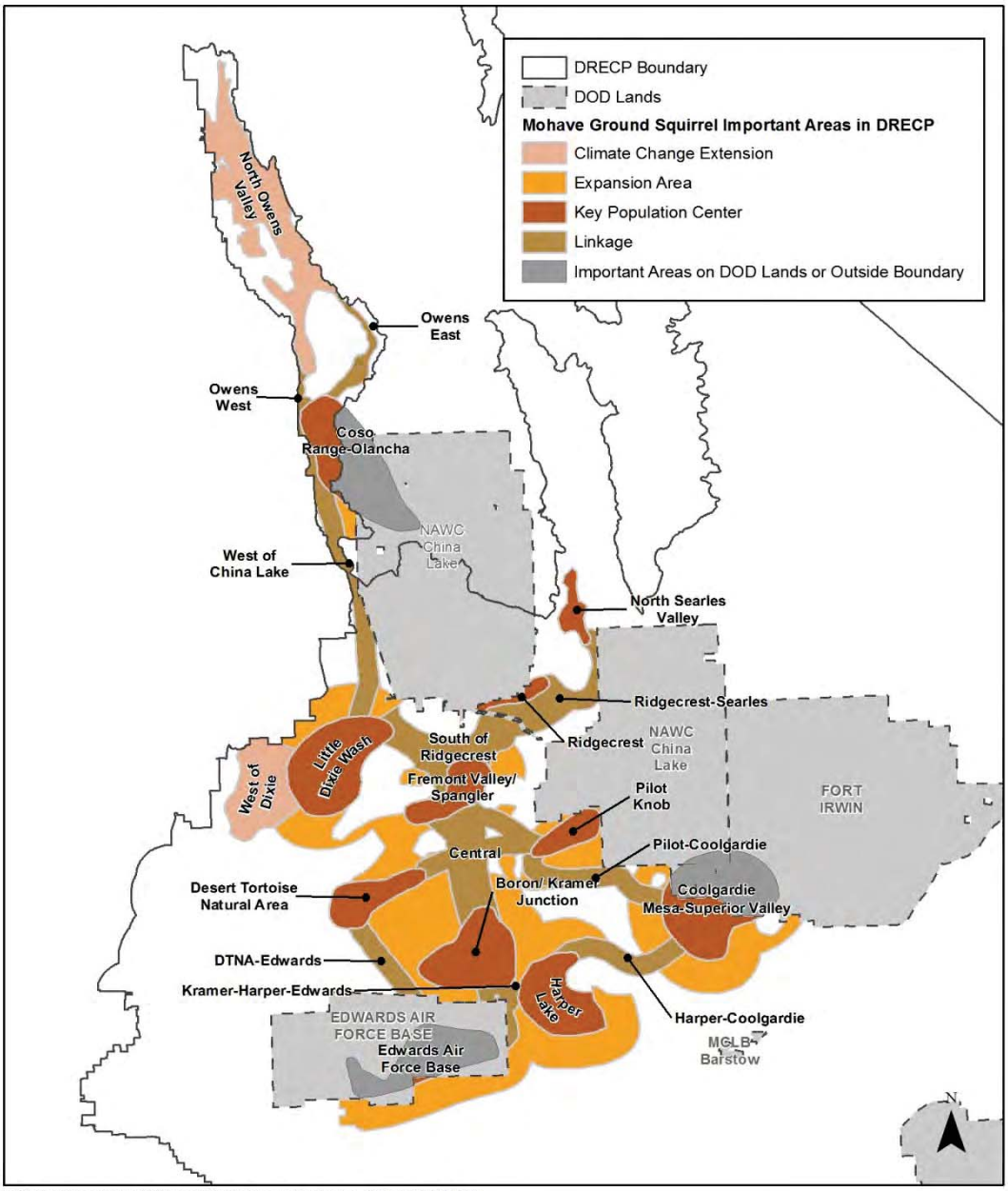
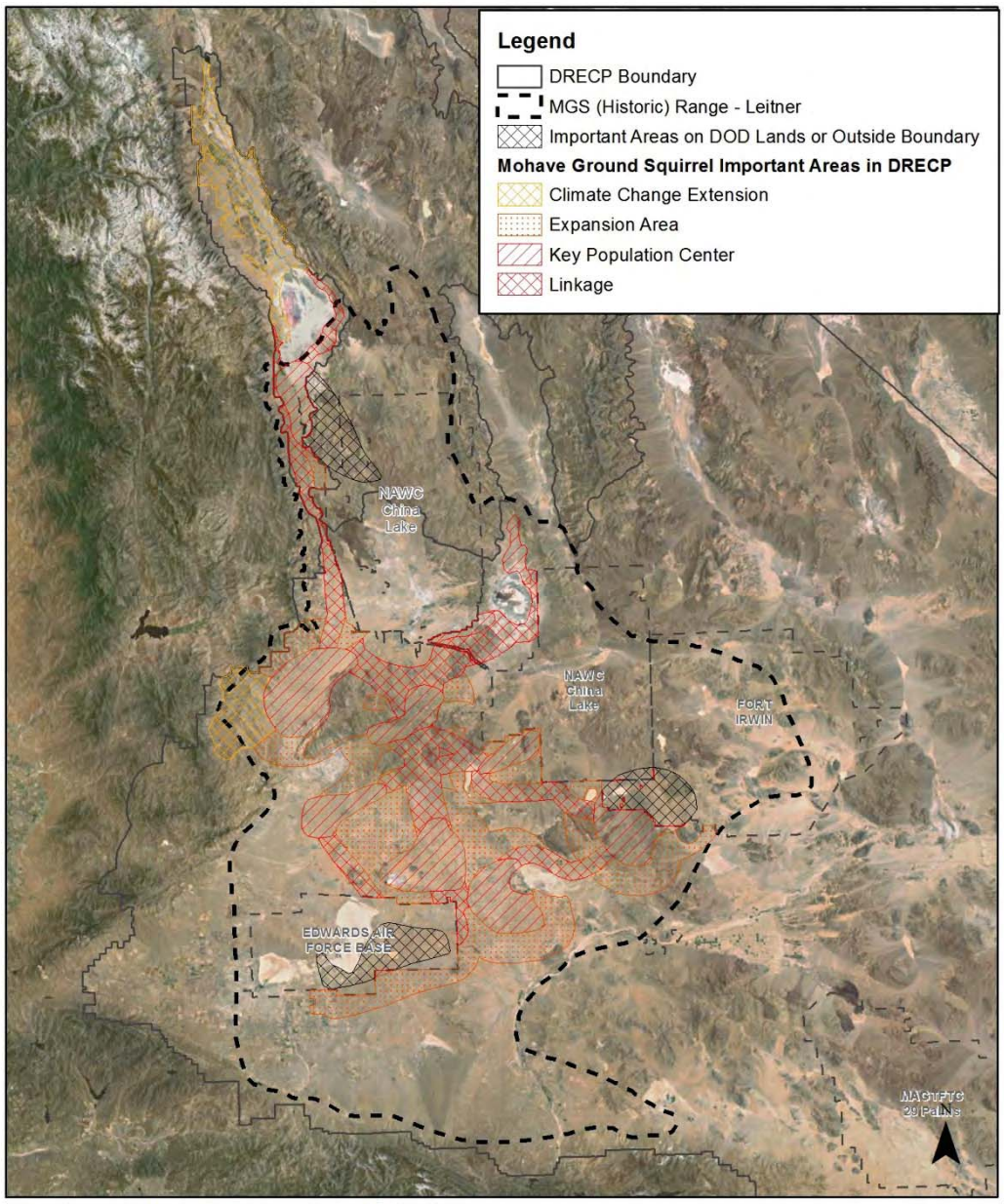


California Department of Fish and Wildlife Renewable Energy. D.Mastalir. 20130321.

0 10 20 40 Miles

Desert Renewable Energy Conservation Plan
Mohave Ground Squirrel Important Areas

MAP1 DRAFT MOHAVE GROUND SQUIRREL IMPORTANT AREAS



California Department of Fish and Wildlife Renewable Energy. D.Mastalir. 20130321.

0 10 20 40 Miles

Desert Renewable Energy Conservation Plan
Mohave Ground Squirrel Important Area Map

MAP2 DRAFT MOHAVE GROUND SQUIRREL IMPORTANT AREAS

Sonoran-Coloradan semi-desert wash woodland/scrub Natural Community: Microphyll Woodland (MW)

SCOWS

Pertinent landscape biological goals and objectives:

Goal MW1: Conserve, restore, and enhance microphyll woodlands within Conservation Areas 1-5.

- **Objective MW1.1:** Conserve the areal extent of at least 90% of all existing microphyll woodlands relative to existing levels in each Conservation Area.

- **Objective MW1.2:** Within existing microphyll woodlands, conserve the areal extent of at least 95% of smoke tree woodland, honey mesquite riparian form and desert willow microphyll woodland rare alliances relative to existing levels in each Conservation Area.

- **Objective MW1.3:** Restore microphyll woodland communities within the plan area to achieve stand and system vigor and health above current conditions.

Goal MW2: Conserve and promote recruitment of older age class stands of microphyll woodland in all Conservation Areas.

Objective MW2.1: Prioritize restoration on larger and more active wash systems that support older microphyll woodland age classes, within at least three systems of each Conservation Area within the first five years of plan operation. Larger and more active washes are defined by length, width and plant vigor.

- **Objective MW2.2:** Prioritize invasive species control efforts and other restoration actions on older microphyll woodland age classes for at least three control efforts in both CA 1 and CA 2 within the first five years of plan operation.

Goal MW3: Increase wildlife usage of microphyll woodlands for all Conservation Areas

- **Objective MW3.1**: Increase bird nesting and cover usage of microphyll woodlands within all Conservation Areas above current levels by the end of the plan period. For list of birds nesting in microphyll woodlands see appendix.

- **Objective MW3.2**: Increase overall wildlife usage of microphyll woodlands within all Conservation Areas above current levels by the end of the plan period. For list of wildlife using microphyll woodlands see appendix.

References

Bureau of Land Management**,** El Centro Field Office, 2010. Imperial Sand Dunes Draft Recreation Area Management Plan and Draft Environmental Impact Statement

Bureau of Land Management, Las Vegas Field Office, 2006. Conservation management strategy for mesquite and acacia woodlands in Clark County, Nevada

McCreedy, Chris, 2011. Birds of Sonoran Desert Xeric Thorn Woodlands: Patterns of Bird Species Composition, Richness, Abundance, and Nest Survivorship, 2003-2010. PRBO Conservation Science Contribution No. 1861, Petaluma CA

Sawyer , J.O., T. Keeler-Wolf, And J.M. Evens, 2009. A Manual of California Vegetation, 2nd ed. California, Native Plant Society, Sacramento, CA.

Seaber, P.R., Kapinos, F.P., and Knapp, G.L., 1987, Hydrologic Unit Maps: U.S. Geological Survey Water-Supply Paper 2294, 63 p.

Appendix

For the purposes of this plan, microphyll woodlands are defined as the desert woodlands comprised of specific vegetation alliances typically associated with the desert wash systems that provide high quality habitat values for desert birds, mammals, and reptiles. These vegetation alliances are listed below. The latter three are designated as "rare" and as such, are subject to higher conservation objectives:

- Blue palo verde - ironwood woodland (*Parkinsonia florida-Olneya tesota)*, more than 150,000 acres within Conservation Areas 1-3 and 5 (CA 1-3 and 5)
- Smoke tree woodland (*Psorothamnus spinosus)* (rare), approximately 14,000 acres within CA 2-5
- Honey mesquite, riparian form (*Prosopis glandulosa)* (rare), approximately 9,100 acres within CA 1-2 and
- Desert willow (*Chilopsis linearis)* (rare), approximately 2,200 acres within CA 1-3.

