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Re: Comments on the Draft Desert Renewable Energy Conservation Plan (DRECP) and Environmental Impact Report/Environmental Impact Statement (EIR/EIS) -- DRECP NEPA/CEQA

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

On behalf of Defenders of Wildlife ("Defenders"), National Parks and Conservation Association ("NPCA"), and The Wildlands Conservancy ("TWC"), please accept and fully consider these comments regarding the Draft Desert Renewable Energy Conservation Plan ("DRECP" or the "Plan") and Environmental Impact Report/Environmental Impact Statement ("EIR/EIS") (herein referred to as "Draft DRECP"). The recommendations provided in our comments below will help ensure that the DRECP results in "an efficient and effective biological mitigation and conservation program providing renewable project developers with permit timing and cost certainty under the federal and California Endangered Species Acts while at the same time preserving, restoring and enhancing natural communities and related ecosystems." DRECP website (www.drecp.org).

Defenders is dedicated to protecting all wild animals and plants in their natural communities. To this end, we employ science, public education and participation, media, legislative advocacy, litigation,

and proactive on-the-ground solutions in order to impede the accelerating rate of extinction of species, associated loss of biological diversity, and habitat alteration and destruction. We have a long history of working to protect the California Desert and the wildlife that it supports.

NPCA is dedicated to the protection and enhancement of National Parks for current and future generations. NPCA advocates on behalf of more than one million members and activists, including 116,000 in California. NPCA has a significant and established on-the-ground presence in the region and manages three field offices in the Mojave Desert, including the Mojave Field Office in Barstow, CA and the Joshua Tree Field Office in Joshua Tree, CA.

TWC is a California non-profit public benefit corporation with the dual mission to preserve the beauty and biodiversity of the earth and to fund outdoor education programs for youth. TWC has preserved more land in California with private funds than any other conservation organization and owns the largest nonprofit preserve system in California. TWC strongly supports renewable energy production and utilization in California as long as it protects its unique and sensitive resources, in particular, the California Desert Conservation Area (CDCA). Our organization has a vested interest in renewable energy development proposed on federal lands within the California desert region, as TWC raised $45 million in private funds to put towards conservation of approximately 630,000 acres of checker-boarded land with the intent of preserving their cultural and natural resource values.

Successful conservation of the California Desert cannot be achieved with piecemeal decision-making and the Bureau of Land Management ("BLM") should use this opportunity to implement the landscape scale approach to development outlined in Sec. Order No. 3330, *Improving Mitigation Policies and Practices of the Department of the Interior*. A landscape approach is critically important given the development pressures facing the landscape, including from renewable energy and associated infrastructure and expected impacts from climate change. A successful landscape approach can "promote environmentally responsible renewable energy development…and "ensure[] the long term survival of native plants and animal species and ecosystems."[1]

We appreciate the time and commitment by the California Energy Commission ("CEC"), California Department of Fish and Wildlife ("CDFW"), BLM, and U.S. Fish and Wildlife Service ("USFWS") (hereinafter "DRECP Agencies") to complete this draft of the DRECP. We also appreciate the DRECP Agencies' efforts to solicit the input of stakeholders through public meetings, website materials, the DRECP Gateway, and webinars. The Draft DRECP is a good first step in the effort to craft a final plan that will balance the need to protect our desert lands and wildlife and the need to contribute to a clean energy future, but the plan does however need significant improvements, and our comments are guided by the hope that we can contribute to a successful final plan. While we offer a number of recommendations to improve this plan, we are mindful of the fact that time is of the essence and that this plan should be completed as quickly as possible. Therefore, we urge the

[1] Sec. Order No. 3330

state and federal agencies to work collaboratively with Defenders and other stakeholders in making the necessary revisions to this plan in order to deliver a final DRECP that meets our clean energy and wildlife and natural resources goals with maximum national, state and local support.

I. THE DRECP MUST BE DEVELOPED CONSISTENT WITH THE DEPARTMENT OF THE INTERIORS' RENEWABLE ENERGY, LANDSCAPE PLANNING, AND MITIATION POLICIES AND PROGRAMS.

Meeting California's and the nation's renewable energy goals quickly and efficiently is important to putting the U.S. on the path toward reining in our carbon pollution and reducing the risks of climate change. The DRECP holds out the possibility of providing effective protection and conservation of desert ecosystems while allowing for the appropriate development of renewable energy projects by identifying appropriate areas for renewable energy development in the desert while conserving areas important for wildlife, wilderness, recreation, and other values across the California desert.

The DRECP is a critical piece of fulfilling the Interior Department's commitments facilitate renewable energy development on lands of lower resource conflict and must be developed consistent with the following policies:

- **Sec. Order No. 3330**: This Secretarial Order directed the Interior Department to establish a department-wide, science-based strategy to strengthen mitigation practices so as to effectively offset impacts of large development projects of all types. The Secretarial Order addressed several of the key issues that need to be integrated into the DRECP: (1) the use of a landscape-scale approach, (2) early integration of the full mitigation hierarchy in project planning and design, (3) ensuring the durability of mitigation measures, (4) ensuring transparency and consistency in mitigation decisions, and (5) a focus on mitigation efforts that improve the resilience of our nation's resources in the face of climate change.

- **BLM Western Solar Energy Program:** Finalized in October 2012, the Program, established through the Solar Programmatic Environmental Impact Statement ("Solar PEIS"), amended 89 resource management plans to do the following: 1. Identify exclusion areas for utility scale solar energy development in the six state study area; 2. Identify priority areas for solar energy development that are well suited for utility-scale production of solar energy (i.e., Solar Energy Zones ("SEZs")); 3. Identify areas potentially available for utility-scale solar energy development outside of SEZs in the six-state study area (i.e., variance areas); and 4. Establish required programmatic and SEZ-specific design features for solar energy development on public lands to ensure the most environmentally responsible development and delivery of solar energy. Through the Solar PEIS Record of Decision ("ROD"), approximately 78.6 million acres of exclusion areas, 285,000 acres of Solar Energy Zones, and 19.3 million acres of variance areas were designated on lands managed by the BLM. (See Solar PEIS ROD at 27). The final DRECP must further refine lands identified in the solar energy program to direct development to lands of lower resource conflicts.

- **Interim Policy, Draft-Regional Mitigation Manual Section-1794**: BLM adopted a defined "durable" to be "effective for as long as the land-use authorization affects the resources and values" and not simply the duration of the permit.

- **Competitive Processes, Terms, and Conditions for Leasing Public Lands for Solar and Wind Energy Development and Technical Changes and Corrections:** In late 2014 BLM released its proposed rule for wind and solar leasing on the public lands. Competitive Processes, Terms, and Conditions for Leasing Public Lands for Solar and Wind Energy Development and Technical Changes and Corrections (79 Fed. Reg. 59022). The proposed regulatory amendments provide a foundation for implementing a landscape-scale approach to affirmatively direct development to lands most suitable for wind and solar development "based on a high potential for energy development and lesser resource impacts." 59034. This approach is consistent with direction in the Federal Land Policy and Management Act ("FLPMA") that the BLM make management decisions based on "a combination of balanced and diverse resource uses that takes into account the long-term needs of future generations for renewable and non-renewable resources."

  In an effort to "facilitate responsible solar and wind energy development and to receive fair market value for such development" the BLM's proposed rule looks to "promote the use of preferred areas for solar and wind energy development and establish competitive processes, terms, and conditions (including rental and bonding requirements) for solar and wind energy development rights-of-way both inside and outside these preferred areas." 59022. These preferred areas would be called "designated leasing areas" ("DLA").

  We incorporate by reference our comments on the Draft Rule on Competitive Processes, Terms, and Conditions: Leasing Public Lands for Solar and Wind Energy Development. Our comments are attached as Attachment 1.

- **The Las Vegas Resource Management Plan ("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 RMP revision. We 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.

II. THE DRECP ENERGY CALCULATOR MUST BE REVISED TO UPDATE THE UNDERLYING ASSUMPTIONS.

The foundation for establishing the acreage of lands within the DRECP area needed to accommodate renewable energy development and transmission projects is the Acreage Calculator, also known as the Energy Calculator. This tool, developed by CEC staff, has undergone several revisions based on stakeholder input over the past several years. The most recent updated version is from July 2012. The Energy Calculator is included in the Draft DRECP in Appendix F3. We believe there continue to be significant issues with the Energy Calculator because it does not accurately or fully account for: 1) Statewide population forecast and energy demand, 2) Effects of implementation of statewide policies involving energy efficiency, demand response, energy storage, and distributed generation, 3) Renewable energy projects that have become operational or under construction since the calculator cutoff date of December 31, 2010, and/or are approved and permitted in the Plan area, and 4) Projects located outside California which deliver electricity to utility companies in California.

Based on an analysis performed by the Sierra Club, which is included in their submitted comments on the Draft DRECP, dated February 23, 2015, the megawatt ("MW") generation goals for the DRECP needed to achieve the required statewide carbon emission reductions is approximately 15,000 MW. However, that generation goal needs to be further reduced by accounting for solar and wind energy projects that are approved in the Plan area or have come online after the energy calculator cutoff date of December 31, 2010. Deducting these projects erases the need not only for their megawatts, but also for their acreages and any multiplier that the draft Plan applied to them. The Sierra Club analysis also found that the MW generation goals for wind energy projects have already been met or exceeded, considering new projects located within the Tehachapi Wind Resource Area and two in western Imperial and eastern San Diego Counties. This fact indicates that no additional acreage elsewhere in the plan area is needed for wind energy development. We fully support and incorporate by reference the findings and recommendations on these issues contained in the Sierra Club's February 23, 2015, comment letter.

Recommendation: The Energy Calculator should be revised by incorporating the information identified above, which will necessitate revising the MW generation goal and the corresponding acreage needed in Development Focus Areas to achieve that goal.

A. <u>The DRECP Must Revise Its Assumptions About the Percentage of Large-Scale Central Station Facilities in the DRECP Area.</u>

The assumption that 100% of future central station solar thermal and 70% of central station PV solar projects in California will be located in the Plan area is uncertain and should be revised to reflect solar development planning and potential in the San Joaquin Valley. Large areas in the San Joaquin Valley which are no longer viable for agriculture due to water supply and drainage issues (e.g., Westlands Water District lands, as well as other lands) have high potential for development of central station solar thermal and solar photovoltaic ("PV") facilities. Indeed, The Nature Conservancy's *2013 Western San Joaquin Valley Least-Conflict Solar Energy Assessment* identified 435,601 acres of Low Biodiversity Conservation Value/Salt-affected lands where solar could be sited in

which neither biodiversity nor agricultural values would be unnecessarily impacted. These areas also have substantial transmission infrastructure. Recent advances in solar PV technology manufacturing have reduced the cost of electricity generation approximately 50% compared to solar thermal. Given this relatively high cost of solar thermal technology, including the current restrictions in place with the plan area on structural height associated with solar thermal towers due to military operational conflicts, there is uncertainty around the extent to which solar thermal technology will be used in the plan area. We understand that solar thermal is currently a technology that can incorporate energy storage, but rapid advances in electricity storage technology (e.g., batteries and capacitors) will likely lead to solar PV having energy storage as well.

Recommendation: The CEC should assess the statewide status and trend for central station solar thermal and solar PV facilities and make any needed corrections to the assumptions used in the Energy Calculator regarding the proportion of solar thermal and solar PV assumed to be located in the plan area.

B. <u>The DRECP Must Update the Existing and Permitted Projects in the DRECP Area.</u>

The Energy Calculator accounted for existing renewable energy projects as of January 1, 2011, and those were limited to large-scale central station facilities. Any project becoming operational after this date is described as "contributing to the incremental need for renewable energy projected in any scenario." Appendix F3, page 14. Appendix O contains information on existing projects that are in operation or under construction. In contrast, the Energy Calculator only accounted for projects in operation as of January 1, 2011.

The projects in Appendix O need to be accounted for in establishing a generation projection for the plan area and the needs to be updated because many projects that are operational, under construction or permitted are absent. According to our review, projects listed Appendix A of this letter need to be added to the DRECP's Appendix O[2]. We emphasize the need to include all these projects in the Energy Calculator, which should substantially reduce the projected MW planning goal of land. Using the project list in Appendix A, the MW reduction is 8,518 MW, but this does not include projects that have been proposed and are under permit review. Those projects need to be identified and accounted for in projecting their MW generation within the plan area. Since all proposed projects are not ultimately authorized or built, we recommend assuming a minimum 30-40 percent failure rate so that projected or anticipated MW generation is more accurate.

Public land administered by the BLM within the plan area has been allocated for renewable energy project development in support of meeting the federal Energy Policy Act of 2005 and Secretarial Orders of the Department of the Interior. These public lands are as follows, and need to be clearly

[2] Please also see list of projects referred to as "existing projects" in the Sierra Club's comments on the Energy Calculator.

accounted for in the DRECP description of the No Action Alternative and to what extent they would contribute to meeting MW generation goals.

- Imperial East Solar Energy Zone - 5,722 acres
- Riverside East Solar Energy Zone - 147,910 acres
- West Chocolate Mountains - 10,759 acres
- Truckhaven Geothermal Leasing Area - 14,731 acres

Recommendation: The Energy Calculator needs to be continually updated to account for projects that are operational and under construction, with consideration of additional projects that 1) have been permitted and not yet under construction, and 2) proposed and under permit review. For the later, we recognize that not all projects under permit review will become operational, so we recommend using a minimum 30-40 percent failure rate to establish a probable outcome, which is consistent with CEC findings with respect to project failures due to power purchase contract cancellations. The failure rate may be higher for projects that have been permitted that have no power purchase contracts in place. We recommend the agencies further investigate this issue and decide on a reasonable assumption for overall project failure rate in general.

Recommendation: The Energy Calculator, MW goals and acreage needed to achieve plan goals need to be modified based on updates to projects that are operating, under construction, permitted and undergoing environmental and permit review. Once the MW generation goals have been revised, the acreage estimates needed should revised to account for the public land areas, noted above, that have already been allocated for renewable energy development.

Recommendation: The CEC should reevaluate the renewable energy goals of the plan every 10 years to determine if assumptions and decisions made to allocate land to renewable energy development are valid or need to be modified. We support the DRECP Agencies exploring the recommendation by the Sierra Club, in its February 23, 2015, DRECP comment letter, for a collaborative planning process to develop a more nuanced, phased build-out.

III. THE DRAFT DRECP MUST BE REVISED TO MEET THE REQUIREMENTS OF STATE AND FEDERAL ENVIRONMENTAL LAWS.

The Draft DRECP is a complex document of three intersecting and interconnected plans – a state Natural Community Conservation Plan ("NCCP"), a federal General Conservation Plan ("GCP") and a federal Land Use Plan Amendment ("LUPA"). As currently written, these three parts need further revision and refinement both to integrate better these three plans and to ensure that the sum of the parts meet the various state and federal legal requirements for plan finalization and permit issuance.

Below, we detail where the plans currently fall short of meeting federal and state requirements and suggest specific changes to ensure that a final plan is legally viable. It is critical that these issues are resolved in a final plan so that the DRECP will not only provide for meaningful conservation of desert resources into the future, but that it will also provide for an efficient, clear, cost-effective and timely system for issuing permits for renewable energy projects. The DRECP, if done well, could provide renewable energy developers, utilities, and land use and transmission planners with a more certain landscape in which clean energy projects and transmission lines are built.

A. The Draft Plan Must Be Revised to Meet the Natural Community Conservation Planning Act Standards

The NCCP Act was enacted in 1991 to "conserve long-term viable populations of California's native animal and plant species and their habitats in areas large enough to ensure their continued existence," while at the same time allowing for "compatible and appropriate" urban growth and economic development.[3] In early 2002, the California Legislature enacted major legislation that revised the NCCP Act, and added numerous new procedural and substantive requirements to the NCCP Act.[4]

The DRECP, as currently designed, does not meet the NCCP Act standards for several reasons:

1. Requiring only the implementation of Step-Down Biological Goals and Objectives ("BGOs") rather than Plan-Wide Biological Goals and Objectives through the DRECP results in the failure of the plan to provide for the conservation and management of the covered species within the Plan Area.