Known concentrations of microphyll woodland are divided into the following five Conservation Areas (CA) that correspond to the DRECP Ecological Subareas (Dudek and Recon):

- Cadiz Valley and Chocolate Mountains Ecological Subarea (1)
- Imperial Valley in the Imperial Borrego Valley Ecological Subarea (2)
- Pinto Lucerne Valley and Eastern Slopes Ecological Subarea (3)
- Providence and Bullion Mountains Ecological Subarea (4)
- Piute Valley and Sacramento Ecological Subarea (5)

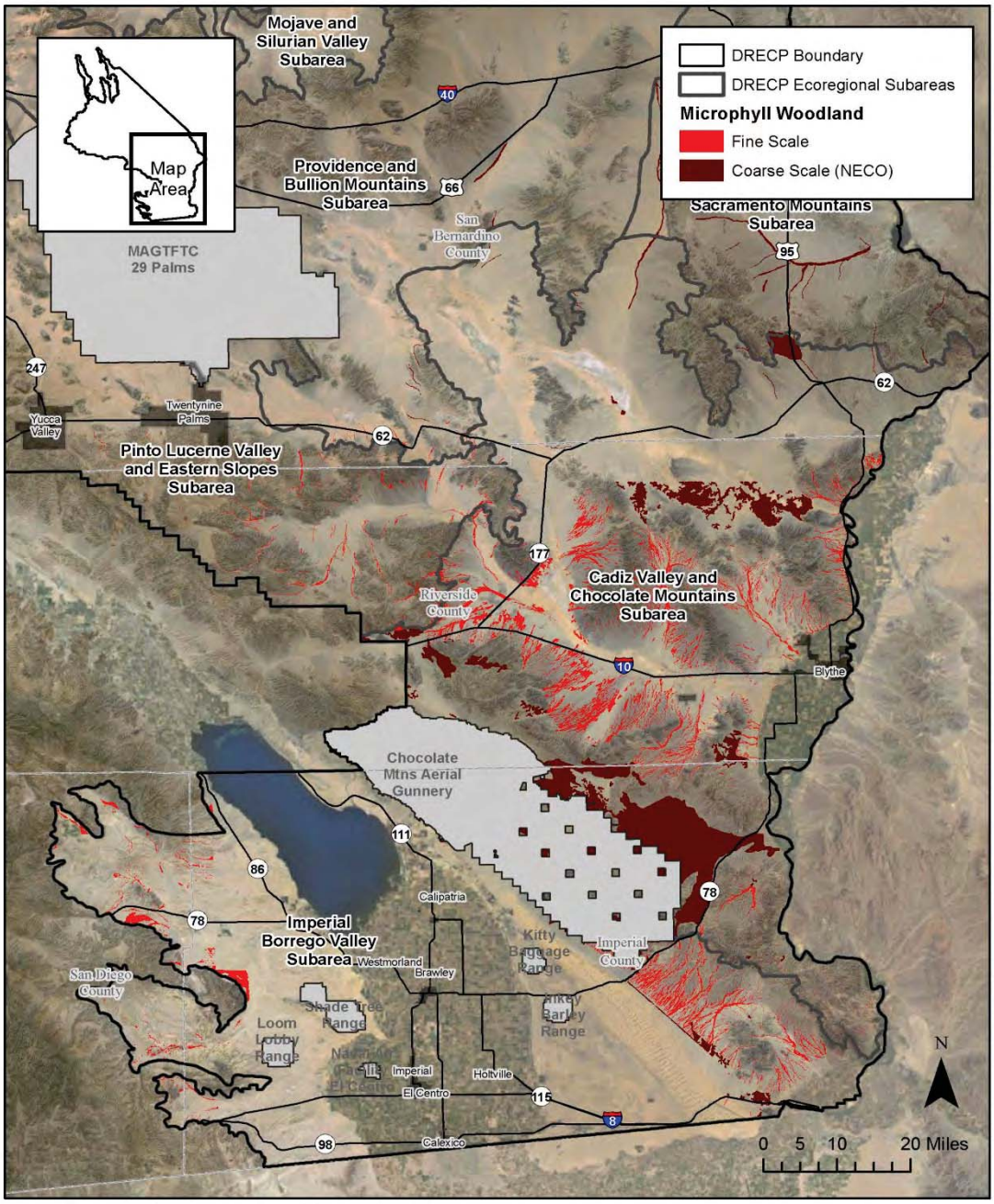
Birds nesting in microphyll woodlands:

- Southwestern willow flycatcher
- Least Bell's vireo
- Bendire's thrasher
- Crissal thrasher
- Lucy's warbler

Wildlife using microphyll woodlands:

- Burro deer
- Leaf-nosed bat
- Couch's spadefoot toad
- Big horn sheep

Map



Department of Fish and Wildlife Renewable Energy. D.Mastalir. 20120211.

Surveyed Microphyll Woodlands within Boundary of Desert Renewable Energy Conservation Plan

DRAFT MICROPHYLL WOODLANDS MAP

May 20, 2013

Dear DRECP Stakeholders:

As part of our commitment to foster transparency, the DRECP team is releasing three sets of draft Biological Goals and Objectives (BGOs); these represent the second subset of draft BGOs for the Desert Renewable Energy Conservation Plan (DRECP) "driver" species and natural communities. Driver species and communities are considered, for purposes of the DRECP, representative of the range and scope of conservation actions that will become part of the overall conservation strategy and approach for the DRECP.

As with other recent DRECP draft documents, there is no formal comment period and, while we are happy to receive comments, we do not anticipate responding to comments other than reflecting our evaluation of comments in the draft DRECP document. The draft DRECP is scheduled for public review later this year.

Thanks again for your participation in the planning process. Please free to call or email if you have any questions.

Best regards,
David L. Harlow
Director
Desert Renewable Energy Conservation Plan
(916) 418-4397

Mojave Desert tortoise (*Gopherus agassizii*)
DETO

Goal DETO 1 (Tortoise Conservation Areas): Within each desert tortoise recovery unit (see Figure 1) that overlaps the plan area, maintain well-distributed populations in Tortoise Conservation Areas (USFWS 2011) through a reserve system that provides sufficient contiguous size and configuration to provide long-term population viability, connectivity, growth in recovery unit population size, and increases in recovery unit distribution.

Objective DETO 1.1 (Tortoise Conservation Areas): Maintain and protect all suitable, intact desert tortoise habitat[1] on public lands within Tortoise Conservation Areas[2] and acquire strategically located in-holdings and private lands adjacent to Tortoise Conservation Areas for incorporation into the reserve system(see Figure 5).

The following Tortoise Conservation Areas that overlap the DRECP plan area are identified by recovery unit (see Figures 1 and 2).

West Mojave Tortoise Conservation Areas

- Desert Tortoise Research Natural Area
- Fremont-Kramer Desert Wildlife Management Area and Critical Habitat Unit
- Superior-Cronese Desert Wildlife Management Area and Critical Habitat Unit
- Ord-Rodman Desert Wildlife Management Area and Critical Habitat Unit

Colorado Desert Tortoise Conservation Areas

- Pinto Mountains Desert Wildlife Management Area and Critical Habitat Unit
- Chuckwalla Desert Wildlife Management Area and Critical Habitat Unit
- Chemehuevi Desert Wildlife Management Area and Critical Habitat Unit
- Piute Valley Desert Wildlife Management Area and Critical Habitat Unit
- Joshua Tree National Park

[1] Suitable, intact habitat is defined as any habitat known to contain desert tortoises or desert tortoise sign based on past surveys, any habitat found to contain desert tortoises or desert tortoise sign during pre-project surveys, or any habitat containing a habitat potential 0.2 or greater based on (Nussear et al. 2009)(see Figure 5).

[2] Tortoise Conservation Areas, including those identified above are defined in the recovery plan for the Mojave population of the desert tortoise (Service 2011).

Eastern Mojave Tortoise Conservation Areas

- Shadow Valley Area of Critical Environmental Concern
- Ivanpah Valley Area of Critical Environmental Concern
- Ivanpah Critical Habitat Unit
- Mojave National Preserve
- Death Valley National Park

Objective DETO 1.2 (Tortoise Conservation Areas): Maintain no net loss in the quantity of conserved desert tortoise habitat within each Tortoise Conservation Area in the plan area in support of long-term desert tortoise population viability (Recovery Criterion 3).

Objective DETO 1.3 (Tortoise Conservation Areas): Contribute to increasing rates of population change (λ) for desert tortoises (i.e., λ>1) over at least 25 years (a single tortoise generation), as measured by extensive range-wide monitoring across Tortoise Conservation Areas within each recovery unit in the plan area, and by direct monitoring and estimation of vital rates (recruitment, survival) from demographic study areas within each recovery unit (Recovery Criterion 1).

Objective DETO 1.4 (Tortoise Conservation Areas): Increase distribution of desert tortoises throughout each Tortoise Conservation Area in the plan area over at least 25 years (i.e., ψ [occupancy] >0) (Recovery Criterion 2).

Objective DETO 1.5 (Tortoise Conservation Areas): Through reserve design principles, augment Tortoise Conservation Areas, such as Ord-Rodman, with high value contiguous habitat to satisfy population viability parameters in the Recovery Plan.

Goal DETO 2 (Desert Tortoise Linkages): Maintain functional linkages between Tortoise Conservation Areas to provide for long-term genetic exchange, demographic stability, and population viability within Tortoise Conservation Areas. Emphasize inclusion of high value contiguous habitats pursuant to Nussear et al. (2001) and avoidance of disturbance in habitat with high desert tortoise habitat potential (see Figure 5).

Objective DETO 2.1a (Desert Tortoise Linkages): Protect, manage and acquire desert tortoise habitat within the following linkages (see Figure 3) with special emphasis placed on areas of high habitat potential and areas identified as integral to the establishment and protection of a viable linkage network (see Figure 5). Ensure the long-term connectivity of Tortoise Conservation Areas by maintaining desert tortoise habitat that is of sufficient size and contiguity for maintenance of viable populations within each linkage.

- *Ord-Rodman to Superior-Cronese to Mojave National Preserve*
- *Superior-Cronese to Mojave National Preserve to Shadow Valley to Death Valley National Park Linkage*
- *Joshua Tree National Park and Pinto Mountains DWMA to Chemehuevi Linkage*
- *Death Valley National Park to Nevada Test Site*

Objective DETO 2.1b (Desert Tortoise Linkages): Protect, maintain, and acquire all remaining desert tortoise habitat within linkages already severely compromised, specifically the following (see Figure 3).

- *Ivanpah Valley Linkage*
- *Chemehuevi to Chuckwalla Linkage*
- *Pinto Wash Linkage*

Objective DETO 2.1c (Desert Tortoise Linkages): Protect intact habitat (see Figure 4) within the following linkages to enhance the population viability of the Ord-Rodman Tortoise Conservation Area.

- *Ord-Rodman to Joshua Tree Linkage*
- *Fremont Kramer to Ord-Rodman Linkage*

Goal DETO 3 (Desert Tortoise in the Colorado Desert): Maintain desert tortoise populations and linkages in the Colorado Desert (see Figure 4).

Objective DETO 3.1: Protect, maintain and acquire suitable intact desert tortoise habitat in the Colorado Desert.

Goal DETO 4 (Other Intact Desert Tortoise Habitats): Protect desert tortoise in areas of intact desert tortoise habitat in the plan area but outside of the areas described in the previous goals and objectives (see Figure 4).

Objective 4.1: Minimize injury and mortality of desert tortoises in these areas of intact habitat.

Goal DETO 5 (Climate Change): Consistent with goals and objectives in DETO 1, 2, and 3 above, assemble and manage the Tortoise Conservation Area and linkage reserve system to provide for desert tortoise population and range change on the landscape in response to biophysical changes as a result of climate change, shifting vegetation communities, and desert tortoise populations.

Objective DETO 5.1: Apply output of a desert tortoise habitat model (Nussear *et al.* 2009) which has been validated, refined and expanded to consider potential effects of

global climate change on existing desert tortoise habitat (Recovery Action 5.1) to the identification of geo-specific climate change planning elements.

Objective DETO 5.2: Use integrated modeling, monitoring and experimentation that explore the ecological consequences of climate change on future vegetation communities within the range of the desert tortoise to identify geo-specific restoration opportunities relative to changes in vegetation communities and in the face of potential retreat of some invasive species (Recovery Action 5.2; USFWS 2011).

Objective DETO 5.3: Apply the output of population models that (1) estimate habitat quantity and tortoise occupancy needed to sustain populations into the future and (2) incorporate predicted effects of climate change to the identification of geo-specific climate change planning elements (Recovery Action 5.3; USFWS 2011).

References

Averill-Murray, R.C., C.R. Darst, N. Strout, and M. Wong. 2013. Conserving population linkages for the Mojave Desert Tortoise (*Gopherus agassizii*). Herpetological Conservation and Biology 8:in press.

Nussear, K.E., T.C. Esque, R.D. Inman, L. Gass, K.A. Thomas, C.S.A. Wallace, J.B. Blainey, D.M. Miller, and R.H.Webb. 2009. Modeling habitat of the desert tortoise (*Gopherus agassizii*) in the Mojave and parts of the Sonoran Deserts of California, Nevada, Utah, and Arizona. U.S. Geological Survey Open-File Report 2009-1102.

U.S. Fish and Wildlife Service. 2011. Revised recovery plan for the Mojave population of the desert tortoise (*Gopherus agassizii*). Sacramento, California.

U.S. Fish and Wildlife Service. 2012. White paper - Connectivity of Mojave desert tortoise populations. Desert Tortoise Recovery Office. Reno, Nevada.