2. The Plan-Wide Biological Goals and Objectives fail to provide for the conservation of covered species and natural communities.

3. Whether or not the plan is meeting Plan-Wide or Step-Down Biological Goals and Objectives, the commitments by the BLM to achieve these measures can be overturned with simple administrative decisions

4. Until the counties/cities make any legally enforceable commitments to fulfill the conservation obligations in this plan, there is no rational basis upon which CDFW can conclude that the DRECP Conservation Strategy will be implemented on private lands.

5. The Draft DRECP fails to demonstrate how the "conservation" increment of the DRECP (i.e., those actions above the "mitigation" obligations) will be implemented.

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[3] California Department of Fish and Game, 1991-92 Report on the Status of the Natural Communities Conservation Planning Program.
[4] SB 107 (Sher), Chapter 4, Stats. of 2002.

6. There is no clear governance structure beyond a loose group of independently operating agencies who are managed by a Program Manager who has no authority over decision-making or funding decisions.

7. There is no clear funding plan upon which a finding can be made that there is adequate funding available to implement the DRECP.

8. While the adaptive management and monitoring has been identified as a critical component of this plan, the adaptive management plan lacks important information about how monitoring and decision-making will be carried out in a timely and relevant manner.

    1. The Step-Down Biological Goals and Objectives Fail to Achieve Conservation (Recovery) of Covered Species within the Plan Area, as Required by the NCCP Act.

To comply with the NCCP Act, an NCCP must provide for measures necessary to recover covered species within the plan area. In particular, the statute's definition of "natural community conservation plan" requires that an NCCP "shall identify and provide for those measures necessary to conserve and manage natural biological diversity within the plan area while allowing compatible and appropriate economic development, growth, and other human uses." Cal. Fish and Game Code § 2805(h). Section 2820, which sets forth the findings that CDFW must make in order for a plan to be approved, details the requirement that an NCCP provides for the conservation (i.e., recovery) of species. For example, before approving an NCCP, CDFW must find that "[t]he development of reserve systems and conservation measures in the plan area provides, as needed for the conservation of species, all of the following," and lists specific categories of conservation measures. Id. at § 2820(a)(4); id. at § 2820(a)(6) (requiring plan to contain "specific conservation measures that meet the biological needs of covered species"). In addition, the plan must establish measures "that provide equivalent conservation of covered species within the plan area." Id. at §2820(a)(4)(B). Finally, before CDFW is allowed to issue a permit authorizing the take of a covered species under the NCCP Act, it must find that the covered species "conservation and management is provided for in a natural community conservation plan approved by the department." Id. at § 2835.

The NCCP Act very specifically defines the terms "conserve," "conserving," and "conservation" as "the use of, methods and procedures within the plan area that are necessary to bring any covered species to the point at which the measures provided pursuant to [CESA] are not necessary, and for covered species that are not listed pursuant to [CESA], to maintain or enhance the condition of a species so that listing pursuant to [CESA] will not become necessary." Id. at § 2805(d).

Thus, for species listed as endangered or threatened under CESA, an NCCP must, by definition, within the plan area, identify and provide for those measures necessary to recover the species to the point where it is no longer is considered endangered or threatened and no longer needs to be on the endangered species list. For unlisted species, the plan must provide measures, within the plan area, that keep the species from declining to the point in which it would need to be listed under CESA.

Step-down Biological Goals and Objectives are a subset of the Plan-wide Biological Goals and Objectives, which address only the impacts of Covered Activities (solar, wind, geothermal, transmission development) on Natural Communities and Covered Species. It is clearly stated in Chapter II.3-14 that the draft plan, when implemented, will not meet the Plan-wide Biological Goals and Objectives: "Because the DRECP does not address all activities and uses in the Plan Area, the DRECP cannot bear the full burden of achieving Plan-wide BGOs. For that reason, the Step-down Biological Objectives represent the desired conservation for each biological resource that would result from DRECP implementation." We interpret this to mean that conservation under the DRECP will contribute to the Plan-wide BGOs but will not ensure that they will be achieved.[5]

CDFW's interpretation of the NCCP Act requirements – that an NCCP does not need to provide for the conservation and management of covered species within the plan area, but only needs to contribute an amount of conservation that is "proportional" to the impacts of the covered activities" – is a clear departure from the NCCP Act's statutory provisions and from how the NCCP Act standard has been applied to <u>every single NCCP approved in the state of California since 1991</u>. Indeed, CDFW has provided <u>no legal rationale</u> in the DRECP for its abrupt departure from the clear "provides for conservation" standard in the NCCP Act.

The inconsistency of CDFW's new interpretation of the NCCP Act standards is highlighted by the case of the Mohave ground squirrel. The Mohave ground squirrel exists almost entirely within the DRECP plan area and therefore must be fully "conserved" by the DRECP. In other words, because the ground squirrel entire range exists almost exclusively within the DRECP plan area, CDFW must make a finding that the DRECP will provide for the recovery of the Mohave ground squirrel before it can approve the issuance of a single take permit under Section 2835. Merely contributing to this species recovery in proportion to the impact of the covered activities (or through the implementation of the Step-down BGOs and completion of the NCCP Reserve) is inadequate when the species occurs entirely within the Plan Area. Therefore, the DRECP fails to provide for those measures necessary to conserve Mohave ground squirrel in the Plan Area.

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[5] Even assuming that CDFW is correct that an NCCP may only provide for conservation "proportional" to the impacts of the covered activities, the rationale for taking the approach of establishing Step-down BGOs for the DRECP is not adequately addressed in the draft plan. On a technical level, this approach is problematic due to the uncertainty surrounding the proportionality estimates. Appendix N-2 describes an approach to estimating the proportion of land within the plan area that will be developed by renewable energy. This analysis is done by county using estimates for urban and commercial build out. However, only urban and commercial development was addressed, apparently assuming that agriculture, grazing, off-highway vehicle use, mining, or other types of development would not be a major driver of land use. Additionally, it is unclear whether projected residential and commercial development would be in conflict with development of renewable energy in certain areas, such as the Antelope Valley. Lastly, there is no explanation for how the percentage of renewable energy development impact within each county was used to develop the step-down biological goals and objectives and the corresponding step-down reserve design. For example, in Riverside County, renewable energy development is expected to be 93-94% of the projected development in the eastern part of the County. One would conclude then that 93-94% of the reserve design envelope should be implemented through the DRECP. However, this analysis is lacking in the draft.

While the Mohave ground squirrel is one of the clearest examples, as discussed infra, the Draft DRECP fails to provide for the conservation of a number of covered species.

Recommendation: The Draft DRECP, in order to meet the NCCP Act standards, must be revised to require the achievement of DRECP Plan-wide BGOs. If the DRECP is going to be an NCCP, the Step-down BGOs must be eliminated as they will not achieve the NCCP standard of providing for the conservation of covered species within the plan area.

2. The DRECP Conservation Strategy Must Be Revised to Meet NCCP Standards.

a. The Draft DRECP Biological Goals and Objectives must be quantitative.

The current draft plan does not propose quantitative Plan-wide BGOs, and this continues to be a significant problem. Our close examination of the Draft DRECP revealed that the document proposes numeric biological objectives for very few covered species and natural communities – most of the BGOs are qualitative. Stated another way, the Draft DRECP does not include quantitative and measurable conservation measures for the covered species and natural communities. The lack of quantitative objectives leaves us without a means of assessing the adequacy of conservation measures proposed in the document and handicaps successful implementation from the outset. Without quantitative Plan-wide BGOs, it is impossible to measure and monitor whether implementation of the plan is on track for meeting those goals, or whether the proposed alternatives would preclude the agencies from meeting them.

In our effort to evaluate the DRECP conservation strategy and assist the DRECP agencies in completing this plan, Defenders worked with The Nature Conservancy ("TNC") to develop quantitative BGOs in order to evaluate the adequacy of the Draft DRECP in protecting the long-term viability of the covered species and natural communities (See Table in Appendix B). Defenders and TNC scientists identified conservation objectives for the target species and communities using the standard approaches used by TNC based on conservation planning principles. For species, this standard approach is based upon the species' rarity, spatial distribution and legal status (See Appendix B for further explanation). Similarly, for natural communities, it is based upon patch size, distribution rarity, and species features (such as dependence on a high water table)[6]. Quantitative objectives identified with these approaches are widely regarded as minimal standards for conservation planning by Defenders, TNC, and other agencies and organizations.

Our analysis of the Draft DRECP based on these quantitative BGOs indicates that implementation of the Plan-wide Reserve Design for the Draft DRECP *will not* achieve our recommended quantitative BGOs for all covered species and natural communities. This work provides an example

[6] Detailed methods for identifying quantitative biological goals and objectives are included in Appendix B of this comment letter.

of how the DRECP could set quantitative Plan-wide BGOs and develop a reserve design to adequately encompass the necessary habitat for conservation of covered species and natural communities.

CDFW must make a finding that the DRECP's conservation strategy will provide for the conservation of covered species. Without quantitative Plan-wide BGOs, there is no evidence in the plan or its accompanying documents that this plan will achieve conservation as there is no clear logical connection between conservation objectives and conservation outcomes. Further, without measurable objectives, there is no way for the agencies to be able to determine whether this plan is achieving success or not as they are implementing it.

Recommendation: We strongly recommend that the DRECP agencies develop quantitative Plan-Wide BGOs that can be used to show how the DRECP reserve design provides assurances for species and natural community conservation and recovery. The recommended approach and quantitative BGOs are described in further detail in Appendix B and included the TNC comment letter on the Draft EIR/EIS for the DRECP. We also recommend that the agencies evaluate the recommended quantitative BGOs to determine if any of the goals should be raised to a higher conservation standard.

b. *The Draft DRECP must demonstrate how the Plan-wide BGOs will be achieved through the NCCP Reserve.*

The Draft DRECP does not provide a thorough analysis of how the biological goals and objectives will be achieved through implementation of the DRECP NCCP reserve. The draft DRECP does not include geo-spatial representation that delineates how and where quantitative biological objectives will be achieved within the reserve design. Therefore, there is no rational basis to conclude that the plan will meet these objectives for covered species.

Recommendation: The DRECP agencies need to provide a thorough analysis for how the Plan-Wide BGOs will be achieved through implementation of a durable conservation reserve design. Maps of species habitat within and outside of the various reserve design designations should be provided to show where and how habitat and important linkages will be protected for each species.

c. *The Draft DRECP's Development Focus Areas ("DFA") should be revised to ensure that they do not preclude meeting the Plan-wide BGOs*

As discussed above, Defenders of Wildlife worked with TNC to develop quantitative Plan-Wide BGOs that should be the minimum requirement for the DRECP to meet the conservation standards of the NCCP for covered species and natural communities. Defenders and TNC scientists then conducted an analysis to determine whether the quantitative Plan-wide BGOs identified for each covered species and natural community could be met through implementation of the Reserve Design Envelope. This analysis is presented in the form of a chart that shows to what extent the various elements of the Reserve Design Envelope meet the recommended quantitative objectives for

each species. This chart also shows where DFAs, if fully developed, would preclude species from meeting their conservation targets. We analyzed whether the location, size, and configuration of proposed DFAs as they currently appear in the Preferred Alternative of the Draft DRECP would preclude meeting our recommended quantitative BGOs. Many of the covered species have some percentage of habitats in the DFAs; however, we were looking for species that may be unable to meet their quantitative goals due to the amount of their modeled habitat within the DFAs. We found that 11 of the 37 covered species may be unable to meet the recommended quantitative Plan-Wide BGOs due to the size and location of DFAs in their habitat. These species include:

1. Greater Sandhill Crane (85% of modeled habitat is in DFA)[7]
2. Mountain Plover (83% of modeled habitat is in DFA)[8]
3. Desert Pupfish (62% of modeled habitat is in DFA)
4. Tricolored blackbird (59% of modeled habitat is in DFA)
5. California black rail (39% of modeled habitat is in DFA)
6. Southwestern willow flycatcher (34% of modeled habitat is in DFA)
7. Alkali mariposa lily (29% of modeled habitat is in DFA)
8. Bakersfield cactus (29% of modeled habitat is in DFA)
9. California Condor (29% of modeled habitat is in DFA)
10. Mohave ground squirrel (11% of modeled habitat is in DFA)
11. Owen's Pupfish (0.5% of modeled habitat is in DFA)

We recognize that implementation of the Conservation Management Actions ("CMAs") in the DFAs would reduce the impact to these species by imposing requirements on developers to avoid impacts to covered species. However, since the Counties have not yet agreed to sign onto the DRECP, it is unclear if the CMAs on private lands will be adopted unless the covered activity is under the jurisdiction of the CEC or a take permit is required. This is especially important for cases in which Covered Species will be impacted by Covered Activities, but no take permit is required, e.g. Burrowing Owl. If the CMAs cannot be guaranteed to provide the necessary protections to species whose habitat falls within DFAs, then DFAs should be refined to ensure the DRECP can meet quantitative BGOs.

Recommendation: For the species listed above, please provide further analysis explaining how the DRECP will ensure that NCCP conservation and recovery standards will be met for these species considering portions of their habitat fall within DFAs and may preclude the species from meeting recommended quantitative BGOs. Provide an analysis of whether the CMAs within DFAs are sufficient for species to meet quantitative BGOs and if they are, provide analysis for how these

[7] Even though the location and size of the DFAs in their entirety may preclude this species from meeting its habitat conservation objective, if the maximum of 297,000 acres of DFAs were developed, it would not convert enough of this species habitat to preclude meeting the quantitative objectives.
[8] Same as above.

CMAs can be assured on both private and public land. In cases where CMAs cannot be guaranteed, consider refining the DFAs[9] following the recommendations below for each species:

1. Desert Pupfish: Remove 5,090 acres of habitat from DFAs
2. Tricolored blackbird: Remove 93,483 acres of habitat from DFAs
3. California black rail: Remove 30,556 acres of habitat from DFAs
4. Southwestern willow flycatcher: Remove 31,161 acres of habitat from DFAs
5. Alkali mariposa lily: Remove 8,410 acres of habitat from DFAs
6. Bakersfield cactus: Remove 52,365 acres of habitat from DFAs
7. California Condor: Remove 231,579 acres of habitat from DFAs
8. Mohave ground squirrel: Remove 114,869 acres of habitat from DFAs
9. Owen's Pupfish: Remove 60 acres of habitat from DFAs

d. The Draft DRECP must strengthen its protections for covered species.

Even without quantifiable Plan-Wide BGOs, Defenders' analysis of the Draft DRECP identified significant problems with protections for covered species. First, we are concerned that the Draft DRECP may result in project impacts failing to be addressed roughly proportional in time and extent as they relate to the implementation of the conservation measures. Under the NCCP Act, the implementation agreement for an NCCP must include "[p]rovisions to ensure that implementation of mitigation and conservation measures on a plan basis is roughly proportional in time and extent to the impacts on habitat or covered species . . .." Cal. Fish and Game Code §2829(b)(9).

According to the Draft Implementing Agreement, the DRECP Agencies will "ensure" that the NCCP Reserve and other Conservation Management Actions will occur at or faster than the pace at which Covered Activities impact Covered Species habitat. Implementing Agreement at 10. However, despite that statement, there is nothing in the Implementing Agreement to support that conclusion. Indeed, the only timeframe discussed in the agreement regarding this "rough proportionality" requirement is the statement that "[a]ll compensatory mitigation actions . . . will be initiated or completed within twelve (12) months after the date on which the impact being mitigated occurs (e.g., the date of ground disturbance for construction activities or direct mortality from operations)" and that the agencies will grant an extension of an additional six month. Id. at 10-11. This allowance for implementing (or at least starting to implement) mitigation to occur within 18 months of the "take" or impact is unacceptable. To begin with, this provision does not even require that the mitigation action is completed within 18 month; it only needs to be "initiated." This leave the completion of mitigation open to endless delays and potentially such mitigation may never occur. Second, there is no justification that such a delay is biologically acceptable. The impact could

[9] It is important to note that the acre totals that we are recommending for removal are not necessarily additive, and would not necessarily benefit just one species at a time. For example, many of the bird species that are dependent on agricultural lands would benefit from removal of the same acreage.

affect breeding or other key life stages for Covered Species and mitigation could occur at a time period that is irrelevant to addressing that impact.

While mitigation appears to have at least some timeframe for completion associated with it, all other Conservation Management Actions have nebulous or non-existent timeframes for completion. For example, restoration must occur within the undefined "prescribed time period." Id. at 11. Non-acquisition forms of compensatory mitigation have time considerations that "may vary." Id. And, for all other Conservation Management Actions that are neither restoration nor mitigation, there is nothing mentioned in the Implementing Agreement about a time frame for implementation. Again, this lack of any clear timeframe or assurance that the "extent" of the impact is appropriately addressed through the implementation of **all** Conservation Management Actions (both mitigation and non-mitigation) violates the NCCPA proportionality requirement.

Recommendation: The DRECP Implementation Agreement must be revised to require that **both** the mitigation and conservation measure remain "ahead" of the impacts from Covered Activities in order to ensure that there is little risk that the "rough proportionality" requirement of Fish and Game Code §2820(b)(9) will be violated. The allowance for these measures to occur **after** the impact to the Covered Species must be deleted from the Implementing Agreement.

In addition to the concern about the implementation of conservation measures, we have identified a number of species specific problems with the proposed Conservation Management Actions.

(1) Desert Tortoise:

The draft plan undermines recovery of the desert tortoise in numerous ways and provides for greater impacts to the species through allowable habitat loss and reductions in compensatory mitigation compared to what is required under current management by state and federal agencies:

- Compensatory mitigation, currently at a 5:1 ratio for all habitat loss from all multiple use activities within all Desert Tortoise Areas of Critical Concern ("ACECs"), would be diminished to a 2:1 ratio and applicable to loss of habitat only in designated critical habitats, not ACECs for the species. In some cases, ACECs are larger than critical habitat, such as in the Western Mojave. Furthermore, compensation would be limited to 2:1 for Covered Activities (except for impacts from new transmission projects which would retain the 5:1 compensation requirement).

  Recommendation: We recommend that 5:1 compensatory mitigation be required for all activities that result in habitat loss within all desert tortoise conservation areas ACECs, critical habitat and Desert Wildlife Management Areas ("DWMAs") identified in the 1994 Desert Tortoise Recovery Plan, and Priority 1 and Priority 2 habitat linkages identified by the U.S. Fish and Wildlife Service in its comments to BLM on Solar PEIS.

- Proposed CMAs for protection of habitat in tortoise conservation areas and linkages are described as "avoidance to the maximum extent practicable" as defined in the glossary of terms for Unavoidable impacts to Resources. The problem stems from the definition, which would allow for development and habitat loss: "…impacts to identified biological and non-biological resources are not allowed *unless there is no reasonable or practicable means of avoidance that is consistent with the basic objectives of the covered project or action.*" (emphasis added). This exception would allow for any Covered Activity to be approved because project proponents will simply state that reduction in a proposed project to avoid habitat linkages would be inconsistent with project objectives, as has been the case with nearly all projects that have undergone environmental review and approval. Project proponents commonly argue against reducing project size because it would not allow them to meet the requirements of their Power Purchase Agreements with the utility companies or preferred size.

  Recommendation: This CMA should be revised to provide for absolute protection of tortoise conservation areas and habitat linkages, and not allow exceptions for Covered Activities or any other multiple uses that result in additional habitat loss.

- New transmission is a Covered Activity proposed to be allowed in tortoise conservation areas and habitat loss would be compensated at a 5:1 ratio.

  Recommendation: New transmission projects located within tortoise conservation areas should be allowed only in existing developed corridors or co-located with existing transmission facilities in existing disturbed areas as necessary to accommodate power from projects located in DFAs. This will prevent further habitat loss and fragmentation of remaining habitat.

- As presented in the Draft EIR/EIS, the Special Recreation Management Area ("SRMA") and Extensive Recreation Management Area ("ERMA") designations emphasize recreational opportunities on public lands including motorized vehicle use. These designations may encourage increased motorized vehicle recreation at the expense of desert tortoise conservation where they overlap with Desert Tortoise ACECs and key habitat linkages.

  Recommendation: We recommend removing SRMA and ERMA designations from all Desert Tortoise ACECs and key habitat linkages.

- With regard to mitigation actions other than private land habitat acquisition, we have concerns with one action in particular, habitat restoration. It appears this action would focus on "restoration" of closed off-road vehicle routes using the commonly used technique called vertical mulching combined with soil pitting and erosion control structures. BLM estimated the cost of this action is $87,755 per acre compared with average habitat acquisition costs of approximately $500 to $3,000 per acre depending on location within the plan area, plus $1,450 per acre to fund long-term management and monitoring. The proposed restoration

of unauthorized off-road vehicle routes is more appropriately described as camouflaging routes to line of sight distance. It does not result in restoration of habitat nor would it be applied to the entire length of unauthorized routes. Habitat restoration in the Mojave Desert takes decades if not hundreds of years especially due to vegetation loss, soil compaction, soil erosion and occupation of disturbed soil by invasive plant species.

Recommendation: We recommend acquisition of private land habitat as the highest priority due to its relatively low cost compared to habitat restoration. However, we support two non-acquisition actions in Tortoise Conservation Areas, which are badly needed to promote recovery of the desert tortoise: 1) installation of tortoise barrier fencing on paved roads and highways; and 2) control of common ravens and annual removal of all raven nests from utility poles, towers and man-made structures.

- In Section II.3.1.7.3.6, the Draft DRECP indicates the wildlife agencies will work with the DRECP Coordination Group to identify species vulnerable to population declines. Draft DRECP at II.3-277. It is well established that the desert tortoise is declining throughout its range based on status reports prepared by the USFWS, which rely on population density data collected during Line Distance Sampling within the various critical habitat units. The most recent status report provides population trend data and within the DRECP Plan area for the period 2004 to 2012, the following annual trends have been reported :

Colorado Desert Recovery Unit	-3.4%
Eastern Mojave Recovery Unit:	-6.0%
Western Mojave Recovery Unit:	-8.6%

The cumulative loss of adult desert tortoises within recovery units was also estimated based on an analysis of Line Distance Sampling data. The following losses were reported for recovery units with the DRECP area:

Recovery Unit	2004	2012	Change	Percent Change
Colorado Desert	111,749	85,306	-26,443	-24%
Eastern Mojave	68,138	42,055	-26,083	-38%
Western Mojave	152,967	76,644	-76,323	-50%

Recommendation: With these documented declines across the species range in the plan area, which are ongoing, we recommend additional Conservation Management Actions be developed to slow and reverse the declines and move the species on a path toward recovery. Such actions should address all stressors currently affecting the species, with the strongest actions directed to the Western Mojave Recovery Unit where the overall population has declined 50% since 2004. The declines in desert tortoise populations throughout the plan

area as documented in the Rangewide Status Reports from the USFWS should also be reported in the Baseline Biology Report in Appendix Q.

(2) Mohave ground squirrel:

The Draft DRECP proposes to diminish current management for the Mohave ground squirrel ("MGS"), which, at present, includes a 1% habitat loss limit and compensatory mitigation at a 5:1 ratio within the designated MGS Conservation Area (a Wildlife Habitat Management Area) established in the 2006 West Mojave Plan amendments to the California Desert Conservation Area ("CDCA") Plan. Under the Draft DRECP Preferred Alternative and Alternatives 1, 3 and 4, compensatory mitigation is lowered to a ratio of 2:1 and is limited to "key population centers as identified in the Mohave ground squirrel BGOs." Draft DRECP at Appendix H, page 56. Under Alternative 2, a 5:1 compensation ratio would apply to the impacts of Covered Activities that occur in Mohave ground squirrel key population centers or Mohave ground squirrel expansion areas as identified in the Mohave ground squirrel BGOs.

The Draft DRECP provides for renewable energy project development in DFAs within the existing MGS Conservation Area in at least three key areas: Rose Valley, north of Kramer Junction on lands between Hwy. 395 and the California City Boundary, and the Desert Tortoise Natural Area. Furthermore, it allows for new transmission anywhere within the proposed Conservation Reserve Design Envelope and would require compensatory mitigation only for Covered Activities. We also note that rights of way, mining and livestock grazing would be allowed within the proposed MGS ACEC. The proposed habitat loss limit is 1% of the ACEC acreage, which varies by alternative.

The Conservation Management Actions for the MGS need to be modified and strengthened to promote the viability and recovery of this species.

Recommendation: We recommend the following action to provide for greater conservation of the Mohave ground squirrel:

- Please see the section on suggested DFA revisions in this document for suggested changes to DFAs in Rose Valley and the West Mojave to ensure key population centers and habitat linkages for Mohave ground squirrel remain intact.

- Ensure the proposed MGS ACEC includes all public lands within the existing MGS Wildlife Habitat Management Area.

- Retain the 1% habitat loss limit and 5:1 compensatory mitigation ratio on all lands within the existing MGS Wildlife Habitat Management Area (and include them in new or existing ACECs).

- Eliminate domestic sheep grazing in the Tunawee Common Allotment in Rose Valley, in the Monolith-Cantil Allotment within the MGS ACEC proposed north of Kramer Junction and

in portions of the Cantil Common Allotment that overlap with MGS Key Population Centers such as in the southern Indian Wells Valley extending from Bowman Road to the Redrock State Park Boundary and Hwy 14 to the El Paso Mountains Wilderness. Grazing by domestic sheep results in significant removal of annual and perennial forage species which the Mohave ground squirrel requires for survival, reproduction and population stability.

- Effectively control and stop off-road vehicle use violations (cross-country travel and on closed routes) within the MGS Conservation Area with special law enforcement emphasis in the Rand Mountains, Fremont Valley, Indian Wells Valley, El Paso Mountains, Red Mountain, Fremont Peak, Cuddeback Lake basin and Kramer Hills.

(3) Desert bighorn sheep:

The Plan-wide Biological Goals and Objectives for conservation of Desert bighorn sheep appear generally sufficient, but the Conservation Management Actions are much too limited to ensure their plan-wide conservation. Conservation Management Actions are only associated with Step-Down Biological Goals and Objectives, which are too limited to fulfill the Plan-Wide Biological Goals and Objectives because funding would be limited to fees associated with Covered Activities.

Recommendation: We recommend that the Plan-wide BGOs and, most importantly the Conservation Management Actions, incorporate all the conservation recommendations included in the draft bighorn sheep conservation plan for this species prepared by CDFW under contract with Dr. John Wehausen.[10] Equally important is a plan and schedule to fund and implement that plan's management actions throughout the DRECP area.

We consider the following actions as the highest priority for funding and implementation:

- Restore and promote movements through linkage habitats. The priority areas for this conservation management action are those linkages that have been severed by Interstate 15 and 40 that include the following areas: 1) Cady/South Soda Mountains-North Soda Mountains-Avawatz Mountains, 2) Clark Mountain/Mohawk Hills-Ivanpah/Mescal Ranges via Mountain Pass, and 3) Granite/Providence Mountains-Marble Mountains.

- Restore and maintain reliable year-long surface water and access to forage. A high priority for restoring and maintaining surface water and forage access is Afton Canyon, where a large and expanding bighorn population in the Cady Mountains utilizes diminishing surface water and obtains highly nutritious forage. A permanent water supply in the canyon should be planned and implemented in the event surface water falls below the surface due to upstream diversions and evapotranspiration from phreatophytes, including invasive saltcedar which

[10] California Department of Fish and Wildlife. 2012. A Conservation Plan for Desert Bighorn Sheep in California. February 2012 Draft. Sacramento, CA. 92pp. ("Desert Bighorn Sheep Conservation Plan") (Attachment 2)

BLM has been controlling periodically for the past two decades. A fence in the western portion of the canyon installed 20 years ago to control cattle drift into the canyon is no longer needed and should be removed. Cattle grazing ended in the Cady Mountain Allotment in approximately 1994 when the permit was acquired by the U.S. Army as part of the mitigation required for expansion of Fort Irwin.

- Remove cattle grazing from ranges occupied by desert bighorn. Domestic cattle grazing and allotments in three ranges occupied by bighorn sheep should be eliminated to reduce competition for space and forage and to eliminate the likelihood of disease transmission. These three areas are 1) Ord and Newberry Mountains, 2) Old Woman Mountains and 3) Kingston Range. There is ample justification for this action in the draft bighorn sheep management plan prepared by Dr. Wehausen for CDFW. The CDCA Plan in 1980 called for elimination of cattle grazing on allotments south of I-40; the Ord and Newberry Mountains and Old Woman Mountains herds are south of I-40 and BLM should take this opportunity to implement this decision.

- The DRECP should include additional conservation management actions identified in the Desert Bighorn Sheep Conservation Plan. See, Desert Bighorn Sheep Conservation Plan at 56-58.

(4) Birds and Bats

There are no biological goals and objectives or conservation and management actions explicitly addressing the impacts Covered Activities are having on birds and bats in the Plan Area. There are multiple existing solar facilities in the Plan Area covering hundreds of thousands of acres that are currently impacting migratory birds and other aerial species. These impacts are known to occur and have been documented by the USFWS Forensic Lab within the Plan Area[11]. We understand that the USFWS is currently working with the BLM and other governmental agencies to investigate the potential cause of these reported mortalities at facilities in the Plan area in an effort to address broader concerns regarding the potential scale and severity of impacts from large-scale solar projects on migratory birds, bats, insects and other aerial species. The reported mortalities from these facilities likely underestimate the true scope of impacts due to the nature of discovery (often incidentally) and the high rate of carcass loss from scavenging and degradation around these facilities.

There is a noticeable lack of detail on the need for further research, standardized avian mortality monitoring protocols and prescriptive measures for developing bird and bat covered species monitoring plans. For example, starting on p. II.3-46, CMA #AM-LL-4 states that "Proponents of

[11] *Avian Mortality at Solar Energy Facilities in Southern California: A Preliminary Analysis*, Rebecca A. Kagan, Tabitha C. Viner, Pepper W. Trail, and Edgard O. Espinoza National Fish and Wildlife Forensics Laboratory (April 7, 2014).

Covered Activities on both federal and nonfederal land that will likely impact bird and bat Covered Species during construction, operation, and maintenance will develop and implement a project-specific bird and bat operational actions for Covered Species." First of all, there is no explanation for how "likely impact" will be determined. Secondly, the bird and bat operation actions for Covered Species will be development on a project-by-project basis, which undermines the intent of the DRECP to provide broad assurances for conservation of impacted species and standardized monitoring and reporting protocols to track how species are meeting pre-determined BGOs.

Additionally, the document states that: "Bird and bat operational actions will be created on a project-by-project basis by incorporating a variety of available measures that are applicable to the specific project and that together meet the approval of the DRECP Coordination Group for sufficiently avoiding and minimizing, and adaptively monitoring and managing impacts to bird and bat species during operations." Draft DRECP at II.3-46. The plan goes onto list some applicable measures that may be implemented at a project-by-project basis. However, it is unclear how these measures were developed and if they are effective in avoiding and minimizing mortality or other impacts to covered species. Neglecting to adopt a comprehensive approach to impacts to birds and bats from covered activities defeats the underlying intent and purpose of the DRECP to provide landscape-level conservation to species throughout the Plan area, not at the project-level.