Maps

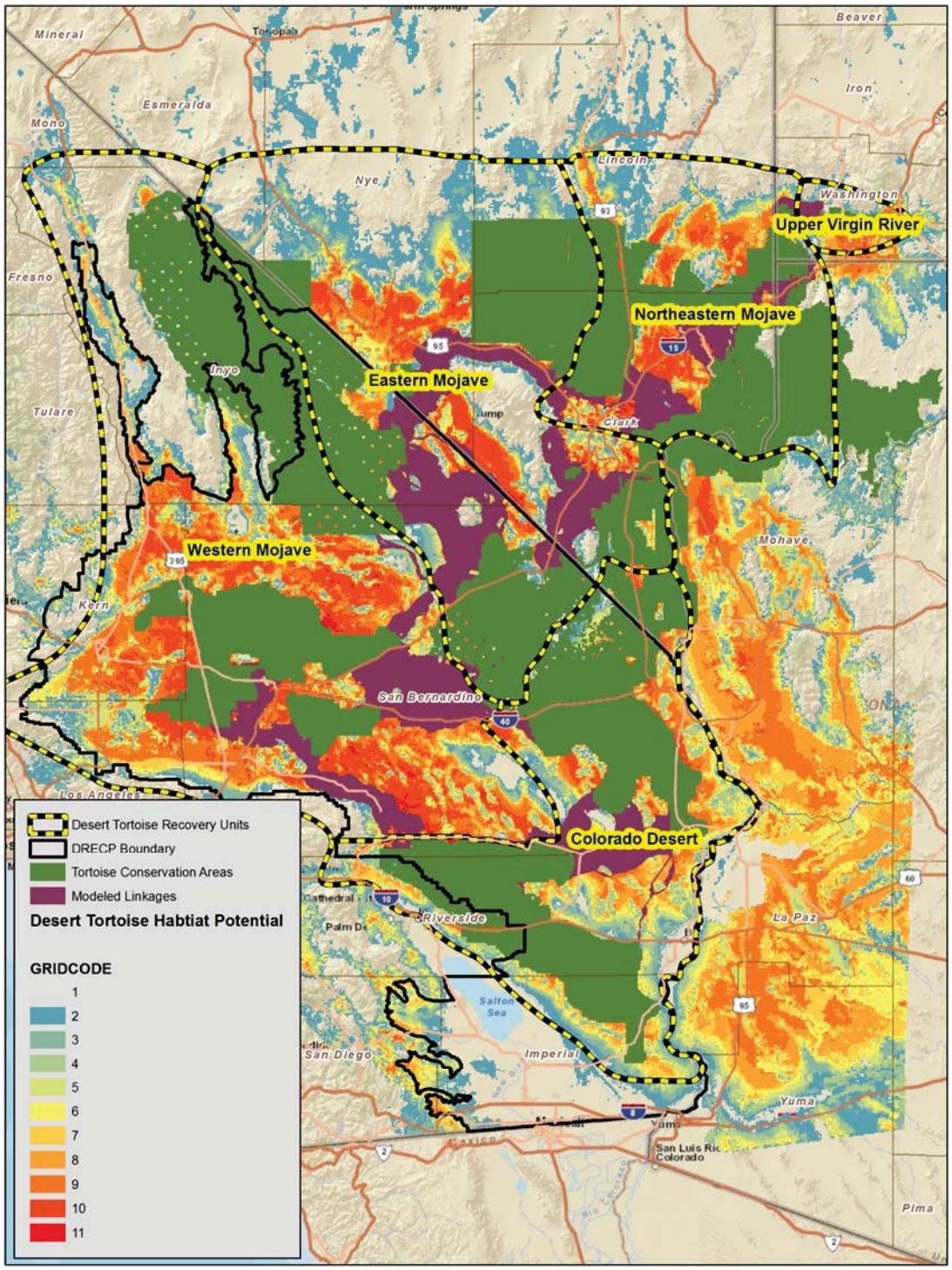


Figure 1 (Context Map) – This map shows the Desert Tortoise Recovery Units, Tortoise Conservation Areas (Service 2010), modeled linkages (Averill-Murray et al. 2013), and Habitat Potential (Nussear et al. 2009)

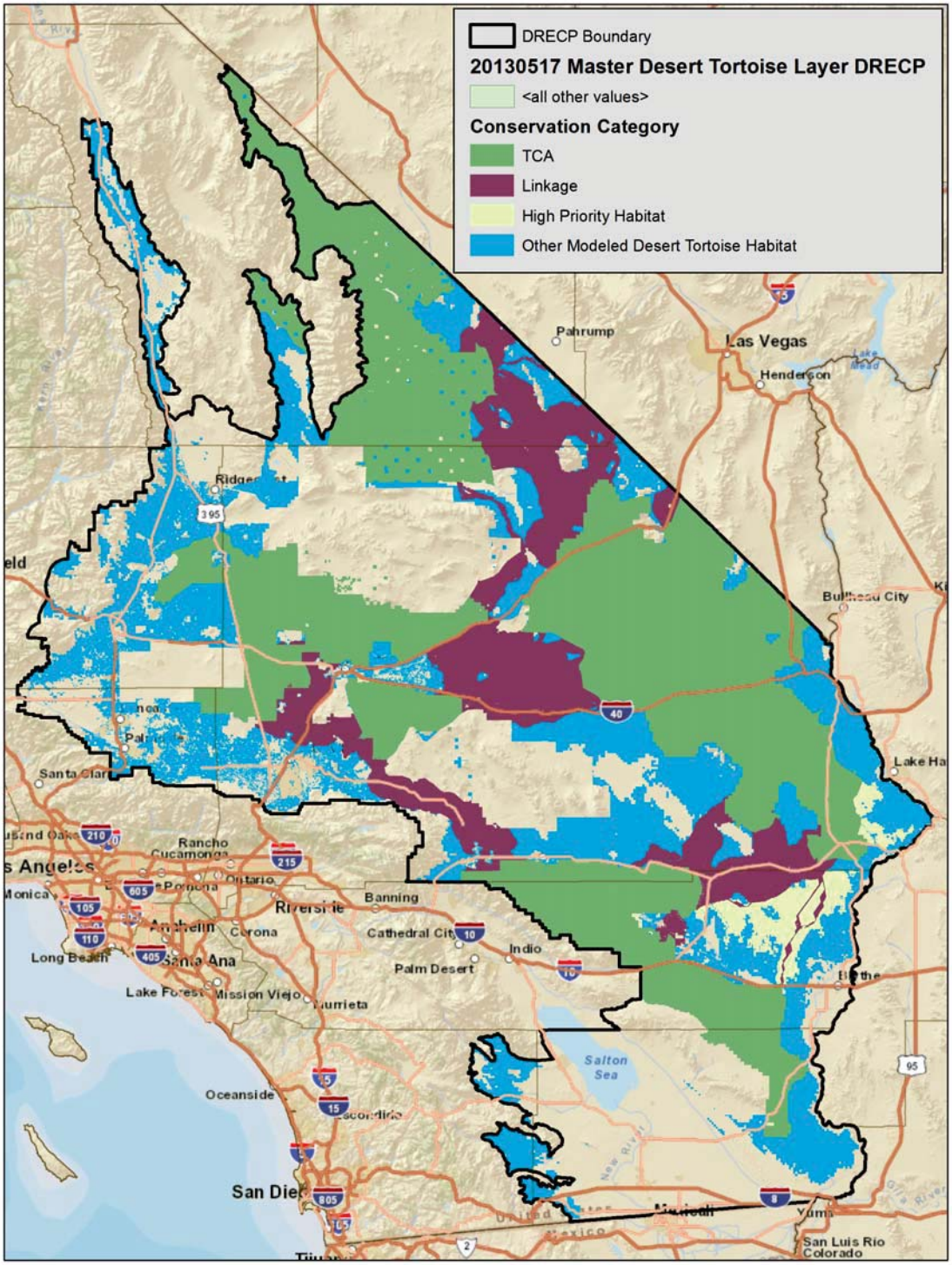


Figure 2 – This map displays the Tortoise Conservation Areas (green), modeled desert tortoise linkages (purple), high-value Colorado Desert habitat (light green), and other potential desert tortoise habitat (blue) within the DRECP Plan Area.

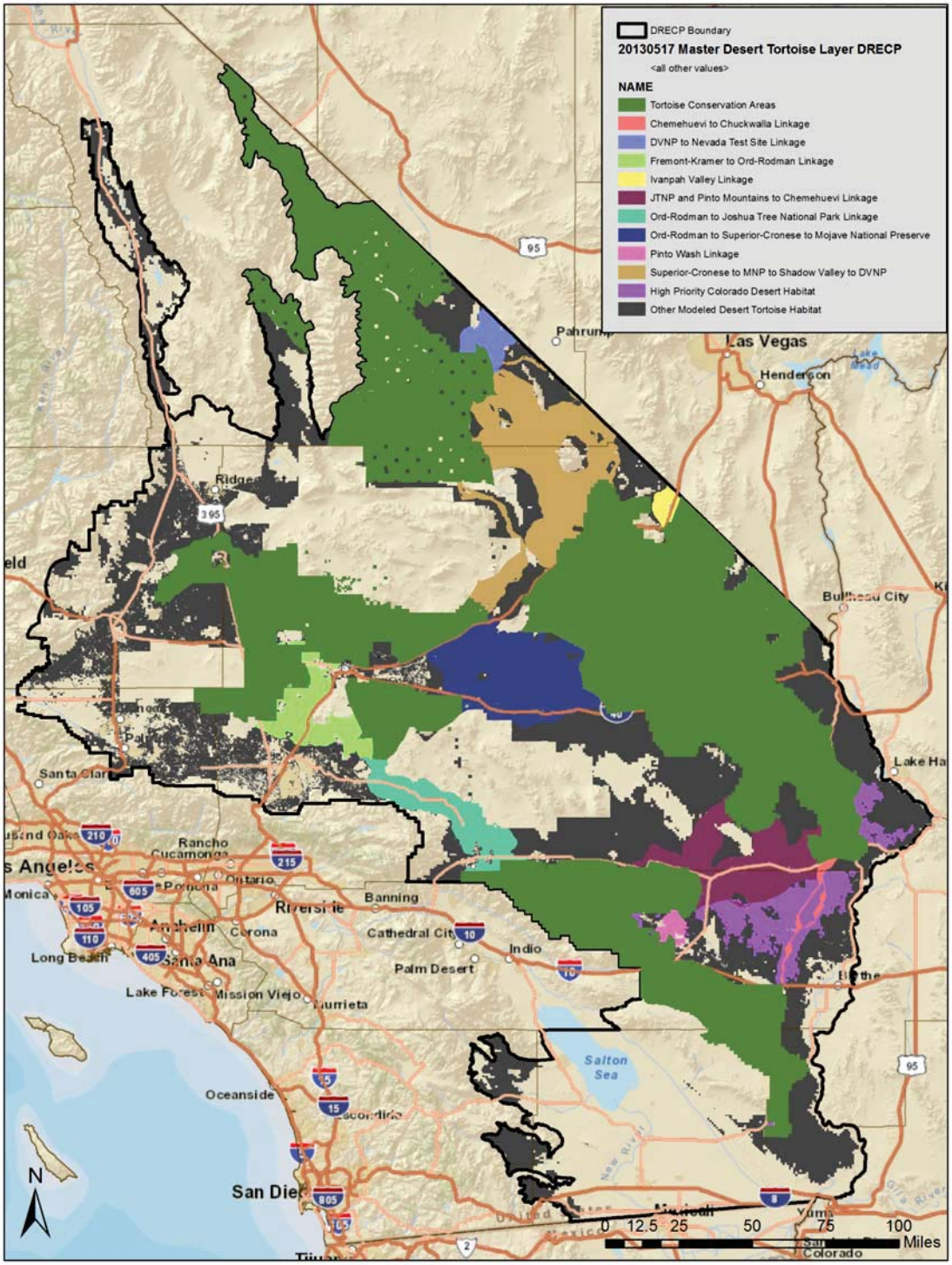


Figure 3 – This map displays the boundaries and names of various features that are referenced in the biological goals and objectives.

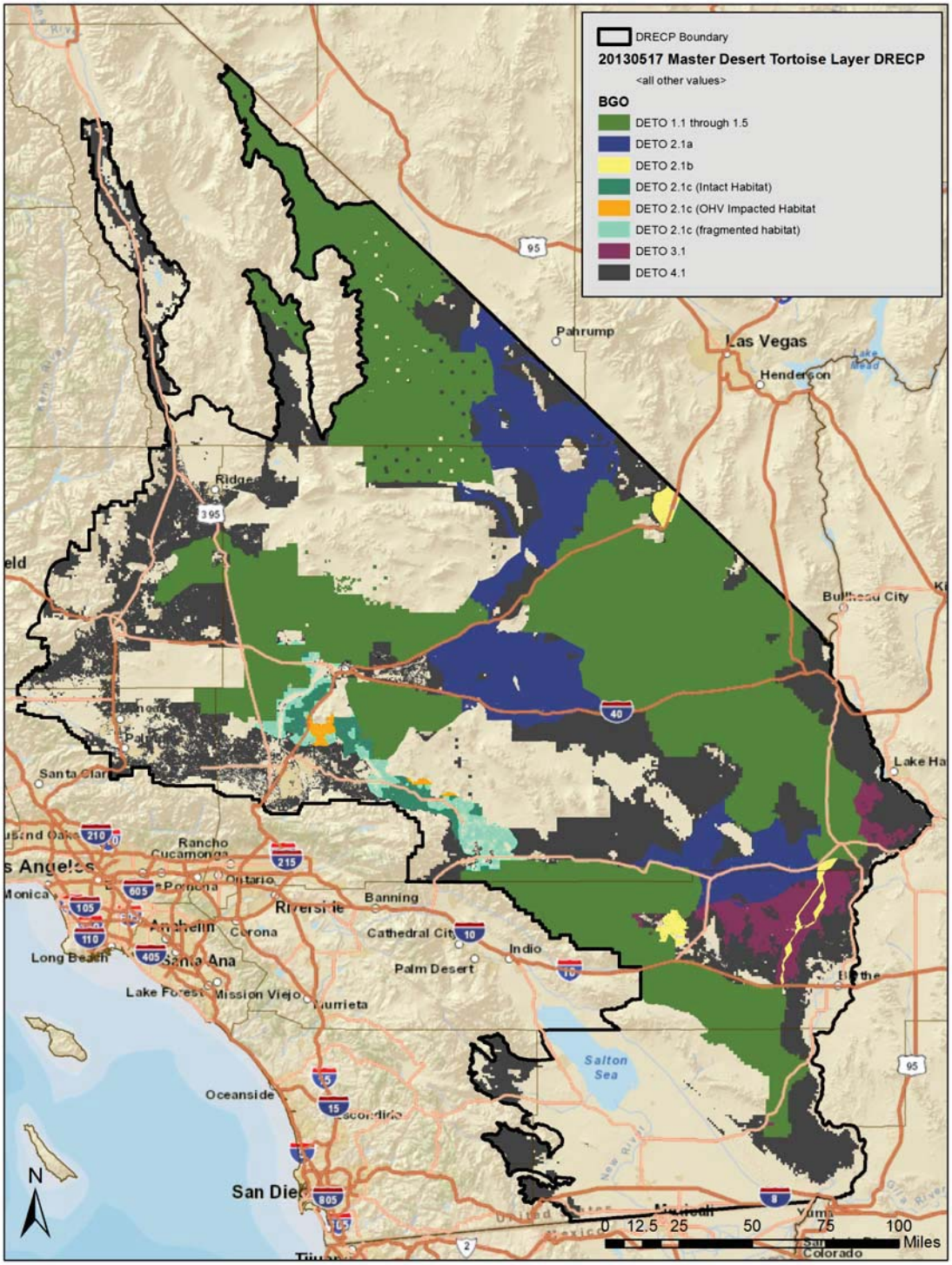


Figure 4 – This map displays the geographic area that each biological goal and objective applies to.