Recommendation: As recommended by the USFWS Forensic Lab Report, and other government agencies, there is a need for more robust scientific information regarding avian impacts from solar facilities. We urge the DRECP Agencies to prioritize research efforts since an effective monitoring protocol is critical to understanding the true nature and extent of the impacts and refining current hypotheses regarding avian risk factors. While this research is being completed, agencies should require solar facilities to conduct standardized interim monitoring that address pre-construction avian use as well as post-construction mortality to understand mortality in the context of baseline population characteristics. Given that these facilities often take years to build, and mortalities have been reported prior to facility operation, mortality monitoring and reporting requirements should commence concurrent with construction.

Recommendation: The DRECP should identify additional conservation measures, such as operational constraints, deterrent strategies, and mitigation offsets, for existing facilities with high reported avian mortality.

Recommendation: The DRECP should provide specific and enforceable conservation and management actions for avoidance and minimization of impacts to birds and bats, and provide prescriptive guidelines for the development of Bird and Bat conservation plans to ensure standardization of monitoring and application of avoidance and minimization measures.

(5) Burrowing owl

The CMAs for burrowing owl are general and the same as the project-by-project actions for burrowing owls currently. Considering that burrowing owls are currently declining in California, the DRECP should strengthen the CMAs for burrowing owl to ensure this species does not continue to decline the California. Additionally, the impacts of various actions such as passive and active translocation are not adequately analyzed and addressed in the draft DRECP.

In addition, the Plan-Wide and Step-down BGOs are flawed and based on incomplete data. There is data that is missing from the baseline biological report for burrowing owl from Audubon California and AECOM.

Finally, the DRECP plan proposed a take allowance of 210 burrowing owls in the Plan area with little justification for how this allowance will continue to ensure this species, which is already in decline, will continue to persist in the Plan Area.

Recommendation: The DRECP should strengthen the CMAs to provide greater assurances for conservation of burrowing owl, especially on private lands within the agricultural matrix of Imperial Valley, Palo Verde Valley and Antelope Valley. CMAs should be informed by a thorough analysis of all impacts resulting from covered activities, including translocations. Specifically, the setback of 200 ft. from burrowing owl burrows is too small according to recent literature on the foraging distance of burrowing owls from their burrows. The DRECP must provide scientific justification for the proposed 200 ft. setback and consider increasing to 2,000 ft. which is more aligned with current information regarding foraging behavior.[12]

Recommendation: The BGOs need to be amended after consideration of the Audubon and AECOM data and to address the following concerns:

- There must be population targets in terms of # breeding pairs for all sub-regions within the planning area that burrowing owl occupies. Population targets for the DRECP should be set based on the best and most recent available science on population estimates.
- Provide justification and further analysis for determining acreage targets for conservation of agricultural lands. Support this analysis with geo-spatial reference for target conservation areas.
- The DRECP NCCP reserve is where durable conservation will occur and includes only 167,000 acres of burrowing owl habitat which is 2.6% of the total modeled habitat for burrowing owl. The DRECP must provide a justification for how this provides assurance for long-term viability for burrowing owl in the plan area.

[12] Section III.7.5.3.1 of the DRECP states that about 80% of burrowing owl foraging occurs within about 1,950 feet of the nest burrows. Similarly, Appendix Q section 5.2.2.1 states that "Nocturnal foraging can occur up to several kilometers away from the burrow." Table 3 of the Burrowing Owl Species Report states that juveniles disperse about 0.25 km (820 ft.) from natal burrows after fledging, and adults disperse an average of 3.1 km (over 10,000 ft.).

Recommendation: Provide justification for a burrowing owl take allowance of 210 individuals. We strongly recommend a lower take allowance for this species considering its perilous status in the state of California and considering the population estimates throughout the Plan area. The DRECP must provide more information regarding how this take will be tracked and monitoring throughout in the DRECP.

(6) California Condor:

The Draft DRECP must be revised to improve protections for the endangered California Condor. The following are recommended improvements:

- The Draft DRECP does not address the recently passed legislation requiring a statewide ban on lead ammunition, California Assembly Bill (AB) 711. This recent development is important to consider in the context of conservation for the California Condor and appropriate BGOs and CMAs need to be incorporated related to outreach and enforcement related to the ban. Additionally, the Draft DRECP does not reference the work done by the USFWS Condor Wind Working Group, especially the threat matrix that was developed by this group. This threat matrix can be used to further inform BGOs and CMAs for this species.

  Recommendation: The Draft DRECP must include new information and policy related to California condor in development of BGOs and CMAs. Specifically, the DRECP should include BGOs and CMAs related to outreach to hunters and enforcement to ensure non-lead ammunition is being used for hunting within the plan area.

- The proposed setbacks from Condor nests are 1.5 miles from any solar and geothermal facility and 5 miles from any wind facility. Draft DRECP at II.3-62. There is no justification for these setbacks provided in the Draft Plan.

  Recommendation: The Draft DRECP must provide justification for how these setbacks were determined. Provide maps showing where condor nests are currently located with 1.5 and 5 mile buffers around each nest to show overlap with the DRECP boundary. The Draft Plan must consider a wider radius setback around a Condor nest for wind facilities.

- The Draft DRECP does not adequately analyze the impacts the Plan could have on potential expansion habitat for the California condor. There are DFAs and Future Assessment Areas ("FAA") proposed close to condor critical habitat and within the historic range of the California condor but there is no analysis regarding how this impacts current and predicted future range of this species.

  Recommendation: The Draft DRECP must provide thorough analysis of the impacts of the DRECP on current and future habitat and range of the California condor. It must also consider the historic condor range and telemetry data when assessing and analyzing impacts

to condor and provide maps to show how DFAs and FAAs may impact historic, current and predicted future habitat.

- According to AM-DFA-ICS-25, no take of condor will be permitted in the form of kill or injury from operation of Covered Activities. Draft DRECP at II.3-68. Within the plan area, a wind facility, Alta East Wind Farm, has been approved for a condor take permit. According to the above CMA, the DRECP appears to prohibit any further take allowances for condor from covered activities.

  Recommendation: Clarify the DRECP's position on take allowances under federal or state ESA for California condor within the Plan area. Will project-by-project take be allowed within the plan area?

(7) Golden eagle:

Golden eagle is a fully protected species under California Fish and Game Code. There is no unauthorized take allowed for golden eagle. However, the DRECP proposes to allow for the take of 15 golden eagles annually throughout the plan area. Our recommendations regarding this take allowance, the golden eagle BGOs, CMAs and adaptive management strategy are detailed in the section of this comment letter relating to the issues with the Bald and Golden Eagle Protection Act ("BGEPA").

e. The Draft DRECP must analyze impacts to Natural Communities.

Natural communities within the plan area must be sufficiently protected on a permanent basis to meet the legal requirements of the NCCP Act. Such protection will ensure that Covered Species also receive adequate protection, not just for the approximately 24-year life of the plan, but for at least the duration of the impacts associated with Covered Activities. The full spectrum of stressor and land use activities needs to be identified, their impacts known and analyzed, and Conservation Management Actions applied to achieve the legally required conservation of natural communities and covered species throughout the plan area. The multiple use activities affecting these resources on public lands needs to be fully accounted for and much more detail is needed on BLM's proposed Conservation Management Actions in Appendix L and specifically how they will address issues with the impacts associated with existing activities, both permitted and unpermitted (i.e., Casual Use). The actions identified in Appendix L constitute BLM's approach to contributing to the required conservation of natural communities and covered species under the NCCP Act, but we find them to be insufficient in duration and in reducing ongoing threats posed by multiple land use activities.

Recommendation: A multi-faceted approach is needed to ensure effective, timely and lasting conservation of covered species and natural communities on public lands to meet the standards of the NCCP Act. This needs to include 1) revising the Baseline Biology Report (Appendix Q) to include an analysis of the condition and trend of covered species and their habitats, 2) quantifying

the impacts of all multiple use activities occurring on public lands, and 3) developing additional conservation management actions so that allowable multiple use activities on public lands are consistent with meeting Plan-wide BGOs. The additional actions required should then be included in each conservation unit description contained in Appendix L.

We have the following specific recommendations for specific natural communities:

Joshua tree woodland: Joshua tree woodland is an iconic natural community of the Mojave desert that supports a high level of biodiversity including nesting habitat for native birds and a food source for Mohave ground squirrels. Joshua tree woodland vegetation alliance has a rank of S3, is threatened by development, and continues to decline throughout the state as a result of direct removal, fragmentation, exposure to increased wildfire, and climate change. The continual loss of Joshua tree woodland must be addressed through the DRECP natural community BGOs in order to meet NCCP standards. However, the draft DRECP fails to use available information to clearly identify areas where Joshua tree woodland is known to occur across the Plan area. As mentioned above, the draft DRECP also fails to establish clear, quantitative and measurable NCCP BGOs. Lacking this information, the draft DRECP proposes land designations that conflict with or otherwise eliminate the conservation potential of Joshua tree woodland natural community. Specifically, the draft DRECP must:

1) Revise the baseline for Joshua tree woodland and include all available mapped acreage for this community. We recommend consulting the Natural Vegetation Classification System's membership rules for the Joshua tree woodland alliance and follow their guidelines for classifying this alliance and establishing BGOs for varying densities of Joshua trees. Please see the California Native Plant Society's comment letter on the draft DRECP for more detailed information.
2) Establish clear, quantitative, and measurable plan-wide BGOs for Joshua tree. The current NCCP BGOs are too generic to be meaningful as a conservation strategy for Joshua tree woodland. Quantitative BGOs for natural communities can be included as percentage targets for conservation, as has been recommended by Defenders and The Nature Conservancy[13].
3) Revise the Joshua tree distribution map to show all available mapped distribution information for California. This can improve conservation planning decisions by helping to prioritize conservation actions for Joshua tree, especially at the periphery of its range and/or where populations have the opportunity to expand into new, transitional habitats without direct management intervention.
4) Prioritize Joshua tree conservation in potential transitional habitat areas, including the following:
    - Western Antelope Valley/Tehachapi Mountain transitional habitat

[13] See The Nature Conservancy's comment letter on the Draft DRECP for more information on recommended quantitative BGOs for natural communities.

- Southern Sierra Nevada Mountains transitional habitat
- Centennial Flats/Conglomerate Mesa transitional habitat
- Lucerne Valley transitional habitat
- Pinon Hills/Countyline transitional habitat

5) Establish an avoidance and minimization CMA for Joshua tree woodlands in DFAs. The loss of Joshua tree woodland as the result of projects within proposed DFAs is a significant impact from covered activities unless mitigated below a significant level. CMAs need to be developed to ensure that Joshua tree woodland on project sites is avoided and preserved in perpetuity from further development. If avoidance is not feasible, off site Joshua tree woodland of equal or superior quality should be acquired at no less than a 1:1 mitigation ratio, where a minimum of 1:1 mitigation ratio should be employed only for degraded Joshua tree woodland habitat. Greater than 1:1 mitigation is required for impacts to higher quality habitat. Mitigation must occur within the same subarea to avoid local extirpation and promote population resiliency to climate change. Acquired habitat should be adjacent to large tracts of existing Joshua tree woodland that have been identified by resource agencies as having a high priority for acquisition for conservation. All mitigation lands preserved on site or acquired off site should be deeded to a local land conservancy and protected in perpetuity under a conservation easement to prohibit incompatible uses on the site. Salvage and transplantation of Joshua trees should not be considered the default mitigation action for loss of Joshua tree woodland vegetative communities as these methods are experimental and there are no assurances of their success.

Microphyll woodland: Microphyll woodlands are 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. The alliance typically includes desert willow, mesquite, smoke tree, blue palo verde and ironwood trees[14]. Similar to Joshua tree woodland comments above, the draft DRECP fails to use available information to clearly identify areas where Microphyll woodland is known to occur across the Plan area, and to establish clear, quantitative and measurable NCCP BGOs. Lacking this information, the draft DRECP proposes land designations that conflict with or otherwise eliminate the conservation potential of Microphyll woodland natural community. Specifically, the draft DRECP must:

1) Revise the draft DRECP Microphyll woodland map and BGO subarea list. There are Microphyll woodland, specifically mesquite, stands in the Preferred Alternative DFAs within the West Mojave and Eastern Slopes subarea that do not appear on the DRECP microphyll woodland map. (Appendix C, Figure C-25). This subarea needs to be added to the BGOs for

[14] *Chilopsis linearis* alliance (Desert willow), *Prosopis glandulosa* alliance (Mesquite), *Psorothamnus spinosus* alliance (Smoke tree), and *Parkinsonia florida - Olneya tesota* alliance (Blue palo verde - Ironwood). Desert willow, mesquite and smoke tree are rare vegetation alliances and a significant portion of Blue palo-verde – Ironwood alliance occurs in the Riverside East DFA.

the Sonoran-Coloradan semi-desert wash woodland scrub natural community. Additional Microphyll woodland that are missing from draft DRECP maps are in Charleston View DFA, Variance lands in Mesquite Valley, and the Daggett Triangle DFA. These baseline mapping and acreage calculations for Microphyll woodland must be revised.

2) Establish quantitative, measurable BGO conservation targets for Microphyll woodland natural communities. Similar to comment above on Joshua tree natural community, there needs to be quantitative goals for Microphyll woodland natural community based on revised and updated baseline and mapping information.
3) Clarify avoidance measures for riparian and wetland areas. According to CMA #AM-DFA-RIPWET-1, the DRECP will enforce a 200 foot setback buffer for riparian and wetland communities. However, the draft DRECP is not clear regarding what activities, if any, would be allowable within buffers and setbacks. The draft is not clear whether there is avoidance from all covered activities within buffers, and whether all proposed incursions into buffers will be reviewed and decided by DRECP Coordination Committee.

3. The BLM Conservation Commitments Must Be Strengthened.

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.

The Draft Agreement by and between the BLM and the CDFW (hereinafter the "Durability MOU") contains conflicting and unclear statements about the application of durability tools to conservation and mitigation lands, the use of these tools; and the duration of these tools on BLM lands. This uncertainty is compounded by the lack of clarity and complete lack of commitment by the BLM found in the draft Implementing Agreement for the DRECP ("Implementing Agreement"). Indeed, it appears that the BLM is not actually agreeing to "execute" the agreement, but rather it is simply agreeing "to implement that DRECP consistent with the Land Use Plan Amendment Record of Decision." Implementing Agreement at 31. All of the other parties to the agreement, including the U.S. Fish and Wildlife Service, also an agency within the Department of the Interior, are "executing"

the agreement. In addition, the Implementing Agreement clearly excludes the BLM from agreeing to Part 3 and explicitly states that the BLM is neither a plan participant nor a permittee and "not subject to the NCCPA." Id. at 3. Further, in the "Obligations" section of the Implementing Agreement, it is clearly stated that "[t]his agreement does not have any affect or bearing on BLM's decision-making authority or implementation of its land use plans." Id. at 6. Instead, the BLM appears to only agree to what will be in the final DRECP Record of Decision and the Durability MOU. Thus, the draft Implementing Agreement does not provide any additional level of commitment or guarantee that the BLM will not administrative change its land use decisions regarding the DRECP in future Administrations. And, with no "executed" Implementing Agreement, there is no recourse that CDFW can take – other than suspending or revoking the DRECP take permit for projects – if the BLM chooses to make decisions inconsistent with the DRECP.

Given that the DRECP relies heavily on BLM lands for the conservation of most of the covered species and natural communities (as well as for the mitigation of impacts to those species from renewable energy projects on both public and private lands), it is critical that the BLM's conservation commitments are durable enough to ensure that those lands will provide the conservation value relied upon for the issuance of the endangered species take permits.

Recommendation: On February 12, 2015, several conservation organizations submitted a letter to the DRECP agencies raising a number of concerns and making recommendation for revisions to the Durability MOU (Attachment 3). As a signatory to this letter, Defenders recommends that the DRECP Agencies implement the recommendations found in this letter. Further, the draft Implementation Agreement must be revised to include the BLM as an "executing" party to this agreement and requiring that the BLM agreeing to all parts of the Agreement, including Part 3 (the NCCP provisions) of the Implementing Agreement.

4. The Local Governments with Land Use Authority over Key Private Lands Identified for Conservation Must Agree to Implement the DRECP.

The NCCP Reserve is comprised of public lands managed by the BLM and certain key private lands over which the counties and some cities have land use authority. The NCCP Act requires that conservation of the lands comprising the NCCP Reserve provides long-term protection of natural communities and covered species. The draft plan identifies certain private lands as Conservation Planning Areas, within which some of the biologically significant lands would be acquired on a willing seller basis through compensatory mitigation for the unavoidable significant impacts associated with Covered Activities. Such acquisition would occur on a scale commensurate with impacts from individual projects. The draft plan does not identify which agency or other entity would manage these lands in perpetuity to achieve the intended mitigation benefits, what conservation management actions would apply, or how they would be guaranteed to occur.

The draft plan also does not include actions needed by local agencies to ensure that conservation of private land habitat within the Conservation Planning Areas will occur. The only action that is proposed is acquisition of those lands from willing sellers and commensurate with the compensatory mitigation requirements for Covered Activities. However, there is nothing in the current DRECP or its draft Implementing Agreement that provides for any level of commitment by any county or city that the private lands within the Conservation Planning Areas within their jurisdiction(s) will continue to be available for conservation. Indeed, without such commitment, counties and cities could approve land use conversions completely incompatible with the DRECP and there is nothing the DRECP agencies can do about it other than revoking the underlying NCCP permit. Moreover, there is evidence that certain key counties object to any private land mitigation acquisition as part of the DRECP. See Letter to BLM Desert Advisory Committee from Lorelei Oviatt, Director, Planning and Community Development Department, Kern County (March 15, 2014) (Kern County opposes acquisition of private lands for mitigation) (Attachment 4); (County of San Bernardino Position Paper on the Draft Desert Renewable Energy Conservation Plan (February 3, 2015) (San Bernardino County opposes acquisition of private lands for mitigation) (http://www.sbcounty.gov/main/Energy.pdf). Thus, without any evidence of any level of commitment by the counties or cities with these key private conservation lands, there is no rational basis upon which CDFW can make a finding that the private lands component of the NCCP will be implemented.

For the plan to succeed, in part, the counties and cities within the plan area with key Conservation Priority Areas on private lands, must enter into an agreement with the DRECP agencies – e.g., agreeing to become a plan participant or permittee – to fulfill the requirements of the DRECP. It is essential that those local agencies support compensatory mitigation/conservation land acquisition within the Conservation Planning Areas to the extent necessary to fully mitigate the effects of Covered Activities on natural communities and covered species, and to achieve the Plan-Wide Biological Goals and Objectives. At a minimum, they will need to amend their general plans to designate (classify or zone) the biologically significant lands within the Conservation Planning Areas for conservation and develop mechanisms to facilitate their acquisition for incorporation into the NCCP Reserve. Such facilitation could include, but not be limited to, acquiring property-tax delinquent lands on a streamlined basis or providing a current appraisal of land values for use in sale negotiations with private land owners, providing programmatic escrow services. We stress the importance of reflecting on lessons-learned from the West Mojave Plan process where, near the close of the planning process, the counties participating in the plan chose to not adopt the plan's provisions applicable to private lands, leaving BLM the only agency to adopt the plan that covered only public lands.

Recommendation: The Final DRECP must include legally binding commitments by the local land use authorities (cities and/or counties) to implement the DRECP Conservation Strategy on private lands. Ideally, these cities/counties would be permittees under a final DRECP.

5. The DRECP Must Be Revised to Ensure that the "Conservation" Increment of the NCCP Conservation Strategy Will Be Implemented.

Another anomaly unique to the Draft DRECP is the repeated distinction in the DRECP documents (draft Plan, draft Durability MOU, and draft Implementation Agreement) between non-mitigation "conservation" lands and actions and "mitigation" lands and actions. See e.g., Implementation Agreement at 10 ("All compensatory mitigation actions . . . will be initiated or completed within twelve (12) months after the date on which the impact being mitigated occurs. . .." compared to no timeline associated with implementation of non-mitigation conservation actions); Id. at 14 ("Revenues from DRECP implementation fees will be used to fund CMAs that provide compensatory mitigation for the impacts of Covered Species" compared with no information about revenue for conservation actions within the Implementing Agreement); Draft DRECP at Appendix I (The Cost Estimation Methodologies and Categories were limited to only "DRECP Mitigation" with no information about costs associated with non-mitigation conservation actions.); Draft Durability MOU at Section 2.c (the MOU limits the use of the Durability tools referred to in Section 2.c to only those BLM Conservation Lands used for "compensatory mitigation."). With no clear timeline for implementation and no funding provided for in the DRECP for non-mitigation "conservation" actions, it is difficult to comprehend how the non-mitigation "conservation" actions will occur in the DRECP.

Recommendation: The DRECP must include a clear implementation plan and funding for **all** conservation measures within DRECP NCCP (both non-mitigation and mitigation actions).

6. The Governance Structure Must Be Strengthened to Provide Clear Lines of Authority, Transparent Decision-Making, and Assurances that the DRECP Will Be Implemented.

A review of the cursory information provided about the governance structure for the DRECP reveals that the current structure will be a loose network of agencies with little direction or oversight. The DRECP Executive Policy Group, comprised of the BLM, USFWS, CEC, CDFW and California State Lands Commission ("CSLC"), will oversee the DRECP Coordination Group, which is made up of the same agencies and possibly any local agency that agrees to implement the plan. The DRECP Coordination Group is responsible for administering the Monitoring and Adaptive Management Plan ("MAMP") and ensuring that the various Conservation Management Actions will be carried out. A Program Manager, presumably hired by one of the state or federal agencies (which agency that would be is unidentified), will be responsible for "running" the Coordination Group. However, the Program Manager will have no supervisory authority over any of the Coordination Group staff, which does not bode well for efficient management of this group. Draft DRECP at II.3-215. In addition, the Program Manager will have no authority associated with any of the DRECP agencies' budget. Finally, there is no guarantee that the DRECP Coordination Group agencies will provide any staff to assist the Program Manager.

In addition to running the Coordination Group, the Program Manager will also chair the Adaptive Management Team ("AMT"), which is responsible for carrying out the MAMP. However, as discussed infra, the membership and decision-making structure of the AMT is undefined.

Finally, missing from the Draft DRECP are some very critical elements of a successful governance structure: clear lines of authority, an open and transparent decision-making structure in the event there is any disagreement with a final "decider" identified for specific decision points, a timeline for program implementation, and funding costs and sources identified.

Recommendation: The governance structure for the DRECP must be further expanded upon to address the issues raised above. There must be a clearly defined structure with clearly defined roles and decision-making responsibility, including the identification of a final "decider" in the event of disagreements among the agencies. Further, there must be funding and staffing made available to ensure that the DRECP will function effectively.

7. The DRECP Funding Commitments Must Be Revised and Strengthened to Ensure Implementation of the Plan.

Like the provisions in the federal ESA, the NCCPA requires that an NCCP "ensure" adequate funding. See Cal. Fish and Game Code §§ 2820(a)(10), (b)(8). Although there are no cases interpreting the 'ensured funding' requirement under the NCCPA, there are a number of federal cases, discussed infra, interpreting the very similar "ensured funding" requirements for issuance of incidental take permits under the federal Endangered Species Act and the California Endangered Species Act. In general, these cases conclude that meeting this requirement cannot rely on speculative future actions by other parties, but requires the applicant's guarantee of adequate funds to carry out the plan.

The Draft DRECP funding plan, as currently written, does not meet the "ensure" adequate funding requirement in the NCCPA. The funding provisions in the Draft DRECP suffer from multiple problems: (1) there is no cost estimate or identified funding to pay for the "conservation" increment in the DRECP, the Monitoring and Adaptive Management Plan, or the plan governance; (2) there is extensive flawed and incomplete information for the various plan costs; and (3) the sources identified for funding are incomplete and speculative.

a. The Draft DRECP cost estimates and funding only apply to those actions relating to mitigating impacts from Covered Activities.

Based on a review of the very brief funding portion of this plan, it appears that funding to implement the Draft DRECP would come from compensatory mitigation fees required for individual approved Covered Activities. Compensatory mitigation fees would be used to acquire private land habitat commensurate with the impacts caused by individual projects and to implement habitat improvements on lands within the biological reserve. Missing from the funding sections of the DRECP as well as Appendix I is any cost estimates associated with the non-mitigation

Conservation Management Actions. See, e.g., Draft DRECP at Appendix I (The Cost Estimation Methodologies and Categories were limited to only "DRECP Mitigation" with no information about costs associated with non-mitigation conservation actions); Draft DRECP 11.3.1.1.8 (this section only discusses cost analysis as it applies to mitigation; no discussion to be found of cost analysis associated with non-mitigation plan components). In addition, there is only very cursory and unsubstantiated cost estimates for program administrative costs and monitoring and adaptive management. Id. at I.33-35. Indeed, the draft explicitly admits that there is absolution no cost estimate for "Covered Species Effectiveness Monitoring. Id. at I.34. Without cost estimates for most of the key components of the NCCP, it is impossible to know whether or not there is funding has been ensured by the DRECP. Thus, this glaring and enormous gap in the funding portion of this plan must be remedied before this plan can be finalized.

Recommendation: The DRECP funding provisions (Section 11.3.1.8.1) and Appendix I must be revised to include cost estimates and funding sources for all Conservation Management Actions, effectiveness monitoring, compliance monitoring, adaptive management and all program administration costs.

b. *The Draft DRECP funding provisions must be revised to address problems with flawed and incomplete information.*

Section II.3.1.8 of the Draft DRECP and Appendix I contain all of the information found in the plan on the costs and budget for implementing the DRECP NCCP and General Conservation Permit. Unfortunately, the information in these sections is scant, missing, and flawed.

The following general problems associated with estimating costs for mitigation are found in Appendix I.

- It relies on Bay Delta Conservation Plan ("BDCP") rather looking at more geographically relevant inland Southern California NCCP/Habitat Conservation Plan ("HCP"). There is no justification/rationale provided for using the BDCP for cost estimates, particularly when the lands, real estate values, and management issues are quite different between the Delta and the desert.
- It failed to capture many acquisition and stewardship costs.
- It failed to consult with some of the key parties doing conservation transactions and restoration projects in the desert including Mojave Desert Land Trust, Transition Habitat Conservancy, Coachella MSCP, and Riverside Land Conservancy.
- It failed to consider the impact of DRECP designations on real estate market.
- It failed to provide supporting documentation such as the PAR analysis, which was relied upon for developing the management costs.
- It failed to include or provide for legal defense costs. The preparers of Appendix I did address violation and/or enforcement costs that relates to conservation easements, but those

costs are different than legal defense costs, which would include responding to costly eminent domain threats.

Appendix I also has the following specific problems that must be remedied in the final plan:

- Page I.1 is missing the following costs that should be included in the final DRECP:
    - Pre-acquisition liability assessment and due diligence
    - Title research and subordination of exceptions such as liens, mineral rights, and other easements
    - Conservation Easement drafting and negotiation
    - Management Plan drafting and negotiation
    - Cultural resource surveys
    - Preparation of property baseline conditions report
    - Stewardship and Conservation Easement enforcement cost
    - Legal defense costs
- Page I.5 appears to arbitrarily use mitigation ratios.
- Page I.15 should include DRECP plan designation as a factor influencing real estate costs.
- Page I.17 – 18 relies on BDCP for conservation easement to fee title ratios. There is a much higher enrolment in the Williamson Act in the BDCP area, which directly impacts easement values.
- Page I.18, Section I.2.2 provides no rationale or justification for the ratio of fee title to conservation easement mitigation acquisition ratio.
- Page I.20, top of page relies erroneously on statewide date. Agricultural land and rent values are highly variable by region. The use of statewide data should either be justified or local data should be used. County Agricultural Commissioners and Farm Service Agencies may provide this data.
- Page I.23, Section I.3 does not explicitly include legal defense funding. In addition, this section also appears to be partially relying on 2010 costs. The spreadsheet referenced on page I.24 is not provided so it is hard to understand the estimates, but they seem too low.
- Page I.25, Table I-19 is missing the following information:
    - Pre-acquisition liability assessment and due diligence
    - Subordination of Title exceptions such as liens, mineral rights, and other easements
    - Conservation easement drafting and negotiation
    - Management Plan drafting and negotiation
    - Cultural resource surveys
    - Preparation of property baseline conditions report
- Page I.25, Section I.4.2 fails to provide for the defense of conservation lands, particularly if they are held in fee rather than by conservation easement. This section also does not address how the location of a mitigation site impacts the amount of management,

enforcement and defense required. Remote lands require less than lands near urbanized areas, roads, recreational facilities, etc.

- Page I.26, Section I.5 provides for the National Fish and Wildlife Foundation ("NFWF") to hold/manage the Long Term Management and Maintenance (LTMM) fund. We recommend that if NFWF is going to hold those funds they must comply with CA Government Code § 65968.
- Page I.27, Section I.7 needs to include structure (e.g., desert shacks) removal and mine closure. In addition, trash removal in the desert frequently includes hazardous waste.
- Page I.29 should have included data from desert conservation organizations that frequently do remediation and restoration.
- Page I.30, Section I.7.1 does not provide support for the assumptions, equivalencies, and costs.
- Page I.33, Section I.9 does not provide support for their assumptions and costs.

Recommendation: Appendix I must be revised to incorporate the correct information and provide additional analysis as identified above.

c. The funding sources for the DRECP must be identified and not speculative.

Assuming that the DRECP is revised to create a more certain budget for implementing the plan, the Draft DRECP has little to no information regarding from what sources or how the plan will be funded. Based on a review of Section II.3.1.8, it appears that the DRECP agencies believe that compensatory mitigation will be the primary funding source for the DRECP NCCP. See, Draft DRECP at II.3-281 ("compensatory mitigation [will be] the primary way in which the DRECP NCCP Biological Goals and Objectives will be achieved, but not the only way. However, the requirements for compensatory mitigation drive much of the scope of the GCP and NCCP, which are DRECP's.") The amount of funding to be generated from compensatory mitigation is completely absent from the draft DRECP. The funding section states that an implementation fee will be required for all Covered Activities, but there is no fee schedule or estimate of a fee provided except for one table of "Total Estimated N[et] P[resent] V[alue] Cost Per Acre Impacted" in which there are three categories of costs (Low, Mid, and High) for each of the seven counties. See Draft DRECP, Table II.3-40. According to the Draft DRECP, "Table II.3-40 provides a range of estimated per-acre compensatory mitigation costs for Covered Activities." Id. at II.3-292. However, as noted in the funding section in the same paragraph, "[a]ctual costs for off-site CMAs for individual Covered Activities are likely to vary from project-to-project, depending on location and other factors. Therefore, the DRECP implementation fee for each individual Activity, including the per acre cost reflected in the fee, is also likely to vary." Id. The only conclusion that can be reasonable reached after reviewing this chapter is that there is no way to estimate how much funding may be generated from implementation fees.

Unfortunately, the other identified funding sources provide even less information or certainty as they are simply a list of state and federal funding sources that may or may not be available for this plan. Moreover, BLM is very clear in the DRECP document that "[n]o additional funding is anticipated" beyond their existing budget. DRECP Executive Summary at 38. Finally, the Draft Implementation Agreement provides no new or expanded information regarding funding sources or commitments. Implementation Agreement at 14-16.

Without a more detailed and certain schedule of funding commitments in the DRECP and its Implementation Agreement, there is no evidence of assured funding to implement all of the parts of the DRECP.

Recommendation: The DRECP agencies must create: (1) a more detailed budget for the true costs of implementing the DRECP over the term of the permit; (2) a detailed schedule of implementation fees for the Covered Activities as well as other funding sources necessary to make up for any gap left unfunded by the implementation fees; and (3) specific funding commitments from the federal and state agencies within the Implementation Agreement.