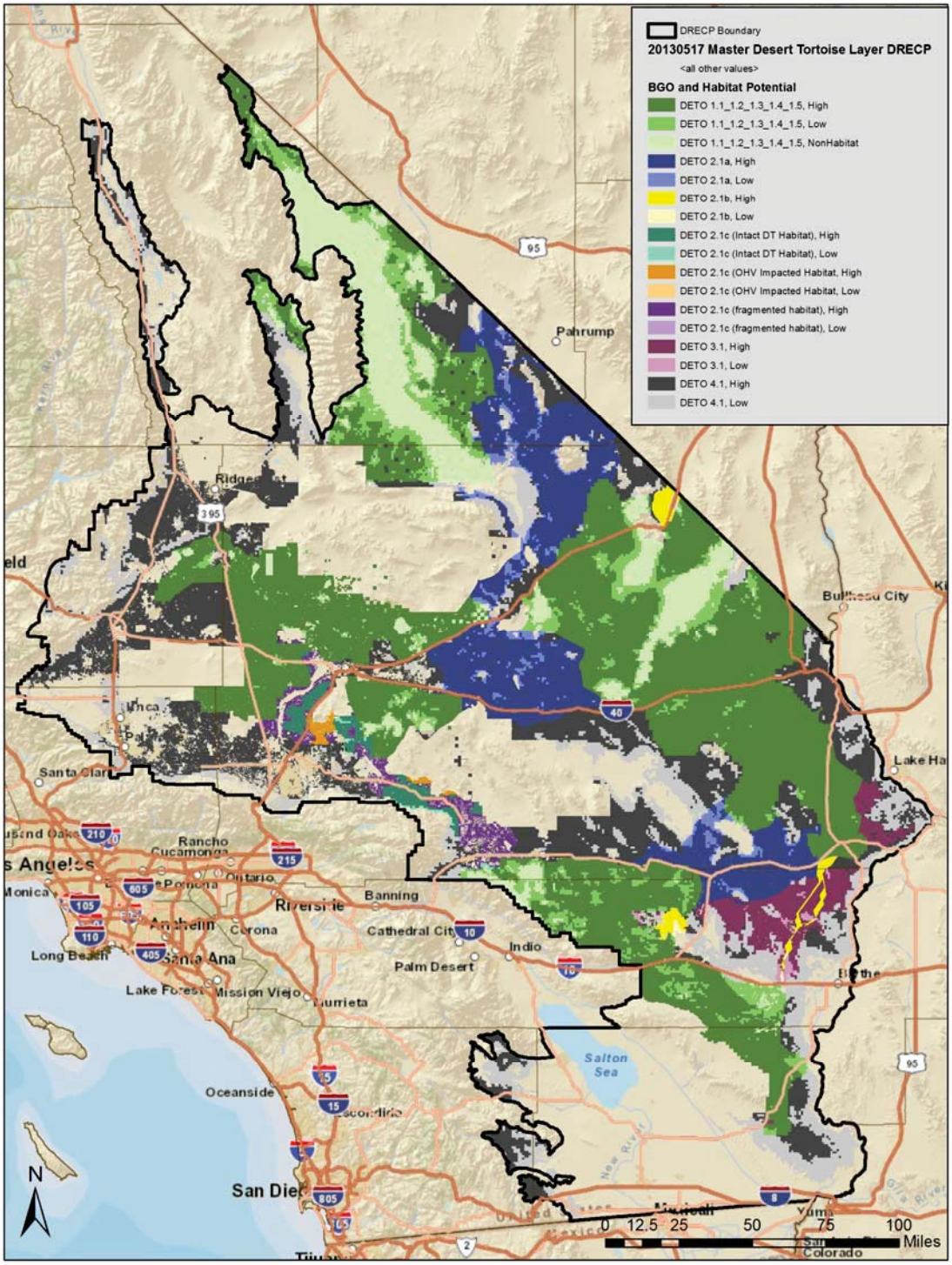


Figure 5 – This map displays the geographic area that each biological goal and objective applies to and categorizes those areas based on desert tortoise habitat potential.

Flat-tailed Horned Lizard (*Phrynosoma mcallii*)
FTHL

One goal of the DRECP is to complement existing conservation strategies to ensure the long-term viability of Covered Species. Accordingly, the conservation goals and objectives, criteria, and management planning actions as identified in the Flat-tailed Horned Lizard Rangewide Management Strategy (RMS; FTHL ICC 2003) serve as the foundation for management of this species under the DRECP and BLM LUPA. As such, these goals and objectives are intended to complement the existing interagency management strategy.

In addition to the DRECP goals and objectives developed for landscapes and natural communities that will benefit the flat-tailed horned lizard, the following goals and objectives rely on, incorporate by reference, and add to RMS management planning actions as needed for DRECP purposes, but are not intended to supplant the need for future revisions to the RMS, as needed per existing interagency agreements.

Goal FTHL 1: Conserve and add to the existing network of Management Areas (MAs) established in the RMS to maintain persistent populations of flat-tailed horned lizards that are adaptive and resilient to the effects of environmental change, including, range shifts, contractions, expansions, local extirpation and recolonization; as well as changes in climate, temperature, and precipitation.

> **Objective FTHL1.1:** Conserve the currently established MA network consistent with the RMS (see numbered areas depicted on Figure 1, FTHL Reserve):
>
> - Borrego Badlands MA (1.1)
> - Ocotillo Wells Research Area (1.2)
> - West Mesa MA (1.3)
> - Yuha Basin MA (1.4)
> - East Mesa MA (1.5)
>
> **Objective FTHL1.2:** Consistent with BLM's LUPA amendments, expand the MA network or add new MAs to enhance viability of core populations and improve connectivity between MAs.
>
> - Yuha Basin ACEC Expansion (2.1)
> - East Mesa ACEC Expansion (2.2)

Goal FTHL 2: Make the net effect of development neutral or positive to the species by preventing the net loss of flat-tailed horned lizard habitat on BLM and CDPR lands inside or outside MAs.

Objective FTHL 2.1. Implement the habitat replacement ratios stipulated in the RMS.

Goal FTHL 3: Ensure conservation of the flat-tailed horned lizard by managing land uses and associated stressors and threats, maintaining linkages, and conserving habitat quality, and maintaining the long-term persistence of self-sustaining populations through monitoring and adaptive management.

Objective FTHL 3.1: Using monitoring and adaptive management, determine limiting factors on population growth and identify primary stressors and threats in flat-tailed horned lizard management areas, linkages, and contiguous habitats where populations are known or suspected to be in decline.

Objective FTHL 3.2: Implement applicable mitigation measures consistent with the RMS and incorporate new information derived through the RMS to avoid and reduce mortality.

Literature Cited

Flat-tailed Horned Lizard Interagency Coordinating Committee (ICC). 2003. Flat-tailed horned lizard rangewide management strategy, 2003, revision. 78 pp. plus appendices.

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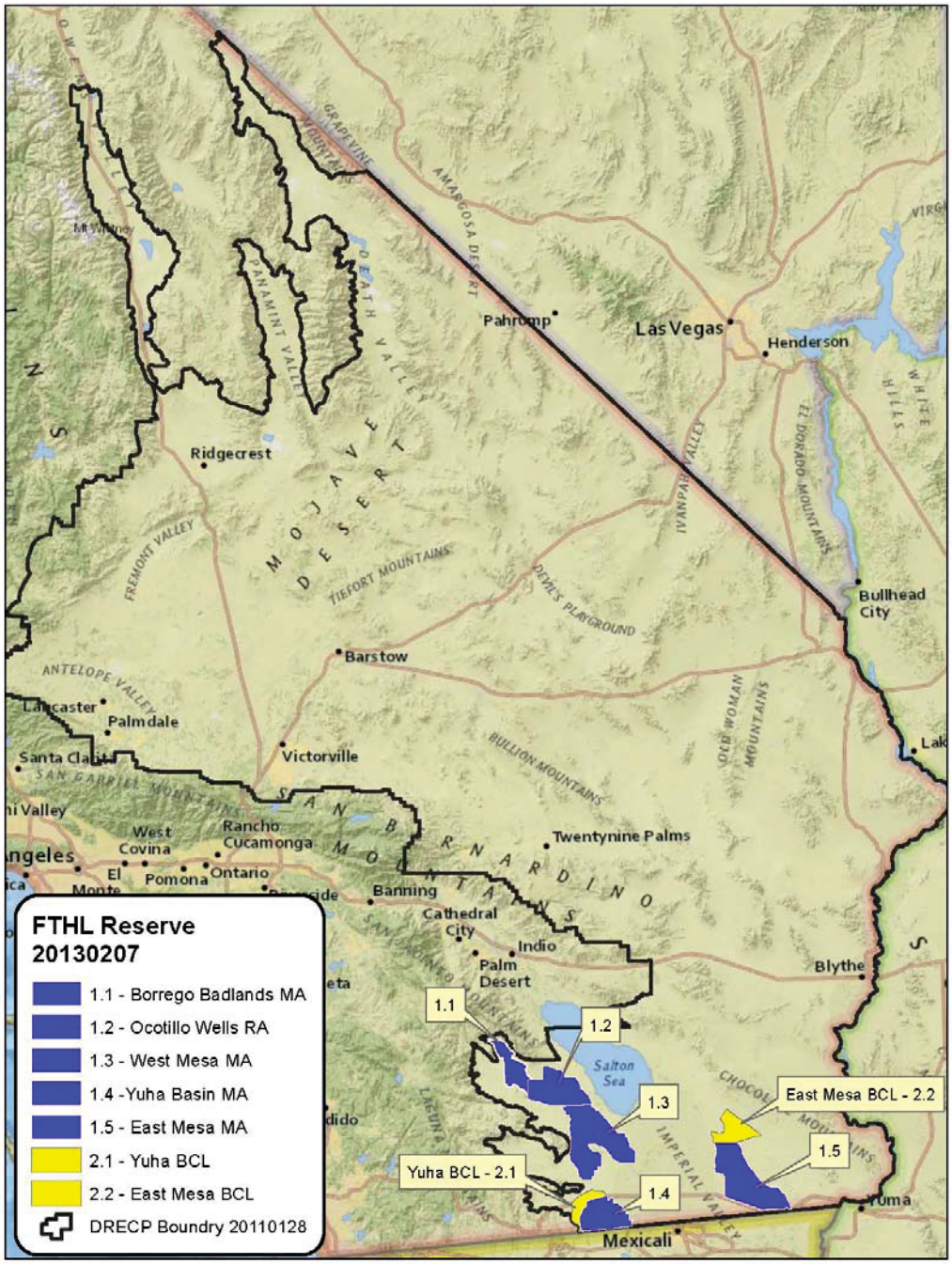
Figure 1 – FTHL Reserve



SAND DUNES Natural Community
NC #20: North American Warm Desert Dunes and Sand Flats

Goal SAND1: Conserve the geomorphic (fluvial, alluvial, and eolian) processes associated with sand dune formation to maintain natural ecological function and biodiversity of psammophytic floral and faunal communities, including sand sheet, hummock, dune, and ramp habitats, upon which Covered Species and Natural Communites depend or are closely associated.

- **Objective SAND1.1:** Conserve the extant sand sources and sediment deposition zones in the Plan Area by maintaining, restoring, and enhancing the fluvial/alluvial sedimentary processes and eolian (wind-driven) transport corridors needed to maintain sand dune formation and the areal extent of the existing dune complexes in the Reserve System. The goals and objectives herein apply to the following dune complexes and those unnamed sand systems mapped in Figure XX:

  - Olancha dunes
  - Death Valley (Mesquite) dunes
  - Dumont dunes (non OHV portion)
  - Cadiz dunes
  - East Mesa sand fields
  - Danby dunes
  - Means dunes
  - Rice Valley dunes
  - Ballarat dunes
  - San Felipe Creek dunes
  - Panamint dunes
  - Ibex–Saratoga dunes
  - Kelso dunes
  - Chuckwalla/Palen/Ford Dry Lake/Blythe dunes
  - Pinto Wash dunes
  - Little Dumont dunes
  - Cady Mountains dunes
  - Newberry Springs complex
  - Borrego Sink dunes

- **Objective SAND1.2.** Restore, maintain, or enhance Covered Species habitat and ecological health of associated rare alliances, including transitional areas encompassing the full array of sand-related and transitional community types through applicable conservation measures and management actions in the Plan.
- **Objective SAND1.3.** Conserve the entirety of the eight rare alliances in the Reserve System, and ensure that Covered Activities in the DFAs do not diminish or obstruct eolian transport into the Reserve System.

Goal SAND2: Remove or reduce potential threats and environmental stressors to maintain and enhance Natural Communities, rare alliances, and populations of Covered Species through conservation strategies (that offset the impacts of Covered Activities resulting in equal or greater habitat value) and monitoring and adaptive management actions, with particular

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emphasis in areas that are most likely to be adaptive and resilient in response to the effects of environmental change (e.g., climate, temperature and precipitation), including range shifts, contractions, expansions, local extirpation, and recolonization.

- **Objective SAND2.1.** Coordinate with various interests, including non-signatory agencies with regulatory jurisdiction and other organizations, in establishing partnerships to better protect against various stressors and threats, including ground water depletion within basins that support the honey mesquite coppice dune alliance. (Note: Honey mesquite grows in two forms: in Natural Community #26 Sonoran-Coloradan Semi-Desert Wash Woodland/Scrub as a S3 desert wash/riparian alliance, and in Natural Community #20 North American Warm Desert Dunes and Sand Flats as a S2 sand dune alliance. The S2 sand dune alliance occurs in eolian corridors where groundwater supports mesquite stands that anchor blowsand in coppice dune formations)
- **Objective SAND2.2.** Acquire knowledge needed to detect adverse ecological trends and potential limiting factors to maintain the ecological health of Natural Communities, rare alliances, and Covered Species, including but not limited to the spread of invasive non-native species.
- **Objective SAND2.3.** Identify and prioritize conservation/management actions on those dune systems that are the largest in extent, and/or support the most robust stands of rare alliances and associated species, and populations of Covered Species, and are most likely to persist under changing climatic conditions.

Appendix 1 – Alliances, Species, and Ecological Subareas

Eolian Processes and Natural Community Relationships

Sand dune systems consist of three geomorphic components: (1) sand source areas (typically mountain canyons, alluvial fans, fluvial washes, and/or playas), (2) eolian (wind) transport corridors (usually valley bottoms), and (3) depositional zones (sand sheet, hummock, dune, and ramp accumulations). Sand deposits range from Pleistocene accumulations to actively migrating 'pulses' of episodically deposited hydrologic sediments that are pushed downwind and sorted by particle size to relatively stable dune and ramp accumulations at the terminus of the eolian corridor.

Sand sheet, hummock, dune, and ramp deposits can variously occur along the length of eolian transport corridors, and support floral and faunal communities co-adapted to these dynamic unstable environments. While some of these communities move spatially across time as sand deposits move progressively downwind, other sand deposits and communities are fixed geographically. For example, sand deposits and natural communities can be permanently

established where (1) wind velocities drop below sand transport threshold levels, such as towards the downwind end of eolian corridors, (2) sand accumulates along topographic barriers within the eolian corridor, including sand ramps on mountain slopes, or (3) accumulations are anchored by sheltering vegetation (honey mesquite coppice dunes).

The following psammophytic vegetation units, natural community alliances, and special stand occurrences are designated as "rare", i.e. with a State rarity ranking of S3, S2 or S1.

For the purposes of this plan, the DUNE Natural Community is comprised of the vegetation alliances listed below. These include the four alliances that comprise microphyll woodlands, which currently also have an individualized set of Biological Goals and Objectives.

Alliance	Rank	Acres
Achnatherum hymenoides	S2	
Pleuraphis rigida	S2	
Dicoria canescens -Abronia villosa	S3	
Swallenia alexandrae special stands	S1	
Panicum urvilleanum (Desert panic grass patches)	S2	
Psorothamnus polydenius	S2	
Wislizenia refracta (Spectacle fruit special stands)	S2	
Prosopis glandulosa (honey mesquite: coppice dune form)	S2	
Total acreage		

Sand dune systems and psammophytic biotic communities support numerous co-adapted endemic plants, animals, and numerous undescribed invertebrate species, as well as the following Covered Species: Mojave fringe-toed lizard, flat-tailed horned lizard (in part), desert tortoise (in part), burro deer (in part), and desert kit fox (in part).

References

Matti, J.C., and Cossette, P.M., 2007, Classification of surficial materials, Inland Empire Region, southern California: conceptual and operational framework: U.S. Geological Survey, Open-File Report (in progress).

DRAFT

Muhs, D.R., Reynolds, R.L., Been, J. and Skipp, G. Eolian sand transport pathways in the southwestern United States: importance of the Colorado River and local sources. Quaternary International Volume 104, pages 3-18, 2003.

Southern California Areal Mapping Project, 2000, A proposed classification for surficial geologic materials in southern California, version 1.0.: U.S. Geological Survey, Open-File Report (in progress)

Southern California Areal Mapping Project (SCAMP), 2002, Classification of surficial geologic materials in southern California for use by the Southern California Areal Mapping Project (SCAMP): U.S. Geological Survey, Open-File Report (in progress).

Map: to be provided

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A NEWLY DISCOVERED LARGE AND SIGNIFICANT POPULATION OF *CASTELA EMORYI* (EMORY'S CRUCIFIXION THORN, SIMAROUBACEAE) IN CALIFORNIA

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ABSTRACT

Castela emoryi is an understudied species, and recent visits to populations across California have shed new light on its distribution and biology, including recruitment, natural history, and herbivory. Field exploration in Rice Valley in Riverside County revealed what is considered to be the largest population of *C. emoryi* in California. Possible threats and conservation needs of this species are discussed.

Key words: California, *Castela emoryi*, conservation, hermaphrodite, population dynamics, rare, Rice Valley, Simaroubaceae, species modeling.

INTRODUCTION

Castela emoryi occurs from northwest Mexico, where it is reportedly very uncommon, to central and western Arizona and into California's Mojave and Sonoran deserts, where most populations are small and scattered and very rarely exceed 100 individuals (SEInet 2013). The species is usually found in silty soils of dry lake beds and occasionally in wash bottoms or on rocky slopes. *Castela emoryi* has a California Native Plant Society Rare Plant Rank of 2.3, which states that it is "rare, threatened, or endangered in California, but more common elsewhere".

New insights into the distribution and biology of this species emerged from a population discovered in Rice Valley, Riverside County, California. The Rice Valley population was first documented by Michael Honer in March 2005 who reported a "solitary tree 2.5 m tall" (*Honer 2066*, RSA) (Consortium of California Herbaria [CCH] 2013). In October 2009 the first author (D.B.) found twelve scattered individuals in the same general location while doing floristic work in the area (*Bell 505*, RSA) (CCH 2013). On a return trip to Rice Valley in January 2012, D.B. found over 2500 individuals farther south from the previously documented populations (*Bell 3062*, RSA). Just a few weeks later, in February 2012, Tasya Herskovits (T.H.) visited this population as part of a modeling survey to determine the extent and range of *C. emoryi* in California, and also noted that this population had over 2000 individuals. She returned in June 2012 to set up two demographic study sites. These study plots serve to address some of the many questions about the overall success and reproductive output of this species.

NOTEWORTHY OBSERVATION

Castela emoryi (A.Gray) Moran & Felger (Simaroubaceae).—USA. California: Riverside County. Rice Valley, ca. 6 air miles SE of the ghost town of Rice at ca. 34.00633, −114.80672, ca. 663 ft (202 m), Duncan S. Bell & Tasya Herskovits. Observations made by D.B. on 28 Jan 2012 (*Duncan Bell & Amanda Bell 3062*, RSA) and by T.H. on 29 Feb 2012. Shrubs locally common on silty flats of valley bottom, at times between shifting sand dunes. Over 2500 individuals scattered over a large area. Individuals ranging from seedlings to fully grown adults up to 15 ft (4.6 m) tall. Seedlings uncommon, and most adult plants 4–8 ft (1.2–2.4 m) in height. Growing with *Ambrosia dumosa* (A.Gray) W.W.Payne, *Amsinckia tessellata* A.Gray, *Androstephium breviflorum* S.Watson, *Astragalus insularis* Kellogg var. *harwoodii* Munz & McBurney, *Brassica tournefortii* Gouan, *Chamaesyce abramsiana* (L.C.Wheeler) Koutnik, *Cryptantha angustifolia* (Torr.) Greene, *Datura discolor* Bernh., *Eriastrum harwoodii* (T.T.Craig) D.Gowen, *Geraea canescens* Torr. & A.Gray, *Larrea tridentata* (Sessé & Moc. ex DC.) Coville, *Lepidium lasiocarpum* Nutt. ex Torr. & A.Gray, *Nicotiana obtusifolia* M.Martens & Galeotti, *Palafoxia arida* B.L.Turner & M.I.Morris, *Proboscidea altheifolia* (Benth.) Decne., *Prosopis glandulosa* Torr., *Tamarix aphylla* (L.) H.Karst.

Significance.—These observations and collections represent the largest population of *C. emoryi* known to date. The largest previously known population is from the Crucifixion Thorn Natural Area in Imperial County, reportedly the largest population in California with over 1000 individuals (Sanders 1998: 2).

Biology and population dynamics.—*Castela emoryi* plants vary greatly in morphology, size, number, sex ratio, and reproductive success between sites. Two main environments have been observed while visiting all known *C. emoryi* populations: the edges of non-saline dry lake beds and the fine-textured soil of washes and lower bajadas. Always located in places where water collects, their preferred habitat appears to be near non-saline, dry lake beds.

So far, *C. emoryi* has not been found in relation to any surveyed alkaline, saline dry lakes. While saline dry lakes are large and numerous throughout the southern California desert, non-saline dry lakes are generally smaller and less frequent, thereby limiting the preferred habitat of *C. emoryi*. The sites harboring the largest, most healthy populations of California *C. emoryi* are, in order of decreasing population size: Rice Valley, the Crucifixion Thorn Natural Area, Sheephole Dry Lake (San Bernardino County), Hayfield Dry Lake (Riverside County), and a very small dry lake north of Afton Canyon

(San Bernardino County). Smaller populations occur in washes often containing fine particle silt and/or clay soil. The two largest of these populations are at Homer Wash (San Bernardino County) and a shallow wash east of Pisgah Crater (San Bernardino County).

In general, *C. emoryi* appears to take on one of two morphological habits, either short (<3 m) and robust or tall (≥3 m) and spreading. *Castela emoryi* may simply tend to grow taller where more water is available, since plants found in washes, with greater runoff and erosion, generally show the shorter habit, while those found near basins and dry lakes, where water collects, are generally taller. The amount of clay and silt content in the soil may also affect water absorption and hence size and morphology.

Rice Valley, home to the largest population of *C. emoryi*, demonstrates the plant's preferred habitat and microhabitat. The Rice Valley population appears to be one of the healthiest, showing numerous females with abundant fruit clusters (Fig. 1) and large, robust individuals with minimal dieback. This site also may have the highest concentration of seedlings and juveniles (Fig. 2, 3) of any site and may therefore be the most reproductively successful. The preferred soil type of *C. emoryi* in Rice Valley is a combination of fine sand mixed with clay where dry lake bed and sand dune habitats merge. Though the population is most dense near the dry lake bed, the individuals that are immediately adjacent to—or in—the dry lake are generally more stunted and less reproductive than the individuals towards the interior of the population. Towards the north end of the population, where sand dune habitat merges with dry lake habitat, the individuals are generally larger, more robust, more reproductive, and generally show more new growth. Within the boundaries of the population the ground is mostly flat or slightly undulating.

In very rare instances, *C. emoryi* occurs on rocky slopes of washes. According to Sanders (1998: 5), *C. emoryi* seed found in 9750-year-old pack rat middens (Van Devender 1990) on rocky slopes in the Kofa Mountains, Arizona, implies that *C. emoryi* formerly occurred on rocky hillsides. He postulates that climate change may have driven *C. emoryi* to a narrower range of habitats (Sanders 1998: 5). In support of his theory, active populations in California have since been found on rocky slopes. Two populations occur in the Eagle Mountains (Riverside County) and Coxcomb Mountains (Riverside and San Bernardino Counties) of Joshua Tree National Park. It is unclear how old these populations are, though differences in morphology, such as numerous branches that are blunt at the apex at the Coxcomb Mountains site (California Natural Diversity Database [CNDDB] Occurrence #50), imply that these populations could be genetically isolated. This site, located on the north-facing slope of a boulder-strewn wash in the southwest Coxcomb Mountains, contains only two individuals, one female and one that is a potential hermaphrodite.

The Eagle Mountains site is also unique as the seven plants growing on the very steep sides of a rocky wash are extremely stressed and skeletal in appearance. In contrast to the stout and robust individuals found in the Coxcombs, they appear to be just surviving, not thriving. Of six females and one male, the total seed count for the population was about 20 and the result of a single reproductive cycle over one year previous to the visit, implying that these plants do not produce seed every year. Most other sites show evidence of three to five separate reproductive cycles spanning up to five years. This site was also impacted heavily by packrat herbivory.

In general, the fewer the plants present at the site, the greater the pack rat damage per plant. Pack rats seem to prize the protective *C. emoryi* thorns for lining their nests, and individuals from smaller populations were more severely impacted. There are many questions as to the role of pack rats in *Castela* survival and reproduction. Initial observations of demographic sites show that numerous inflorescences tagged in 2012 were snipped off by pack rats, implying that they may eat the seeds or collect fruiting branches. It is possible that pack rats play a role in seed dispersal, a role that may have previously been filled by now-extinct Pleistocene megafauna (Sanders 1998: 3). However, in some populations, such as the Eagle Mountains site and a larger site near Pisgah Crater, the pack rat damage is so extensive that it impedes the plants' ability to thrive and produce viable seed.