8. The Monitoring and Adaptive Management Plan Needs Additional Details.

Adaptive management and monitoring has been identified as critical component of the DRECP. However, the Monitoring and Adaptive Management Plan ("MAMP") lacks critical information about how monitoring and decision-making will be carried out in a timely and relevant manner. An adaptive management regime can and should be enacted to help reduce uncertainty, improve the ability to predict outcomes over time, and make future management actions more effective based on learning. A formal, structured, transparent and collaborative adaptive management process is necessary to reduce current uncertainty through monitoring and research as well as to improve management and permitting over time. Just as species conservation occurs on multiple scales – so must adaptive management. This means a framework that continuously re-evaluates: (1) population status and trends, (2) actual project-level mortality, (3) quantifiable benefits of compensatory mitigation, and (4) any modifications or changes in management necessary to achieve the Plan-wide and Step-down BGOs.

The use of clearly delineated triggers, for additional examination and/or action will be extremely important to the realization of an effective adaptive management regime. Unfortunately, the DRECP contains so such triggers. The DRECP should establish a process to ensure that information is made available to the public when such trigger-points are reached. These trigger points should be based on project-specific data as well as conditions related to broader permit governance (e.g., monitoring protocols, reporting standards, CMAs, etc.).

Standardized, transparent monitoring and research are the cornerstone of any adaptive management permitting regime. Adaptive management is imperative to improve our understanding of species impacts and evaluate whether the DRECP is achieving population goals and objectives. This standardized science-based regime should be designed carefully such that it can help validate the

effectiveness of CMAs and mitigation requirements, contribute to knowledge gaps, and provide data to inform adaptive management decisions at the plan-wide and project levels.

Adherence to strict monitoring protocols and guidelines must be required such that project-level data can be pooled by multiple facilities and across sub-regions within the DRECP to facilitate statistical power. In addition, the DRECP agencies should encourage collaborative research efforts amongst other federal and state agencies (e.g., Department of Energy and the United States Geological Survey), industry, and conservation organizations to improve our understanding of species biology and evaluate strategies to minimize and compensate impacts.

In order for the MAMP to work and for CDFW and USFWS to be able to make their required findings for permit issuance, the DRECP must include an adaptive management plan that tests alternative strategies for meeting those biological goals and objectives, and a framework for adjusting future conservation actions, if necessary, based on what is learned. See HCP Handbook; 65 Fed. Reg. at 35252.

The Draft DRECP lacks critical detail about how the MAMP will be designed. For example, as discussed infra, the MAMP currently is missing important climate change data and monitoring. Key to implementing an Adaptive Management Program is robust monitoring requirements that provide information to inform adaptive management actions. Monitoring must be standardized and transparent, with data collected by biologists given directly to wildlife agencies. The current MAMP fails to contain that information.

Recommendation: The MAMP must be revised to address the points raised above about how the MAMP would work (e.g., triggers, strategies, etc.) as well how it will be funded and how make the decisions. In addition, there must be more detail regarding how changes will be made as information is gathered through this plan, informing implementation and management.

B. The General Conservation Plan Does Must Be Revised To Meet Federal Endangered Species Act Requirements.

The DRECP will serve as a federal General Conservation Plan ("GCP"), which will allow for the take of listed species under Section 10(a)(2)(B) of the federal ESA. In an October 5, 2007, policy memorandum, the Director of the USFWS stated that a new tool was available for landowners as part of a new kind of Habitat Conservation Plan. Memorandum from Director Dale Hall to Assistant Regional Directors, "Final General Conservation Plan Policy" (October 5, 2007) ("GCP Policy") (Attachment 5). As stated in the memo, "[b]asically, this GCP will include everything that a traditional HCP has EXCEPT the names of an applicant or the future permittees." Id. at 3. In addition, it appears based on the GCP Policy that the USFWS intended that a GCP would be a very simple process for the landowner once the GCP was completed. Essentially, after a GCP is completed, all each landowner/applicant "needs to do is complete the application form, pay the application fee and demonstrate compliance with the terms and conditions of the Plan." Id. at 304.

Defenders does not have any specific policy issue with the DRECP serving as a GCP. Indeed, we are pleased to see a GCP linked to an effort to produce a robust Conservation Strategy. However, we are concerned that that current draft GCP lacks critical details upon which a final decision can be based and upon which the straight-forward "application form/application fee" approach may be utilized.

Under Section 10 of the ESA, the DRECP must satisfy at least the following criteria to qualify as an HCP/GCP:

- The applicant will, to the maximum extent practicable, minimize and mitigate the impacts of any taking that is incidental to an otherwise lawful activity; and
- The taking will not appreciably reduce the likelihood of the survival and recovery of the species in the wild.
- The applicant will ensure that adequate funding for the Plan will be provided;

16 U.S.C. § 1539(a)(2)(B).

As we discuss below, the Draft DRECP/GCP and accompanying documents fail to meet these requirements.

1. The GCP Fails to Minimize and Mitigate Takings to the Maximum Extent Practicable.

The ESA requires that an HCP minimize the take of covered species to the "maximum extent practicable." 16 U.S.C. § 1539(a)(2)(B)(ii). As discussed above in the sections regarding the NCCP, the DRECP lacks important analysis and information upon which the USFWS can concluded that the plan will minimize and mitigate to the maximum extent practicable. For example, the GCP contains pages of tables that provide little detail and analysis of how this plan will minimize and/or mitigate impacts to individual listed species. These tables do not substitute for rigorous analysis and explanation for determining impacts. Indeed, they are nearly impossible to read or understand.

Recommendation: The GCP must revised to include additional analysis regarding the extent of impact to listed species and what specific minimization and mitigation measures will address those impacts.

2. The GCP Fails to Demonstrate that Taking will not Appreciably Reduce the Likelihood of Survival in the Wild.

Under the ESA, mitigation measures must be "reasonably specific, certain to occur, and capable of implementation; they must be subject to deadlines or otherwise-enforceable obligations; and most important, they must address the threats to the species in a way that satisfies the jeopardy and adverse modification standards." Ctr. for Biological Diversity v. Rumsfeld, 198 F.Supp.2d 1139, 1152 (D.Ariz.2002) (citing Sierra Club v. Marsh, 816 F.2d 1376 (9th Cir.1987)); see also NWF v. NMFS, 481 F.3d 1224 at *12 & n. 16 ("Although the record does reflect a general desire to install

structural improvements [to benefit fish] where feasible, it does not show a clear, definite commitment of resources for future improvements."). "[A]t a minimum, a mitigation strategy must have some form of measurable goals, action measures, and a certain implementation schedule; i.e., that mitigation measures must incorporate some definite and certain requirements that ensure needed mitigation measures will be implemented." Id. at 355 (citing Rumsfield, 198 F.Supp.2d 1139 (D. Az. 2002)). As discussed above, the Draft DRECP suffers from a lack of measureable objectives and outcomes, deficient CMAs for specific species, no implementation schedule, a vague MAMP, ill-defined governance structure, and a lack of funding. .

Recommendation: The GCP needs additional analysis and detail as discussed above to ensure that the take from the Covered Activities will not jeopardize specific Covered Species.

3. The Draft Plan and Draft Implementation Agreement Fail to Ensure Adequate Funding for Plan Implementation.

As discussed above, the Draft DRECP and draft Implementation Agreement fail to comply with the funding provisions of the NCCPA and thus also fail to comply with the federal Endangered Species Act ("ESA"). The ESA is clear that the plan must "ensure" funding over the lifetime of the permit. 16 USC § 1539(a)(2)(B)(iii); HCP Handbook at 3-33 to 3-34; National Wildlife Federation v. Babbitt, 128 F.Supp.2d 1274, 1294- 95 (E.D. Cal., 2000); Southwest Center for Biological Diversity v. Bartel, 470 F.Supp.2d 1118, 1155 (S.D. Cal., 2006). Of particular note, the HCP Handbook is explicit that a HCP cannot rely on unappropriated federal funding to "ensure" funding of the plan in light of the "Anti- Deficiency Act and the availability of appropriated funds." HCP Handbook at 3-33 to 3-34. In addition, a HCP must provide "remedies for failure to meet funding obligations by signatory measures." National Wildlife Federation, 128 F.Supp.2d at 1294-95. Further, an HCP "cannot rely on speculative future actions of others" for funding, and that the HCP effectively must be backed by a guarantee by the applicant to ensure funding for all plan elements. Bartel, 470 F.Supp.2d at 1155. The HCP Handbook also emphasizes that,

> Whatever the proposed funding mechanism is, failure to demonstrate the requisite level of funding prior to permit approval or to meet funding obligations after the permit is issued are grounds for denying a permit application or revoking or suspending an existing permit, respectively.

HCP Handbook at 3-35 (emphasis in original).

In contrast to these requirements, as detailed above, the Draft DRECP does not provide a financing plan and instead only provides general descriptions of funding sources and vague assurances that funding will be available. In addition, the Draft Implementation Agreement states that, "such assurances do not require that all necessary funds be secured at the time of permit issuance, but rather establish that such funding is reasonably certain to occur during the course of HCP and/or NCCP implementation." Id. at 13. This is wholly inconsistent with the requirement to "ensure" funding for the plan. See Bartell, 470 F.Supp.2d at 1155; Babbitt, 128 F.Supp.2d at 1294-95.

Finally, the DRECP fails to provide adequate remedies to ensure funding if there is a shortfall of initial funding sources for plan implementation. Indeed, the only remedy provided for in the Implementation Agreement is permit suspension or revocation. This is unlawful; as the court concluded in National Wildlife Federation v. Babbitt, permit revocation was **not** an adequate remedy to ensure funding. Id. The same is true here; the DRECP must have some financial backstop or guarantee to ensure that the plan is fully implemented.

Recommendation: For all of the reasons discussed here and above, the Draft DRECP must be revised to provide significant and detailed information about the costs and funding sources secured to implement the DRECP.

B. The DRECP Must Be Revised to Ensure Consistency with Federal Land Statutes and Policies.

We appreciate the effort by the BLM to incorporate the National Conservation Lands and Lands with Wilderness Characteristics ("LWC") into the Draft DRECP. Our comments contain recommendations for these lands and other federal land responsibilities.

1. The National Lands Conservation System Lands Must Be Correctly Identified for Conservation Purposes.

In 1976, Congress specifically identified the significance of the lands of the California desert in the Federal Land Policy Management Act ("FLPMA"). 43 U.S.C. § 1781. This was one of only a few specific designated management areas mentioned in FLPMA. Although not all lands were to be protected for conservation purposes, this specific identification of California desert lands shows that Congress considered the lands of the California desert as "nationally significant."

In 2009, Congress established the National Landscape Conservation System ("NLCS") or ("National Conservation Lands") "to conserve, protect, and restore nationally significant landscapes that have outstanding cultural, ecological, and scientific values for the benefit of current and future generations." At the same time, Congress determined which public lands administered by the Bureau of Land Management would be included in the System.

First, Congress listed several *categories* of lands that are, by definition, to be included within the NLCS including: wilderness, wilderness study areas, national monuments, national conservation areas, components of the wild and scenic rivers system, and national scenic or historic trails. 16 U.S.C. §§ 7202(b)(1)(A–F). Within the CDCA, there are many lands that are included in the NLCS because they fall into the categories listed in subsection (b)(1) including, but not limited to: San Jacinto/Santa Rosa Mountains National Monument, Amargosa River and Cottonwood Creek Wild & Scenic River segments, t e Old Spanish Trail, at least 72 designated wilderness areas, and at least 8 wilderness study areas

Second, Congress also expressly designated other lands as part of the NLCS. 16 U.S.C. § 7202(b)(2). As relevant here, Congress stated that all "public land within the California Desert Conservation Area administered by the Bureau of Land Management for conservation purposes" were designated as part of the NLCS. 16 U.S.C. § 7202(b)(2)(D). At that time, in 2009, pursuant to subsection (b)(2), all of the lands within the CDCA "administered by the Bureau of Land Management for conservation purposes" were included by Congress in the NLCS *in addition to* wilderness, wilderness study areas, national monuments, wild and scenic river segments, and national scenic or historic trails designated in subsection (b)(1).

In addition to the lands specifically identified in 2009 Act, we strongly urge BLM to define the additional lands that have been included in the NLCS which are "managed for conservation purposes" to include:

- All designated Areas of Critical Environmental Concern ("ACEC") in the CDCA.
- All designated Desert Wildlife Management Areas ("DWMAs") within the CDCA, which were designated to conserve the desert tortoise and its critical habitat with the intent that they be managed to support both survival and recovery of the desert tortoise.
- All BLM designated Conservation Areas for imperiled plants and wildlife.
- Wildlife Habitat Management Areas ("WHMA") were designated in the CDCA Plan to provide for wildlife conservation zones and habitat connectivity or continuity.
- All wetland and riparian areas designated in the CDCA in 2009.
- Research Natural Areas
- National Natural Landmarks
- National Register of Historic Places lands (e.g., Archaeological Districts, National Historic Districts)
- Lands with Wilderness Characteristics
- Limited Use Class Lands (Class L) (Class L lands are managed to protect "sensitive, natural, scenic, ecological, and cultural resource values [and] to provide for generally lower-intensity, carefully controlled multiple use of resources, while ensuring that sensitive values are not significantly diminished.")

Further, National Conservation Lands in the CDCA are congressionally designated and not simply designations made by BLM through the LUPA process. Furthermore, the full extent of the NLCS for the CDCA should remain constant across all alternatives in the DRECP including the No Action Alternative. BLM simply has to fully describe what these lands are comprised of and their physical extent and location. Their extent should not vary by DRECP alternative.

Recommendation: Since BLM has decided to use the DRECP as a mechanism to fulfill its obligation to manage NLCS lands in the CDCA, we recommend that the full spectrum of NLCS lands that were designated in the 2009 Public Lands Omnibus Act – as described above - be

disclosed in the DRECP and that their statutory management requirements be included as part of the DRECP Conservation Strategy.

Recommendation: As part of the DRECP planning process BLM must: 1) provide a comprehensive list of all NLCS lands in the CDCA as of 2009; and 2) utilize the comprehensive list of part of the conservation baseline for the DRECP plan amendments.

Recommendation: We thank the BLM for the list of National Conservation Lands identified in the Draft DRECP and fully support those lands as National Conservation Lands. Further, we adopt, and incorporate by reference, the recommendations by The Wilderness Society and California Wilderness Coalition, in their DRECP Comment letter, dated February 22, 2015, for area-specific recommendations for the NLCS. These lands are also listed in Appendices C and D of this letter for reference.

2. The National Lands Conservation System Lands Must Be Correctly Managed for Conservation Purposes.

Within the DRECP, the BLM has not only National Conservation Lands, but it has also set forth specific management prescriptions.

Recommendation: We adopt, and incorporate by reference, the following recommendations by The Wilderness Society and California Wilderness Coalition, in their DRECP Comment letter, dated February 22, 2015:

- The BLM should clarify in the DRECP that National Conservation Lands additions cannot be reversed through agency action; and can only be undone by Congress.
- All National Conservation Lands additions should be recommended and evaluated for a mineral withdrawal.
- BLM should clarify the intent behind disturbance caps for National Conservation Lands.
- ACEC designations should be retained where they overlap with National Conservation Lands.

3. The DRECP Inventory and Management of Lands with Wilderness Characteristics Needs Additional Refinements.

LWC lands are of special significance in the CDCA and we believe they should become part of the NLCS. These are lands that are in natural condition and fully qualify for wilderness designation and provide substantial conservation value for natural communities and their compliment of species.

Recommendation: We adopt, and incorporate by reference, the recommendations by The Wilderness Society and California Wilderness Coalition, in their DRECP Comment letter, dated February 22, 2015, for the inventory and management of LWC.

4. Special Recreation Management Areas and Extensive Recreation Management Areas Must Not Conflict with the Conservation Needs of Covered Species and Natural Communities.