Though other species in family Simaroubaceae are known to be hermaphroditic, the existence and significance of hermaphroditic *C. emoryi* individuals has been virtually unexplored. In 2012 hermaphrodites were found at six of twenty sites. All noted hermaphrodites are male dominant, with some presence of female flowers and developed or aborted fruits. It is possible that female-dominant individuals also produce male flowers, though this is much more difficult to determine with the naked eye. Sites vary in frequency of hermaphrodites, with CNDDB Occurrence #29, in a dry lake east of the Sheephole Mountains, showing the most documented hermaphrodites. Hermaphrodites may play an important role in fruit production in populations with little or no males.

Insect interactions and herbivory.—The relationship of *C. emoryi* with pollinators is also largely undocumented. In the summer of 2012 numerous species of bees and wasps were observed at four populations. It appeared that they were more attracted to the male flowers than the female flowers. The flowers also produce nectar which attracts ants (Fig. 4). Since few plants bloom during this hot mid-summer time, *C. emoryi* may be essential for some bee and wasp species (Fig. 5), and more study is needed to determine if other *C. emoryi*-dependent species exist other than *Atteva exquisita* (Lepidoptera) which appears to rely on *C. emoryi* as a larval host plant (Powell et al. 1973).

Insect herbivory was found to be prevalent and widespread across California's *C. emoryi* populations. At Rice Valley, extensive damage to fruit clusters by the moth larvae of *A. exquisita* was observed in September and November 2012. The outer coatings of the fruits were chewed, extensive webbing was present, and the fruits were prematurely dried and browned, which was also previously noted by Powell and Harbison at *C. emoryi* populations in Imperial County in the 1960s (Powell et al. 1973). In contrast to the previous year's fruits, 2012 showed an unusual "boom" of *A. exquisita*, perhaps due to heavy summer rains. *Atteva exquisita* is the only documented insect that is immune to the insecticidal properties of compounds present in the stems of *C. emoryi*.

In being restricted to—and therefore dependent on—plants of family Simaroubaceae (Powell et al. 1973), of which *C. emoryi* is the sole representative in the California deserts, *A. exquisita* is completely dependent on *C. emoryi* as its larval host plant. In the field, Powell et al. (1973) noted that, since *C.*

Fig. 1–5. *Castela emoryi*.—1. One of the thousands of mature individuals of Rice Valley, with first author for scale. This individual was approximately ten feet tall. Note the different color of fruit clusters: the green seeds are the newest in age, and the darker seed clusters are two- to five-years old. Photo by Amanda Bell.—2. Seedling growing out of the hard pan silty clay soils of Rice Valley. Photo by Duncan S. Bell.—.3. Leafy sapling in Rice Valley. Recruitment in the Rice Valley population is more abundant than in most other populations across California. Photo by Duncan S. Bell.—4. Close-up of flower with visiting ant species. Photo by Tasya Herskovits.—5. Flowers and developing fruit with a visiting wasp species. Photo by Tasya Herskovits.

emoryi is largely leafless, *A. exquisita* larvae fed primarily on flowers and developing seeds. Later in the season when flowers were gone larvae were found primarily in the seed clusters of *C. emoryi* where they fed on the seed covers of its fruits. Herbivory was also noted on the stems and branches of *C. emoryi* where, at times, sections were skeletonized and girdled by the larvae. Morgan and Felger (1968), while doing field studies in Baja California, also found larvae of *A. exquisita* eating leaves and bark of *C. emoryi.*

Population explosions of *A. exquisita* potentially could be detrimental to isolated populations of *C. emoryi* and may explain the case of the Skull Valley population in Imperial County (CNDDB Occurrence #1) observed in 2012 in which nearly all 100+ individuals were dead. However a local resident (Edie Harmond, pers. comm.) noted that this die-off was possibly due to a lengthy drought that occurred in the area in the 1970s that led to intense pack rat herbivory due to a shortage of pack rat resources. It has also been suggested that border patrol may have sprayed plants with herbicide or other chemicals in an attempt to kill the plants and prevent illegal immigrants from hiding in the large dense stands of *C. emoryi* in Imperial County (Steve Hartman, pers. comm.). Whatever the reason, this is currently the only known population of *C. emoryi* in California that is in serious decline. This population needs further observation as it is very uncommon to find dead individuals of this long-lived species.

Natural history, recruitment, and seed germination.—Another noteworthy discovery in 2012 was that of new leaf growth of *C. emoryi* on adults as well as juveniles. It was previously thought that fully developed leaves (in contrast to deciduous, scale-like leaves) never appear on mature plants once these have lost their first season's ephemeral leaves, even as new growth or sucker shoots (Sanders 1998: 3). However, sucker shoots as well as new, leafy branches were observed on plants at several sites, including Rice Valley and Homer Wash (San Bernardino County). At the Homer Wash population, new shoots were observed growing from the base on many individuals. The south end of the population was visited on 3 Jul 2012, and the north portion of the population was visited on 11 Sep 2012. While the northern individuals were healthy and reproductive, the southern individuals appeared to have suffered a massive vegetative die-off in the recent past. Most of these individuals, growing along the steep sandy banks of a wash, were resprouting from the base with leafy, spiny branches. This population warrants further exploration to compare the conditions of the northern and southern portions and discover the reason for massive dieback on the southern portion.

Very little is known about the germination of *C. emoryi* seeds. Sanders (1998: 3) proposed that seeds may need to be passed through the gut of an animal to germinate properly. *Castela emoryi* holds its seed clusters for an extended period of time, possibly for up to 5–7 years (Shreve 1964). Recent or newer seeds tend to be green or yellow in color and very full in size, whereas older seeds are dark yellow, red, or black and shriveled and withered in appearance. The branches of a single *C. emoryi* individual can hold seeds of a broad age range (Fig. 5). Observations of seedlings are very rare, and the Rice Valley population has been one of the only known locations where seedlings have been found in large numbers. A majority of the seedlings were observed growing at the skirt or near the understory of the adult individuals (for a sample of seedlings see *D. Bell 3062*, RSA). A common garden study is needed to explore germination further.

Threats and conservation needs.—Rice Valley was designated an open OHV [off-highway vehicle] recreational area but was closed in 2002 due to lack of use and visitation; however, OHVs are still a threat in the area, and motorcycle and dune buggy tracks were noted on several trips to Rice Valley. *Castela emoryi* is often a large, robust shrub, but seedlings are rare and juvenile plants are under threat from OHV activity.

Renewable energy projects are also a threat. A solar project has been approved for the north end of the valley, and it has been reported that the project will be tapping into the water table of Rice Valley in the form of wells to extract water needed to wash the project's parabolic mirrors. Tapping into the valley's water table could prove devastating for this population of *C. emoryi*.

Some possible conservation options would be to designate this population another "Crucifixion Thorn Natural Area" as has been done in Imperial County and to incorporate this area into the Rice Valley Wilderness which lies just to the south of this important population. An Area of Critical Environmental Concern (ACEC) would also be an option: there are other rare plant populations that co-occur with this *C. emoryi* population, as well as fauna that are endangered or of conservation concern, such as the desert tortoise and fringe-toed lizard. Moreover, there are a number of Native American cultural sites that are known from the area.

There are many renewable energy projects under construction in the southwestern deserts at this time, and these projects specifically look for open, flat basins on which to build, a habitat that *C. emoryi* also often prefers. In 2012 several individuals of *C. emoryi* were bulldozed for the Desert Sunlight solar project northwest of Desert Center in California. We would like to see all forms of development avoided in the greater Rice Valley area to protect its unique and diverse flora and fauna.

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LITERATURE CITED

California Native Plant Society [CNPS]. 2013. *http://cnps.site.aplus.net/cgi-bin/inv/inventory.cgi/Go?_id=castela_emoryi&sort=DEFAULT&search=Castela%20emoryi/* (Jan 2013).

California Natural Diversity Database [CNDDB]. 2013. RareFind. California Department of Fish and Game, Sacramento, California. *http://www.dfg.ca.gov/biogeodata/cnddb/mapsanddata.asp* (Jan 2013).

Consortium of California Herbaria [CCH]. 2013. *http://ucjeps.berkeley.edu/consortium/* (Jan 2013).

Moran, R. and R. Felger. 1968. *Castela polyandra*, a new species in a new section; union of *Holacantha* with *Castela* (Simarubaceae). *Trans. San Diego Soc. Nat. Hist.* **15**: 31–40.

Powell, J. A., J. A. Comstock, and C. F. Harbison. 1973. Biology, geographical distribution, and status of *Atteva exquisita* (Lepidoptera: Yponomeutidae). *Trans. San Diego Soc. Nat. Hist.* **17**(13): 175–186.

Sanders, A. C. 1998. Crucifixion thorn. Unpublished report prepared for the U.S. Department of the Interior Bureau of Land Management. *http://www.blm.gov/ca/pdfs/cdd_pdfs/crucif1.PDF* (Jan 2013). 8 p.

Shreve, F. 1964. Vegetation of the Sonoran Desert, pp. 1–186. *In* F. Shreve, and I. L. Wiggins. 1964. Vegetation and flora of the Sonoran Desert, vol. 1. Stanford University Press, Stanford, California.

Southwest Environmental Information Network [SEINet]. 2013. *http://swbiodiversity.org/seinet/taxa/index.php?taxon=1167* (Jan 2013).

Van Devender, T. R. 1990. Late Quaternary vegetation and climate change of the Sonoran Desert, United States and Mexico, pp. 134–163. *In* J. L. Betancourt, T. R. Van Devender, and P. S. Martin [eds.], Packrat middens: the last 40,000 years of biotic change. University of Arizona Press, Tucson.

Special Status Plant Species of the Castle Mountains

Prior to floristic surveys done by Andre and Bell 5 taxa, included within the California Native Plant Society's Rare, Threatened, and Endangered Plant Inventory (CNPS 2014), were known from the Castle Mountains. After explorations were made by Andre and Bell it was found that 36 CNPS special status plant species are found here making this mountain range a hotspot for rare plant species and populations.

Near endemics: Penstemon bicolor, Acmispon argyraeus var. multicaulis. Scleropogon brevifolius in California restricted to Lanfair Valley…..

Table #. Special status plant species of the Castle Mountains

Family	**Taxon**	**Rank**
Pteridaceae	*Pellaea truncata*	2B.3
Apiaceae	*Cymopterus multinervatus*	2B.2
Apocynaceae	*Asclepias nyctaginifolia*	2B.1
Asteraceae	*Sanvitalia abertii*	2B.2
Asteraceae	*Xanthisma gracile*	4.3 change to 2B
Boraginaceae	*Cryptantha tumulosa*	4.3
Boraginaceae	*Phacelia coerulea*	2B.3
Cactaceae	*Grusonia parishii*	2B.2
Euphorbiaceae	*Chamaesyce abramsiana*	2B.2
Euphorbiaceae	*Chamaesyce revoluta*	4.3
Euphorbiaceae	*Euphorbia exstipulata* var. *exstipulata*	2B.1
Euphorbiaceae	*Tragia ramosa*	4.3
Fabaceae	*Acmispon argyraeus* var. *multicaulis*	1B.3
Fabaceae	*Astragalus nutans*	4.3
Linaceae	*Linum puberulum*	2B.3
Malvaceae	*Abutilon parvulum*	2B.3
Nyctaginaceae	*Mirabilis coccinea*	2B.3
Oleaceae	*Menadora scabra* var. *scabra*	2B.3
Onagraceae	*Oenothera caespitosa* ssp. *crinita*	4.2
Orobanchaceae	*Cordylanthus parviflorus*	2B.3
Plantaginaceae	*Penstemon bicolor* ssp. *roseus*	1B.1
Polemoniaceae	*Aliciella triodon*	2B.2
Polygalaceae	*Polygala acanthoclada*	2B.3
Polygonaceae	*Eriogonum heermannii* var. *floccosum*	4.3
Portulacaceae	*Portulaca halimoides*	4.2
Rubiaceae	*Galium proliferum*	2B.2

Solanaceae	*Physalis lobata*	2B.3
Verbenaceae	*Aloysia wrightii*	4.3
Zygophyllaceae	*Kallstroemia parviflora*	4.2
Alliaceae	*Allium nevadense*	2B.3
Poaceae	*Bouteloua eriopoda*	4.2
Poaceae	*Enneapogon desvauxii*	2B.2
Poaceae	*Muhlenbergia appressa*	2B.2
Poaceae	*Munroa squarrosa*	2B.2
Poaceae	*Panicum hirticaule*	2B.1
Poaceae	*Scleropogon brevifolius*	2B.3

Annotated Checklist of the Castle Mountains

FERNS AND FERN ALLIES

Pteridaceae

†Pellaea truncata Goodd. SPINY CLIFFBRAKE. Perennial. Uncommon. On steep rocky slopes of volcanic rock in the northwest part of the range. (Bell 5814, RSA)

CONIFERAE

Cupressaceae

Juniperus osteosperma (Torrey) Little UTAH JUNIPER. Tree/shrub. Scattered on rocky slopes of mountain range. (Bell 5694, RSA)

Amaranthaceae

Amaranthus crassipes Schltdl. SPREADING AMARANTH. Annual. Locally common in localized populations on valley floor section of the range, growing in muddy/mucky soils following the summer monsoons. (Andre 25642, GMDRC; Bell 5732, RSA)

Amaranthus fimbriatus (Torrey) Benth. FRINGED AMARANTH. Annual. Common throughout the range following summer monsoonal rains. (Bell 4233, RSA)

Amaranthus torreyi (A. Gray) Benth. SANDHILL AMARANTH. Annual. Frequent/scattered across the range following summer monsoonal rains. (Bell 4213, RSA)

Anacardiaceae

Rhus trilobata SKUNKBRUSH. Shrub. Frequent to uncommon in narrow rocky canyons of the range. (Bell 2794, RSA)

Apiaceae

†Cymopterus multinervatus (J. Coulter & Rose) Tidestrom PURPLENERVE SPRINGPARSLEY. Only known from one location on the west side of the range. (Andre 10115, UCR)

Lomatium nevadense (S. Watson) J. Coulter & Rose var. ***nevadense*** NEVADA LOMATIUM. (Andre 7776, GMDRC)

Apocynaceae

Asclepias erosa Torrey DESERT MILKWEED. Uncommon in drainages and at a few disturbed locations. (Bell 5746, RSA)

†Asclepias nyctaginifolia A. Gray MOJAVE MILKWEED Rare. Just a few populations found in the area usually occurring in small rocky drainages. (Bell 4241, RSA)

Asteraceae

Acamptopappus sphaerocephalus (A. Gray) A. Gray var. ***sphaerocephalus*** GOLDENHEAD (Andre 13590, UCR)

Adenophyllum cooperi (A. Gray) Strother COOPER'S DYSSODIA (Andre 13589, UCR; Bell 5710, RSA)

Ambrosia confertiflora DC. WEAK LEAVED BURSAGE. (Bell 5736, RSA)

Ambrosia dumosa (A. Gray) Payne BURROBUSH. Shrub. Fairly common on valley floor and on rocky slopes of range. (Bell 5956, RSA)

Ambrosia eriocentra (A. Gray) Payne WOOLY BURSAGE. Shrub. Occasional to common in rocky drainages and washes. (Andre 14036, RSA; Bell 3612, RSA)

Ambrosia salsola (Torr. & A. Gray) Strother & B.G. Baldw. BURROBRUSH. Shrub. Fairly common across range. (Bell 5799, RSA)

Artemisia dracunculus L. WILD TARRAGON (Bell 5828, RSA)

Artemisia ludoviciana Nutt. MUGWORT (Bell 4263, RSA) Occasional in rocky drainages.

Baccharis brachyphylla A. Gray SHORT LEAVED BACCHARIS (Bell 5821, RSA)

Bahiopsis parishii (Greene) E. E. Schilling & Panero PARISH'S VIGUIERA (Bell 5962, RSA)

Baileya multiradiata Harv. & A. Gray ex A. Gray DESERT MARIGOLD (Andre 13600, UCR; Bell 5741, RSA)

Brickellia atractyloides A. Gray var. ***arguta*** (B.L. Rob.) Jeps CALIFORNIA SPEAR LEAVED BRICKELLIA (Andre 13588, HSC; Bell 5711, RSA)

Brickellia californica (Torrey & A. Gray) A. Gray CALIFORNIA BRICKELLBUSH (Bell 5827, RSA)

Brickellia desertorum Cov. DESERT BRICKELLBUSH (Bell 5949, RSA)

Brickellia incana A. Gray WOOLLY BRICKELLBUSH (Bell 5802, RSA)

Brickellia microphylla (Nutt.) A. Gray LITTLE LEAVED BRICKELLBUSH (Bell 4264, RSA)

Brickellia oblongifolia Nutt. var. ***linifolia*** (D. Eaton) Robinson NARROWLEAF BRICKELLBUSH (Bell 5970, RSA)

Chaenactis macrantha D. Eaton MOHAVE PINCUSHION (Andre 13580, UCR)

Chaenactis stevioides Hook. & Arn. DESERT PINCUSHION (Andre 13572, UCR)

Chaetopappa ericoides (Torrey) G. Neson HEATH LEAVED CHAETOPAPPA (Andre 13595, UCR; Bell 2798, RSA)

Dieteria canescens (Pursh) Nutt. Var. ***leucanthemifolia*** (Green) D. R. Morgan & R. L. Hartm. HOARY ASTER (Bell 2797, RSA)

Encelia virginensis Nelson VIRGIN RIVER BRITTLEBUSH (Bell 5707, RSA)

Ericameria cooperi (A. Gray) H.M. Hall COOPER'S GOLDENBUSH (Bell 4258, RSA)

Ericameria laricifolia (A. Gray) Shinn. TURPENTINE BRUSH (Bell 5832, RSA)

Ericameria paniculata (A. Gray) Rydb. MOJAVE RABBITBRUSH (Bell 5748, RSA)

Ericameria teretifolia (Durand & Hilg.) Jeps. GREEN RABITBRUSH (Bell 5717, RSA)

Erigeron concinnus (Hook. & Arn.) Torrey & A. Gray NAVAJO FLEABANE (Andre 25609, RSA)

Erigeron divergens Torrey & A. Gray SPREADING FLEABANE (Bell 4242, RSA)

Erigeron pumilus Nutt. var. ***intermedius*** Cronq. SHAGGY FLEABANE (Bell 5964, RSA)

Gutierrezia microcephala (DC.) A. Gray MATCHWEED (Bell 5720, RSA)

Gutierrezia sarothrae (Pursh) Britton & Rusby COMMON SNAKEWEED (Andre 25646, RSA)

Layia glandulosa (Hook.) Hook. & Arn. WHITE TIDY TIPS. (Andre 4814, GMDRC)

Malacothrix coulteri Harvey & A. Gray SNAKE'S HEAD (Sanders 6989, UCR)

Packera multilobata (Torr. & A. Gray ex A. Gray) W.A. Weber & A. Love LOBELEAF GROUNDSEL (Bell 3594, RSA)

Pectis papposa Harv. & A Gray CHINCHWEED (Bell 5698, RSA)

Porophyllum gracile Benth. ODORA (Bell 5823, RSA)

Prenanthella exigua (A. Gray) Rydb. THORNY SKELETON PLANT (Andre 13582, UCR)

Psilostrophe cooperi (A. Gray) E. Greene COOPER'S PAPER DAISY (Bell 5725, RSA)

†Sanvitalia abertii A. Gray ABERT'S SANVITALIA (Andre 22188, RSA; Bell 4246, RSA) Scattered populations across area after summer rains.

Senecio flaccidus Less. Var. ***monoensis*** (E. Greene) B. Turner & T. Barkley MONO RAGWORT. On alluvium on west side of range. (Andre, 22184, UCR)

Stephanomeria exigua Nutt. SMALL WIRELETTUCE (Bell 5792, RSA)

Stylocline psilocarphoides M. Peck BARETWIG NESTSTRAW (Sanders 7000, UCR)

Syntrichopappus fremontii A. Gray FREMONT'S SYNTRICHOPAPPUS (Andre 13606, UCR)

Tetradymia stenolepis E. Green MOJAVE COTTONTHORN (Bell 2793, RSA)

Thymophylla pentachaeta (DC.) Small FIVENEEDLE PRICKLYLEAF (Bell 5951, RSA)

Verbesina encelioides (Cav.) Benth. & Hook. F. ex A. Gray GOLDEN CROWNBEARD (Andre 25615, GMDRC; Bell 5961, RSA)

†Xanthisma gracile (Nuttall) D.R. Morgan & R.L. Hartman ANNUAL BRISTLEWEED (Bell 5695, RSA)

Xylorhiza tortifolia (Torrey & A. Gray) E. Greene var. ***tortifolia*** MOJAVE ASTER (Andre 13571, UCR)

Bignoniaceae

Chilopsis linearis (Cav.) Sweet ssp. ***arcuta*** (Fosb.) Henrickson DESERT WILLOW (Bell 5756, RSA)

Boraginaceae

Amsinckia tessellata A. Gray. FIDDLENECK (Sanders 6990, UCR)

Cryptantha nevadensis Nelson & Kenn. NEVADA FORGET ME NOT (Andre 13593, UCR)

†Cryptantha tumulosa (Payson) Payson NEW YORK MOUNTAIN CRYPTANTHA (Andre 10241, UCR; Bell 3592, RSA)

Pectocarya setosa A. Gray STIFF STEMMED COMB BUR (Bell 3617, RSA)

†Phacelia coerulea E. Green SKY BLUE PHACELIA (Andre)

Phacelia crenulata Torrey var. ***ambigua*** (M.E. Jones) J.F. Macbr. NOTCH LEAVED PHACELIA (Andre 13583, UCR)

Phacelia fremontii Torrey FREMONT'S PHACELIA (Andre 13597, UCR)

Phacelia vallis-mortae J. Voss DEATH VALLEY PHACELIA (Bell 3590, RSA)

Tiquilia canescens (DC.) A. Richardson var. ***canescens*** WOODY CRINKLEMAT (Bell 5954, RSA)

Brassicaceae

Boechera perennans (S. Watson) W.A. Weber PERENNIAL ROCKCRESS (Bell 3607, RSA) Uncommon on steep rocky slopes.

Caulanthus cooperi (S. Watson) Payson COOPER'S JEWEL FLOWER (Sanders 6994, RSA)

!Chorispora tenella (Pallas) DC. CROSSFLOWER (Andre 14029, UCR)

Descurainia pinnata (Walter) Britton YELLOW TANSY MUSTARD (Sanders 7005, UCR)

!Descurainia sophia (L.) Webb FLIX WEED (Sanders 7001, UCR)

Lepidium lasiocarpum Nutt. SHAGGYFRUIT PEPPERWEED (Andre 14031, RSA)

Lepidium montanum Nutt. MOUNTAIN PEPPERGRASS. (Andre 25593, GMDRC)

Physaria tenella (A. Nelson) O'Kane & Al-Shehbaz LITTLE BLADDERPOD (Andre 9998, RSA)

!Sisymbrium irio L. LONDON ROCKET (Andre 14030, UCR)

Stanleya pinnata (Pursh) Britton PRINCE'S PLUME (Bell 5681, RSA)

Thysanocarpus curvipes Hook. FRINGE POD (Andre 10240, UCR)

Cactaceae

Ferocactus cylindraceus (Engelm.) Orc. BARREL CACTUS (Bell 5722, RSA) Localized populations on rocky slopes and ridges.

†Grusonia parishii (Orcutt) Pinkava MATTED CHOLLA (Bell 5757, RSA) Localized populations on open flats in Joshua tree woodland of valley floor.

Opuntia chlorotica Engelm. & J. Bigelow PANCAKE CACTUS (Sanders 5023, UCR)

Caryophyllaceae

Eremogone macradenia (S. Watson) Ikonn. MOJAVE SANDWORT (Bell 5678, RSA) On rocky slopes and ridgelines.

Chenopodiaceae

Atriplex canescens (Pursh) Nutt. FOURWING SALTBUSH (Bell 5745, RSA)

!Bassia hyssopifolia (Pallas) Volk. FIVEHOOK BASSIA (Bell 5966B, RSA) A single collection found on the mine tailings of Hart Mine.

Chenopodium incanum (S. Watson) A. A. Heller var. ***occidentale*** D.J. Crawford MEALY PIGWEED (Andre 14034, UCR; Bell 4254, RSA)

Grayia spinosa (Hook.) Moq. HOPSAGE (Andre 13587, UCR)

Krascheninnikovia lanata (Pursh) A.D.J. Meeuse & Smit WINTER FAT (Andre 13605, UCR; Bell 5831, RSA)

Cucurbitaceae

Cucurbita palmata S. Watson COYOTE MELON (Bell 5798, RSA)

Euphorbiaceae

†Chamaesyce abramsiana (Wheeler) Koutnik ABRAM'S SPURGE (Bell 4256, RSA)

Chamaesyce albomarginata (Torrey & A. Gray) Small RATTLESNAKE SPURGE (Bell 5740, RSA)

Chamaesyce fendleri (Torrey & A. Gray) Small FENDLER'S SPURGE (Bell 4215, RSA)

Chamaesyce micromera (Engelm.) Wooton & Standley SONORAN SPURGE (Bell 5697, RSA)

†Chamaesyce revoluta (Engelm.) Small ROLLED LEAF SPURGE (Bell 4219, RSA)

Chamaesyce serpyllifolia (Pers.) Small THYME LEAFED SPURGE (Bell 5726, RSA)

Chamaesyce setiloba (Torrey) Millsp. YUMA SPURGE (Bell 4225, RSA)

†Euphorbia exstipulata Engelm. Var. ***exstipulata*** CLARK MOUNTAIN SPURGE (Bell 4245, RSA)

Euphorbia schizoloba Engelm. MOJAVE SPURGE (Bell 3597, RSA)

†Tragia ramosa Torrey DESERT NOSEBURN (Bell 4237, RSA)

Fabaceae

†Acmispon argyraeus (Greene) Brouillet var. ***multicaulis*** (Ottley) Brouillet SCRUB LOTUS (Andre 10243, UCR; Bell 4248, RSA)

Astragalus lentiginosus Hook. Var. ***fremontii*** (A. Gray) Watson FREMONT'S MILKVETCH (Andre 13596, UCR; Bell 5703, RSA)

Astragalus newberryi A. Gray NEWBERRY'S MILKVETCH (Bell 3606, RSA) Uncommon on rocky slopes.

†Astragalus nutans M.E. Jones PROVIDENCE MTNS. MILKVETCH (Andre 10236, UCR; Bell 3595, RSA) Found in rocky places at the northern section of the range.

Hoffmannseggia glauca (Ortega) Eifert INDIAN RUSHPEA (Bell 5727, RSA)

Lupinus brevicaulis S. Watson SHORT STEMMED BLUE LUPINE (Andre 4993, UCR)

Senegalia greggii (A. Gray) Britton & Rose CATCLAW (Bell 5750, RSA)

Geraniaceae

!Erodium cicutarium (L.) L'H-r. RED STEMMED FILAREE (Bell 5975, RSA)

Krameriacea

Krameria erecta Schultes LITTLE LEAVED RATANY. (Andre 25380, GMDRC)

Lamiaceae

!Marrubium vulgare L. HOREHOUND (Bell 5743, RSA) Localized populations at sag ponds.