The SRMAs/ERMA designations are administrative designations established by BLM through the land use planning process and related to public land areas having special values for their recreational resource experiences. Recreational use in the CDCA typically includes the use of motorized vehicles for basic access to recreational resources, but also the use of areas designated specifically for motorized vehicle competition and unrestricted travel (i.e., Off-road Vehicle Open Areas). We have concerns about using these designations where they overlap with certain areas designated for conservation where conservation management actions are needed to achieve the Plan-wide BGOs. These certain areas include ACECs or NLCS lands managed to conserve and recover listed species as for the desert tortoise, California condor, Southwestern willow flycatcher, Least Bell's vireo and Mohave ground squirrel. SRMA and ERMA designations emphasize and may contribute to increased recreational use, often involving access by motorized vehicles, which may be in conflict with the Plan-Wide BGOs intended to conserve and recover these species largely through habitat protection and limitations on multiple use activities. However, we have no issue with the proposed designation of SRMAs for the existing Off-road Vehicle Open Areas (Dove Springs, Jawbone, Spangler Hills, Stoddard Valley, Johnson Valley, El Mirage, Algodones Dunes, Plaster City, and Superstition Hills).

Recommendation: The DRECP must clarify and/or emphasize that in the event of overlap, the more protective management prescriptions apply (e.g., ACEC or NCL provisions over SRMAs). It must also ensure that the Desert Tortoise Natural Area is maintained for conservation purposes, and not recreation. It should therefore be removed from any proposed SRMAs. Finally, the Draft DRECP must exclude from proposed SRMAs all areas where recreation, particularly OHV recreation, may prevent the DRECP from meeting its species conservation objectives.

5. The DRECP Must Make Additional Management Changes to fulfill the Federal Land Policy and Management Act and CDCA Management Mandates.

Resource Management Plans (RMPs), or LUPAs, are required by section 202 of the Federal Land Policy and Management Act (FLPMA), which states that "In the development and revision of land use plans, the Secretary shall . . . use and observe the principles of multiple use and sustained yield set forth in this and other applicable law . . . ; give priority to the designation and protection of areas of critical environmental concern . . . ; [and] consider present and potential uses of the public lands." 43 U.S.C. 35 § 1712(c)(1), (3), (5).

FLMPA mandates that "management be on the basis of multiple use and sustained yield . . . ." 1701 U.S.C. § 102(a)(7). Multiple use is defined as:

> . . . a combination of balanced and diverse resource uses that takes into account the long-term needs of future generations for renewable and non-renewable resources, including, but

> not limited to, recreation, range, timber, minerals, watershed, wildlife and fish, and natural scenic, scientific and historical values . . . [and] *management of the various resources without permanent impairment of the productivity of the land and the quality of the environment* . . . .

1701 U.S.C. § 103(c) (emphasis added).

The statute further requires that:

> public lands be managed in a manner that will protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archeological values . . . [and] that, where appropriate, will preserve and protect certain public lands in their natural condition . . . [and] [] will provide food and habitat for fish and wildlife . . . .

1701 U.S.C. § 102(a)(8).

The CDCA was established in 1976 under Section 601 of FLPMA, requiring BLM to provide for the immediate and future protection of public lands within the CDCA under principles of multiple use and sustained yield, and the maintenance of environmental quality. Since its establishment, there has been a continued erosion of the extent and condition of some of these resources in various parts of the CDCA, such as rare and endangered species of plants, fish and wildlife, cultural resources and overall environmental quality. BLM's proposed LUPA in the Draft DRECP comes at a critical time in CDCA history in the context of how public lands were and are to be managed, their sensitive resources and values protected and overall environmental quality maintained. Given what has been lost since the CDCA was designated in 1976, we view the BLM's LUPA component of the DRECP an essential step in public land and resource conservation as envisioned under FLPMA. The BLM LUPA needs to take unprecedented measures to ensure CDCA public land management meets FLPMA standards.

Recommendation: We offer the following recommendations to strengthen BLM's LUPA component of the DRECP relative to the intent of FLPMA and its mandates regarding biological resources. These recommendations should be considered as also necessary to meet the federal and state endangered species requirement:

Desert tortoise: Maximum protective management for desert tortoise DWMAs and ACECs plus all the USFWS's Priority 1 and 2 linkage habitats is needed to contribute to meaningful recovery of the species. The species continues to decline across its range according to USFWS published status reports, with populations in the Western Mojave Recovery Unit declining faster than in other recovery units. We recommend there be no Covered Activities allowed in existing DWMAs and ACECs and that in general, a maximum habitat loss of 0.5% be established, except for the Western Mojave where maximum habitat loss should be lowered to 0.25%. These habitat loss thresholds should apply to all multiple use activities both permitted and unpermitted. Allowable habitat loss in the Priority 1 and 2 habitat linkages from all land use activities should be limited to 1% of the acreage within the linkage and compensated for at a 5:1 ratio.

SRMA and ERMA designations are proposed for public lands over extensive areas within the plan area. These designations emphasize recreation as a key feature and SRMAs, in particular, emphasize motorized vehicle use. Although we recognize that basic access to many of the public land areas involves the use of motorized vehicles, we believe that such access can be provided for through BLM's off-road vehicle route designation process in compliance with 43 CFR 8342 criteria. There is ample evidence that off-road vehicle use can adversely impact the desert tortoise and its habitat, and that excessive use including unauthorized use on closed routes and cross-county is occurring in tortoise conservation areas over large expanses in the Western Mojave Recovery Unit for the species.

Recommendation: We recommend that SRMAs and ERMAs not overlap with desert tortoise conservation areas (critical habitat, DWMAs and ACECs) including Priority 1 and Priority 2 habitat linkages. We also recommend that designated open routes currently located in desert wash habitat be removed and that all washes be closed to off-road vehicle use.

Mohave ground squirrel: Under FLPMA and BLM's management policies for Sensitive Species, BLM should propose stronger protection policies for public land habitat supporting the Mohave ground squirrel (MGS). We recognize and appreciate that BLM has proposed a new ACEC for this species in the draft plan to include some key habitats that are not currently within the existing MGS Conservation Area, as well as proposing to establish a network of new ACECs for various resources that will largely overlap with the previous MGS Conservation Area, thus forming a landscape-scale ACEC layer encompassing much of the species habitat on public land.

Recommendation: We recommend that the management prescriptions within each of the existing and new proposed ACECs intended to provide stronger conservation for the species include additional actions, as follows, in order to stabilize the species and its habitat:

- No habitat loss allowed within known Key Population Centers as described in the draft plan.
- Maximum 1% habitat loss within the species range outside of Key Population Centers and within Key Linkage habitat and a 5:1 compensation requirement for such habitat loss.
- Retain public lands north of Kramer Junction and west of Hwy. 395 in the MGS Conservation area by designating them as part of the Mohave Ground Squirrel ACEC as proposed in the Preferred Alternative and removing this ACEC as a Special Assessment Area.
- Eliminate domestic sheep grazing on all public lands within the Cantil, Rudnick, Tunawee and Olancha Common Allotments that occur within the existing MGS Conservation Area and any future ACEC designated to conserve the species and its habitat.
- Resolve the severe off-road vehicle use issues involving vehicle use on closed routes and cross-country with area-wide law enforcement and additional area closures that resolves this issue in a timely and effective manner.

- Revise off-road vehicle route and area designations so that they contribute to the conservation of the species and its habitat and halt habitat loss from excessive and unauthorized use.
- Prohibit off-road vehicle use in all washes.

Golden eagle: Although BLM has identified Key Raptor Areas within the CDCA and some specific WHMAs associated with raptor nesting territories, most of which are for golden eagle habitat protection, site specific plans for these areas have not been prepared and the necessary conservation actions have not been implemented, including areas in the Red Mountain-El Paso Mountains and Granite-Ord-Newberry Mountains WHMAs in the western Mojave region of the plan area. The draft plan addresses golden eagle management primarily by setting a proposal annual allowable incidental take of 15 individuals per year and identifying several possible impact mitigation measures intended to offset the adverse effects of eagle mortality from covered activities. Because much of the golden eagle population within the plan area is supported by public lands, we recommend that the plan be revised to include specific management criteria and conservation management actions designed to protect and enhance the golden eagle population throughout the CDCA. This will necessitate restrictions on human activities that result in loss of eagle foraging habitat, loss of prey species and disruption of adults occupying nests and defending breeding territories.

Recommendation: We recommend the following proposed DFAs in important bird use areas be re-assessed considering their significance for golden eagle:

- Rose Valley: The draft plan describes this area as very important for bird migration, raptors and Golden eagles, as follows, "Songbirds, shorebirds, and waterfowl pass through Indian Wells Valley and Rose Valley on their way to breeding grounds. The flyway has stop-over riparian and wetland habitat in the Sierra Nevada canyons and at Little Lake and Haiwee Reservoir. Riparian areas here provide important migratory stop-over habitat for the federally listed Least Bell's Vireo and Southwest Willow Flycatcher. This flyway also provides excellent habitat for Golden Eagles, Prairie Falcons, and other raptors, with nearby cliffs for nesting and the valley floor for foraging. Little Lake Watchable Wildlife Area, close to both water and cliffs, is an exceptional place to view swallows, raptors, and waterfowl." Draft DRECP at II.3-322.

- Lucerne Valley, Johnson Valley, Apple Valley: These proposed DFAs are located near the Granite Mountains and north slope of the San Bernardino Mountains, known for their high concentration of golden eagles which nest and forage extensively in the area.

- Upper McCoy Wash region: An expansive DFA is proposed for the eastern Riverside County region that extends far north of I-10. Golden eagles are known to have nesting territories in the McCoy and Big Maria Mountains and likely forage throughout the upper McCoy wash region. We recommend eliminating the public lands in this proposed DFA

located north of the McCoy solar energy project and extending east to the Big Maria Mountains.

For additional information on management requirements and our recommendations on golden eagles, please our comments below regarding the Bald and Golden Eagle Protection Act ("BGEPA"). In addition, we provide further information regarding refinements to DFAs below.

Desert bighorn: Desert bighorn is one of the most iconic species in the CDCA and the plan area. Due to conservation and management of this species by the CDFW, BLM and volunteer organizations, such as the Society for the Conservation of Bighorn Sheep, the number of desert bighorn has slowly increased over the past several decades, but conservation and management issues continue to be needed to ensure this species continues to thrive into the future.

The Biological Goals and Objectives for conservation of Desert bighorn sheep appear sufficient, but the Conservation Management Actions are much too limited to ensure their plan-wide conservation. Conservation Management Actions are only associated with Step-town Biological Goals and Objectives which are too limited to fulfill the plan wide goals because funding would be limited to fees associated with Covered Activities.

Recommendation: We recommend that the Plan-Wide Biological Goals and Objectives and, most importantly the Conservation Management Actions, incorporate all the conservation recommendations included in the Desert Bighorn Sheep Conservation Plan Equally important is a plan and schedule to fund and implement that plan's management actions throughout the DRECP area.

We consider the following actions as the highest priority for funding and implementation:

- Restore and promote movements through linkage habitats. The priority areas for this conservation management action are those linkages that have been severed by Interstate 15 and 40 that include the following areas: 1) Cady/South Soda Mountains-North Soda Mountains-Avawatz Mountains, 2) Clark Mountain/Mohawk Hills-Ivanpah/Mescal Ranges via Mountain Pass, and 3) Granite/Providence Mountains-Marble Mountains.
- Restore and maintain reliable year-long surface water and access to forage. A high priority for restoring and maintaining surface water and forage access is Afton Canyon where a large and expanding bighorn population in the Cady Mountains utilizes diminishing surface water and obtains highly nutritious forage. A permanent water supply in the canyon should be planned and implemented in the event surface water falls below the surface due to upstream diversions and evapotranspiration from phreatophytes, including invasive saltcedar which BLM has been controlling periodically for the past two decades. A fence in the western portion of the canyon installed 20 years ago to control cattle drift into the canyon is no longer needed and should be removed. Cattle grazing ended in the Cady Mountain

Allotment in approximately 1994 when the permit was acquired by the U.S. Army as part of the mitigation required for expansion of Fort Irwin.

- Remove cattle grazing from ranges occupied by desert bighorn. Domestic cattle grazing and allotments in three ranges occupied by bighorn sheep should be eliminated to reduce competition for space and forage and to eliminate the likelihood of disease transmission. These three areas are 1) Ord and Newberry Mountains, 2) Old Woman Mountains and 3) Kingston Range. There is ample justification for this action in the Desert Bighorn Sheep Conservation Strategy, pages 12, 16-17, 31-32, 36, 41, 44, 49, and 53. The CDCA Plan in 1980 called for elimination of cattle grazing on allotments south of I-40 – the Ord and Newberry Mountains and Old Woman Mountains herds are south of I-40 and BLM should take this opportunity to implement this decision.
- Eliminate competition for space, food and water by eliminating horse and burros from occupied ranges and key habitat linkages.
- Protect and maintain habitat in occupied ranges and key habitat linkages from adverse impacts caused by multiple use activities.
- Other recommended management actions. The DRECP should include additional conservation management actions identified in the Desert Bighorn Sheep Conservation Strategy found on pages 56-58.

Flat-tailed horned lizard. The California Fish and Game Commission recently voted to provide emergency protection for the Flat-tailed horned lizard in response to a listing petition. The voted to accept the petition and the species will now undergo a 12-month formal status review by the CDFW.

Recommendation: Given the Commission found that listing of the species under CESA may be warranted and afforded it emergency protection during the status review, we recommend BLM and the cooperating agencies undertake a critical review and make necessary changes to the Flat-tailed Horned Lizard Rangewide Management Strategy based on information contained in the listing petition and CDFWs analysis of the petition. The draft DRECP proposes to keep and implement the existing rangewide plan for the species, but enhanced conservation actions may be necessary to achieve the plan-wide biological goals and objectives and meet the legal and policy requirements for public land management in the CDCA.

Microphyll woodlands. Microphyll woodlands are 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. The alliance typically includes desert willow, mesquite, smoke tree, blue palo verde and ironwood trees[15]. The majority of this alliance occurs

[15] *Chilopsis linearis* alliance (Desert willow), *Prosopis glandulosa* alliance (Mesquite), *Psorothamnus spinosus* alliance (Smoke tree), and *Parkinsonia florida - Olneya tesota* alliance (Blue palo verde - Ironwood). Desert willow,

within the DRECP's Riverside East DFA; however, the draft DRECP is lacking quantitative and measurable BGOs and strong CMAs to ensure conservation of this natural community.

Recommendation: Revise baseline and mapping to include the most recent and up to date information. Provide quantitative BGOs and strengthen the CMAs related to Microphyll woodland natural community, especially the CMAs that apply within the DFAs.

Joshua Tree woodlands. Joshua tree woodland is an iconic natural community of the Mojave Desert that supports a high level of biodiversity including nesting habitat for native birds and a food source for Mohave ground squirrels. Joshua tree woodland vegetation alliance has a rank of S3, is threatened by development, and continues to decline throughout the state as a result of direct removal, fragmentation, exposure to increased wildfire, and climate change. The continual loss of Joshua tree woodland must be addressed through the DRECP natural community BGOs, which as currently proposed are nor quantitative nor measurable. The insufficiency of the BGOs is exacerbated by weak conservation language used to develop avoidance and minimization Conservation and Management Actions (CMAs) for natural communities under the DRECP's BLM LUPA component. CMAs call for avoidance and minimization of natural communities, "to the maximum extent practicable." While requiring maximum avoidance and minimization of impacts is commendable, the ambiguous and subjective nature of the CMA requirement provides no certainty that the community will maintain viable in the face of cumulative impacts. The amount of impacts to DRECP natural communities becomes even less constrained through the "unavoidable impacts to resources" allowance associated with natural community CMAs (e.g., CMA AM-DFA-RIPWET-1 p. II.3-49, and elsewhere).

Recommendations:

1) Strengthen the CMAs for natural communities to provide assurance that natural communities will be conserved within the BLM's LUPA designations.

2) Revise the map of the Joshua Tree woodlands to better illustrate where this community occurs within proposed BLM LUPA designations, and add to the importance and relevance of administering proposed ACECs and/or NCLs for Joshua tree conservation.