Salvia dorrii (Kellogg) Abrams DESERT SAGE (Andre 13608, UCR; Bell 5721, RSA)

Scutellaria mexicana (Torr.) A.J. Paton MEXICAN BLADDER SAGE (Bell 5718, RSA)

Linaceae

Linum lewisii Pursh var. ***lewisii*** LEWIS' FLAX. (Andre 4987, GMDRC)

†Linum puberulum (Engelm.) A.A. Heller HAIRY FLAX (Sanders 6992, UCR)

Loasaceae

Mentzelia laevicaulis (Hook.) Torrey & A. Gray GIANT BLAZINGSTAR (Bell 3605, RSA)

Malvaceae

†Abutilon parvulum A. Gray DWARF INDIAN MALLOW (Andre 29972, GMDRC))

Sphaeralcea ambigua A. Gray var. ***ambigua*** APRICOT MALLOW (Andre 13584, UCR; Bell 5708, RSA)

Sphaeralcea ambigua A. Gray var. ***rugosa*** Kearney APRICOT MALLOW (Andre 25640, RSA)

Molluginaceae

Mollugo cerviana (L.) Ser. THREADSTEM CARPETWEED (Andre 29987, RSA)

Nyctaginaceae

Allionia incarnata L. WINDMILLS (Bell 5702, RSA)

Boerhavia coulteri (Hook) S. Watson COULTERS SPIDERLING (Bell 4262, RSA)

Boerhavia triquetra S. Watson var. ***intermedia*** (M.E. Jones) Spellenb. FIVEWING SPIDERLING (Bell 4221, RSA)

Boerhavia wrightii A. Gray WRIGHT'S SPIDERLING (Bell 4214B, RSA)

Mirabilis albida (Walter) Heimeri WHITE FOUR O'CLOCK (Bell 5686, RSA)

†Mirabilis coccinea (Torrey) Benth. & Hook. SCARLET FOUR O'CLOCK (Bell 4236, RSA)

Mirabilis multiflora (Torrey) A. Gray GIANT FOUR O'CLOCK (Andre 13594, UCR; Bell 3616, RSA)

Oleaceae

Forestiera pubescens Nutt. DESERT OLIVE (Bell 3608, RSA)

Fraxinus anomala S. Watson SINGLE LEAVED ASH (Bell 3603, RSA)

Menodora scabra A. Gray var. ***glabrescens*** A. Gray

†Menodora scabra A. Gray var. ***scabra*** ROUGH DESERT OLIVE (Bell 5692, RSA)

Onagraceae

Chylismia brevipes (A. Gray) Small ssp. ***brevipes*** YELLOW CUPS (Andre 13573, UCR)

Eremothera chamaenerioides (A. Gray) W.L. Wagner & Hoch LONG FRUIT SUNCUP (Andre 13585, UCR)

†Oenothera cespitosa Nutt. ssp. ***crinita*** (Rydb.) Munz CAESPITOSE EVENING PRIMROSE (Bell 3593, RSA)

Oenothera cespitosa Nutt. Ssp. ***marginata*** (Hook. & Arn.) Munz FRAGRANT EVENING PRIMROSE. Rocky slopes. (Andre 10239, GMDRC)

Oenothera primiveris A. Gray YELLOW DESERT EVENING PRIMROSE (Andre 14035, UCR)

Oenothera suffrutescens (Ser.) W.L. Wagner & Hoch WILD HONEYSUCKLE (Bell 3611, RSA)

Orobanchaceae

Castilleja chromosa A. Nelson DESERT PAINTBRUSH (Andre 13609, UCR; Bell 5701, RSA)

†Cordylanthus parviflorus (Ferris) Wiggins PURPLE BIRD'S BEAK (Andre 25394, RSA)

Papaveraceae

Eschscholzia californica Cham. ssp. ***mexicana*** (E. Greene) C. Clark (Andre 10237, UCR)

Eschscholzia glyptosperma E. Greene DESERT GOLD POPPY (Andre 13575, UCR)

Plantaginaceae

†Penstemon bicolor (Brandegee) Clokey & Keck PINTO BEARDTONGUE (Andre 10238, UCR; Bell 3589, RSA)

Polemoniaceae

†Aliciella triodon (Eastw.) Brand COYOTE GILIA (Andre)

Gilia aliquanta A.D. Grant & V. Grant ssp. ***breviloba*** A.D. Grant & V. Grant PUFF CALYX GILIA (Andre 10245, UCR)

Gilia clokeyi H. Mason CLOKEY'S GILIA (Andre 14032, RSA)

Gilia ophthalmoides Brand EYED GILIA (Andre 13592, UCR)

Gilia sinuata Benth. CINDER GILIA (Andre 14033, RSA)

Gilia transmontana (H. Mason & A.D. Grant) A.D. Grant & V. Grant TRANSMONTANE GILIA (Sanders 6999, UCR)

Langloisia setosissima (Torrey & A. Gray) E. Green ssp. ***setosissima*** BRISTLY LANGLOISIA (Andre 13581, UCR)

Linanthus bigelovii (A. Gray) E. Greene BIGELOW'S LINANTHUS. Uncommon on gravelly alluvial slopes. (Andre 10108, UCR)

Phlox stansburyi (Torrey) A.A. Heller COLD DESERT PHLOX (Bell 4253, RSA)

Polygalaceae

†Polygala acanthoclada A. Gray DESERT MILKWORT (Bell 5755, RSA)

Polygonaceae

Eriogonum deflexum Torrey FLAT TOPPED BUCKWHEAT (Bell 5714, RSA)

†Eriogonum heermannii Durand & Hilg. Var. ***floccosum*** Munz CLARK MOUNTAIN BUCKWHEAT (Bell 4265, RSA)

Eriogonum inflatum Torrey & Fremont DESERT TRUMPET (Bell 5713, RSA)

Eriogonum microthecum Nutt. Var. ***simpsonii*** (Benth.) Reveal SIMPSON'S BUCKWHEAT (Bell 2792, RSA)

Eriogonum nidularium Cov. BIRDNEST BUCKWHEAT (Bell 5793, RSA)

Eriogonum palmerianum Rev. PALMER'S BUCKWHEAT (Bell 4257, RSA)

Eriogonum plumatella Durand & Hilg. FLAT TOPPED BUCKWHEAT (Andre 22179, RSA; Bell 4227, RSA)

Eriogonum pusillum Torrey & A. Gray YELLOW TURBANS (Bell 3613, RSA)

Eriogonum trichopes Torrey LITTLE DESERT TRUMPET (Bell 5729, RSA)

Eriogonum wrightii Benth. WRIGHT'S BUCKWHEAT (Bell 5689, RSA)

Portulacaceae

†Portulaca halimoides L. SILKCOTTON PURSLANE (Bell 5753, RSA)

Portulaca oleracea L. COMMON PURSLANE (Andre 25605, RSA)

Ranunculaceae

Delphinium parishii A. Gray ssp. ***parishii*** PARISH'S LARKSPUR (Andre 13574, UCR)

Rosaceae

Fallugia paradoxa (D. Don) Endl. APACHE PLUME (Bell 5830, RSA)

Rubiaceae

Galium parishii Hilend & J. Howell PARISH'S BEDSTRAW (Bell 4252, RSA)

†Galium proliferum A. Gray DESERT BEDSTRAW (Andre)

Solanaceae

Datura wrightii Regel JIMSONWEED (Bell 5742, RSA)

Lycium andersonii A. Gray ANDERSON'S DESERT THORN (Bell 5800, RSA)

Nicotiana obtusifolia Martens & Galeotti DESERT TOBACCO (Bell 5829, RSA)

Physalis crassifolia Benth. YELLOW NIGHTSHADE GROUND CHERRY. (Andre 25627, RSA)

Physalis hederifolia A. Gray var. ***palmeri*** (A. Gray) Cronq. PALMERS GROUND CHERRY (Andre 22172, RSA; Bell 4238, RSA)

†Physalis lobata Torrey LOBED GROUND CHERRY (Andre 13612, UCR; Bell 5803, RSA) Known from just a few restricted populations at south end of range in silty soils.

!Solanum elaeagnifolium Cav. SILVERLEAF NIGHTSHADE (Bell 5735, RSA) Localized populations at sag ponds.

Verbenaceae

†Aloysia wrightii Abrams VERA DULCE (Bell 4230, RSA) Uncommon on rocky slopes.

Verbena gooddingii Briq. SOUTHWESTERN MOCK VERVAIN (Andre 13576, UCR; Bell 3602, RSA)

Zygophyllaceae

Kallstremia californica (S. Watson) Vail CALIFORNIA CALTROP (Andre 25719, RSA)

†Kallstroemia parviflora Norton WARTY CALTROP (Andre 22189, RSA; Bell 5749, RSA)

Larrea tridentata (DC.) Cov. CREOSOTE BUSH (Bell 5747, RSA)

!Tribulus terrestris L. PUNCTURE VINE (Bell 5811, RSA)

MONOCOTS

Agavaceae

Yucca baccata Torrey SPANISH BAYONET (Andre 13610, UCR; Bell 5724, RSA)

Yucca brevifolia Engelm. JOSHUA TREE (Bell 5723, RSA)

Alliaceae

†Allium nevadense S. Watson NEVADA ONION (Andre 4992, UCR)

Liliaceae

Calochortus kennedyi Porter DESERT MARIPOSA LILY (Andre 13579, UCR)

Poaceae

Aristida adscensionis L. SIX WEEK THREE AWN (Bell 5682, RSA) Occasional to common.

Aristida purpurea Nutt. var. ***longiseta*** (Steudel) Vasey RED THREE AWN (Bell 5784, RSA)

Aristida purpurea Nutt var. ***nealleyi*** (Vasey) K.W. Allred NEALLEY THREE AWN (Andre 13611, UCR)

Bothriochloa barbinodis (Lagasca) Herter BEARD GRASS (Bell 4239, RSA) Only known from one population in the vicinity of Stagecoach Well at the northwestern section of range growing at base of dry waterfall with small spring.

Bouteloua aristidoides (Kunth) Griseb. NEEDLE GRAMA (Bell 4231, RSA) Uncommon to locally common on rocky slopes and flats.

Bouteloua barbata Lagasca SIXWEEK GRAMA (Bell 5706, RSA) Occasional to common after summer rains.

Bouteloua curtipendula (Michaux) Torrey SIDEOATS GRAMA (Bell 2796, RSA) Occasional in rocky/bouldery canyons.

†Bouteloua eriopoda (Torrey) Torrey BLACK GRAMA (Andre 22176, RSA; Bell 4220, RSA) Uncommon to locally common on rocky slopes and ridges, along wash margins and in open grassy flats.

Bouteloua gracilis (Kunth) Griffiths BLUE GRAMA (Bell 5683, RSA)

Dasyochloa pulchella (Kunth) Rydb. LOW WOOLLYGRASS (Andre 13578, UCR; Bell, 5730, RSA)

Elymus elymoides (Raf.) Swezey SQUIRREL TAIL GRASS (Andre 13599, RSA; Bell 5966A, RSA)

†Enneapogon desvauxii Beauv. NINE AWNED PAPPUS GRASS (Bell 4240, RSA)

!Eragrostis cilianensis (All.) Janchen STINKGRASS (Bell 5728, RSA) Common/frequent following summer rains.

Hilaria jamesii (Torr.) Benth. GALLETA GRASS (Bell 5716, RSA)

Hilaria rigida (Thurb.) Scribn. BIG GALLETA GRASS (Bell 5952, RSA)

Leptochloa panacea (Retz.) Ohwi ssp. ***brachiata*** (Steud.) N. Snow MUCRONATE SPRANGELTOP. (Andre 25395, RSA)

†Muhlenbergia appressa C.O. Goodd. APPRESSED MUHLY (Andre)

Muhlenbergia microsperma (DC.) Trin. ANNUAL MUHLY (Bell 5712, RSA)

Muhlenbergia porteri Beal PORTER’S MUHLY (Bell 4229, RSA)

†Munroa squarrosa (Nutt.) Torrey FALSE BUFFALO GRASS (Andre 25639, RSA)

†Panicum hirticaule C. Presl MEXICAN PANICGRASS (Bell 5815, RSA)

Poa fendleriana (Steud.) Vasey MUTTONGRASS (Bell 3601, RSA)

†Scleropogon brevifolius Philippi BURRO GRASS (Andre 22173, RSA; Bell 5948, RSA) Rare to locally common on hill sides and on gravely benches above drainages.

Sporobolus contractus A. Hitchc. SPIKE DROPSEED (Bell 5704, RSA)

Sporobolus cryptandrus (Torrey) A. Gray SAND DROPSEED (Bell 5738, RSA)

Sporobolus flexuosus (Vasey) Rydb. MESA DROPSEED (Bell 4260, RSA)

Stipa hymenoides Roem. & Schult INDIAN RICE GRASS (Bell 5739, RSA)

Stipa speciosa Trin. & Rupr. DESERT NEEDLE GRASS (Andre 13591, UCR; Bell 5953, RSA)

Tridens muticus (Torrey) Nash SLIM TRIDENS (Bell 4259, RSA)

Themidaceae

Dichelostemma capitatum Alph. Wood ssp. ***pauciflorum*** (Torrey) Keator BLUEDICKS (Andre 13604, RSA)