3) Include Joshua tree conservation management language to the following ACECs or NCLs proposed in the Preferred Alternative of the DRECP, listed below. Management of these ACECs/NCLs should address conservation of Joshua tree woodlands by monitoring population trends, removing and/or preventing threats to this natural community, and taking remedial actions when impacts to Joshua tree woodlands occurs.

- Cerro Gordo - Congolomerate Mesa ACEC designation

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mesquite and smoke tree are rare vegetation alliances and a significant portion of Blue palo-verde – Ironwood alliance occurs in the Riverside East DFA.

- Castle Mountain NLCS designation
- Shadow Valley and Halloran Wash ACEC / NLCS designations
- Old Woman Springs Wildlife Linkage NLCS designation
- Granite Mountain corridor ACEC designation
- Jawbone / Butterbredt ACEC
- Kelso Creek Monkeyflower ACEC
- Middle Knob NCL designation

4) Prioritize Joshua tree conservation in potential transitional habitat areas, including the following:

- Western Antelope Valley/Tehachapi Mountain transitional habitat
- Southern Sierra Nevada Mountains transitional habitat
- Centennial Flats/Conglomerate Mesa transitional habitat
- Lucerne Valley transitional habitat
- Pinon Hills/Countyline transitional habitat

5) Establish an avoidance and minimization CMA for Joshua tree woodlands in DFAs consistent with our recommendations contained supra.

C. The DRECP Must Create A Legally Sound and Scientifically Credible Framework for Authorizing Programmatic Take of Golden Eagles.

We have a strong history of providing comments on eagle conservation and we are incorporating by reference our joint comments on the Draft Eagle Conservation Plan Guidance; the 2012 proposed revisions and changes in the regulations governing eagle permitting; wind energy in the Desert Renewable Energy Conservation Plan (DRECP); the Draft Environmental Assessment (DEA); Eagle Management and Permitting under the Bald and Golden Eagle Act (BGEPA); and programmatic eagle take permit application for the Shiloh IV Wind Project.[16] The concerns and recommendations described below center on the need for a legally sound, scientifically credible, and workable framework for authorizing programmatic take of golden eagles in the DRECP in order to ensure the enduring preservation of the species in the California desert and beyond.

1. The proposed DRECP golden eagle permitting program should include an analysis of impacts from covered activities other than wind.

All Covered Activities, including solar, transmission and perhaps even geothermal, may result in take to eagle. Direct mortality from wind turbines is only one form of take to golden eagles pursuant to BGEPA. BGEPA defines "take" broadly as "pursue, shoot, shoot at, poison, wound, kill, capture,

[16] Audubon, et al., Joint Comments on the Draft Eagle Conservation Plan Guidance (May 19, 2011); Audubon, et al., Joint Comments on Advance Notice of Proposed Rulemaking, Docket No. FWS-R9-MB-2011-0094 (July 12, 2012); Defenders of Wildlife, et al., Joint Recommendations on Wind Energy Development in DRECP (August 24, 2012); Defenders of Wildlife, Eagle Management and Permitting under BGEPA, Docket No. FWS-R9-MB-2011-0094 (September 22, 2014); Audubon California, et al., Joint Comments on the eagle permit application for the Shiloh IV Wind Project (November 29, 2013).

trap, collect, destroy, molest, or disturb."[17] "Disturb" has been defined in FWS regulations as "to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available: (1) injury to an eagle, (2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or (3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior."[18] As such, solar facilities can result in golden eagle take by disturbing them in the form of loss of foraging habitat that results in interference with normal breeding, feeding or sheltering behavior. Likewise transmission and even geothermal can have direct and indirect impacts on golden eagle that meet the regulatory definition of disturb.

Recommendation: The DRECP must analyze potential direct and indirect impacts to golden eagles from all covered activities, not just wind energy development, in order to implement its golden eagle permitting program. All covered activities that result in golden eagle take, whether through direct mortality or disturbance should be required to obtain a permit as required under BGEPA.

2. <u>DRECP has failed to show that an annual take of 15 golden eagles from the plan area is compatible with the preservation standard of BGEPA.</u>

The overarching purpose and frame for permitting eagle take under BGEPA is driven by the need to ensure preservation of eagles. Congress made clear through its statutory language that permitted eagle take is only appropriate when it is "compatible with the preservation of eagles." [19] "Compatible with the preservation of eagles" has been interpreted by FWS regulations as meaning "consistent with the goal of stable or increasing breeding populations."[20] Hence, maintaining stable or increasing breeding populations is the top priority and necessary prerequisite for any authorization under BGEPA in the DRECP, and absent this outcome, any "take" authorization is inappropriate.
DRECP has failed to provide sufficient rationale to justify why an annual take of 15 golden eagles from the plan area from wind facilities will result in stable or increasing breeding populations pursuant to BGEPA regulations. We ask that DRECP address the concerns described below regarding the methodology used to calculate an annual take limit for the plan area.

First, this annual take is calculated based on a construct of a "local area population" that is defined by an area of 150 million acres – which far exceeds any biologically relevant boundary for golden eagle populations. As acknowledged in the Service's interim monitoring protocol for golden eagles, a local population scale is an important component of meeting the preservation standard to

> ensure that impacts are not concentrated in particular localities to the detriment of locally-important eagle populations, cumulative effects need to be considered at the population management level—*Service Regions* for Bald Eagles and *Bird Conservation Regions* for Golden

[17] 16 USC 668(c).
[18] 50 CFR 22.26.
[19] 16 U.S.C. § 668(a).
[20] 74 *Fed. Reg.* 46,836.

> Eagles—and, especially for project-specific analyses, at local area population levels (the population within the average natal dispersal distance of the nest or nests under consideration). Eagle take that is concentrated in particular areas can lead to effects on the larger management population because 1) disproportionate take in local populations where breeding pairs are 'high' producers may reduce the overall productivity of the larger population; and 2) when portions of the management population become isolated from each other the productivity of the overall management population may decrease. [21]

When the Eagle Rule of 2009 was drafted, it stated that the local area population should be defined based on an area 140 miles in radius (the predicted natal dispersal distance of golden eagles) around the project site. However, the DRECP is a landscape planning area, not a single wind project and its 22.5 million acre area is partially based on political jurisdictions, not ecological systems. This results in a population that far exceeds any distinct biologically relevant local population and is based on an arbitrary planning boundary that has nothing to do with eagle biology, movement, or ecology.

A local area population defined by this 150 million acre area (determined based on an 140 mile radius around the DRECP area) includes places outside the DRECP that have a much greater density of golden eagles such as the Sierra Nevada and thus artificially inflates the take threshold within the plan area, which has a much lower density of resident and migrant golden eagles than surrounding areas. This frustrates any ability of this permitting program to prevent significant population–level effects and ensure that certain biologically relevant local area populations do not become population sinks as a result of the DRECP.

Recommendation: The DRECP must adopt a more biologically relevant definition of "local area population" when determining the appropriate level of eagle take that is consistent with stable and increasing eagle populations and incorporate it into the permitting structure under BGEPA for the DRECP.

Second, the Draft DRECP fails to justify why it chose the upper end of the allowable take threshold for a local breeding population to calculate the take limit within the plan area. The Eagle Rule of 2009 identified allowable take thresholds between 1 and 5 percent of the total estimated local area eagle population as benchmarks, with 5 percent being at *the upper end of what might be appropriate* under the Eagle Act's preservation standard to ensure stable and increasing populations.[22]

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[21]Joel E. Pagel, et.al., *Interim Golden Eagle Inventory and Monitoring Protocols; and Other* Recommendations (February 2010) at 3, *available at* http://www.fws.gov/southwest/es/oklahoma/documents/te_species/wind%20power/usfws_interim_goea_monitoring_protocol_10march2010.pdf.

[22] See ECPG at 94.

The DRECP is proposing to implement the upper end of the allowable take range – 5 percent of the eagle population in the 150 million acre "local area population." without any justification of why the upper end of this range is appropriate based on the characteristics of the planning area. FWS' Eagle Conservation Plan Guidance classifies projects as Category 1 or "high risk sites" if the project "causes the cumulative annual take for the local-area population to exceed 5% of the estimated local-area population size."[23] The Guidance states explicitly that these projects would likely not meet BGEPA regulatory requirements.[24] However, by establishing a take limit for wind development, alone, at 5% of the local area population, the DRECP is sure to experience cumulative take exceeding 5% of the local population. This result is contrary to BGEPA regulations and FWS' Eagle Conservation Plan Guidance, and thus further justification is necessary.

In addition, we have concerns that this choice may be inconsistent with stable and increasing local area populations based on:

- **The lack of certainty in baseline population data and the inability to quantify cumulative population impacts within the plan area.** Note in the preamble to its 2009 regulations, FWS committed to using "modeling to evaluate the level of take [FWS] can permit that is compatible with [the Preservation Standard], taking into consideration the cumulative effects of all permitted take, including other forms of lethal take permitted under this section and other causes of mortality and nest loss."[25] There is no evidence that FWS performed this analysis or adequately considered cumulative effects when establishing the DRECP take limit.
- **The failure to consider cumulative impacts qualitatively or quantitatively when establishing the take limit.** Under FWS' BGEPA regulations, it was determined that 5% was the upper limit of the level of appropriate take for all permitted take (from wind development and other sources) <u>and</u> other non-permitted sources of cumulative impacts (e.g., lead exposure, collision, etc.) in order to be consistent with BGEPA's preservation standard. There are clearly other sources of cumulative take within the plan area in addition to wind energy development. It appears that the DRECP failed to account for these other sources when allowing take from wind development to equate to 5% of the local area population. Accordingly, we have concerns that this level of permitted take for wind development is not consistent with stable or increasing breeding populations.
- **The overall infancy of impact avoidance and minimization strategies, and the absence of any FWS approved Advanced Conservation Practices.** (See discussion regarding Advanced Conservation Practices below).

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[23] U.S. Fish & Wildlife Service, *Eagle Conservation Plan Guidance Module 1 – Land-based Wind Energy Version 2* (2013).
[24] *Id.*
[25] 74 *Fed. Reg.* 46,839.

- **The lack of approved, effective compensatory mitigation practices deployable within the plan area.** Pursuant to FWS' 2009 regulations, compensatory mitigation is still required to offset the take of any permitted take of golden eagles. Accordingly, FWS must show that 15 annual takes can be fully compensated each year within the same biologically relevant local area population affected by the permitted take.

Recommendation: The DRECP must justify its golden eagle take limit with a sufficient biological analysis to show that the permitted annual take will result in stable and increasing biologically relevant local area eagle populations within the plan area. This will require more information and analysis of cumulative take within the plan area and a showing that any authorized take can be fully and effectively mitigated within the appropriate biologically-relevant local area population boundary.

3. Biological goals and objectives should be quantifiable and measurable.

For a regional eagle conservation framework such as the DRECP to be effective, the Service must first establish explicit numerical population objectives to guide the conservation strategy at the appropriate scale. The stated biological goals and objectives for golden eagle are neither numeric nor measurable. Numeric population objectives are vital to guide consistent decision making in a transparent fashion, providing more certainty for developers, facilitating administrative efficiency, and ensuring measurable conservation outcomes. Numeric population objectives also provide: (1) a measurable basis for evaluating whether the BGEPA permitting program is achieving the Preservation Standard; (2) the foundation for an adaptive approach through standardized monitoring data and other research, and (3) a basis for evaluating whether mitigation decisions are effectively minimizing and offsetting eagle take. In sum, effective population objectives must be:

- Consistent with the Preservation Standard of BGEPA;
- Applicable at a variety of spatial scales (e.g., local populations, EMUs, and potentially flyways);
- Developed through a standardized approach that is based on the best available science and incorporates the appropriate level of uncertainty and risk;
- Refined periodically based on monitoring and population status and trends;
- Developed within a collaborative, peer-reviewed process; and
- Representative of population parameters, such as sex or age ratios, genetic characteristics, etc.

Recommendation: Revise the biological goals and objectives to ensure there are quantifiable targets that can be used to evaluate how well the DRECP to achieving conservation and recovery standards for golden eagle. Simply have regional take caps is insufficient to ensure a viable population of golden eagles in the desert.

4. The monitoring and adaptive management program should be clearly defined upfront.

The monitoring and adaptive management and monitoring program in the Draft DRECP does not provide sufficient detail regarding monitoring and is not based on quantifiable population goals and objectives for eagles. Thus, the Draft DRECP does not provide assurances that eagle populations will be managed to ensure the local area populations within the DRECP are stable or increasing. An adaptive management plan that is based only on take thresholds cannot ensure the preservation standard is met. A formal, structured, transparent and collaborative adaptive management process is necessary to reduce current uncertainty through monitoring and research as well as to improve management and permitting over time. Standardized, transparent monitoring and research is the cornerstone of any adaptive management permitting regime. Specifically, research and monitoring efforts should be developed to:

- Collect regional baseline population data;
- Evaluate trends in population status;
- Understand risk factors for take and improve risk assessment methodologies;
- Identify and quantify threats to regional populations and the opportunities to reduce threats through compensatory mitigation;
- Refine avoidance strategies;
- Identify and assess the effectiveness of Advanced Conservation Practices; and
- Identify and assess the effectiveness of compensatory mitigation measures.

Recommendation: The DRECP must provide more detail in the monitoring and adaptive management plan for golden eagles. Providing only quantifiable take thresholds does not allow the DRECP agencies to track how implementation of the plan is ensuring golden eagle populations are stable or increasing. The MAMP must include quantifiable population goals and objectives, specific protocols for monitoring and methodology for assessing effectiveness and refining conservation and avoidance strategies.

While a robust adaptive management program is critical to the success of a regional conservation framework for eagles, until we learn more, we caution the DRECP against an over reliance on adaptive management for providing DRECP eagle permits. A commitment to adaptively manage should not altogether supplant the need for the Service to proceed cautiously in strict adherence to the mitigation hierarchy. Given significant uncertainty, it is crucial that the Service approach adaptive management as an experiment to limit the risk of doing too much of the wrong thing and ensure that we maximize learning along the way. This is particularly relevant for eagle permitting since there are few known measures to effectively minimize and compensate for eagle take once a project is built.

5. <u>The DRECP should establish a standardized process for transparent reporting.</u>

The DRECP should establish a standardized reporting process that requires transparent reporting of golden eagle mortality in the DRECP area. Transparent and comprehensive reporting requirements will improve the effectiveness of the DRECP's eagle permitting program by:

- Improving transparency, which will in turn reduce misinformation and mistrust;
- Simplifying data aggregation and analysis for the DRECP agencies, local governments and other researchers;
- Incentivizing responsible development and operation, which could result in reduced eagle take;
- Leveraging DRECP compliance and enforcement resources by facilitating "citizen" oversight; and
- Encouraging the development of innovative GIS monitoring tools.

Recommendation: Develop a system for transparent, publically available, reporting of monitoring data for projects with an eagle take permit in the DRECP. Standardization of data collection and reporting will be necessary; hence, data protocols must be developed by the DRECP to ensure the results are used and useful.

6. <u>There is no process for researching and approving Advanced Conservation Practices (ACPs).</u>

A DRECP eagle permit program will undoubtedly have a different type of impact on eagle populations than project-specific eagle permits and there is a higher possibility of harm and uncertainty. This is why the DRECP is proposing to implement ACPs, or "scientifically supportable approved measures that represent the best available techniques to reduce eagle disturbance and ongoing mortalities to a level where remaining take is unavoidable," to ensure that the DRECP permit program would be compatible with the preservation of eagles. However, there are very few ACPs which have been demonstrated to be effective in minimizing eagle take and FWS has yet to officially approve any ACPs. Accordingly, more work is necessary to quantify the effectiveness of new options is necessary. The lack of approved ACPs is one of the most critical gaps in implementing the DRECP eagle take permit program and the impediment is not only the lack of identified measures but the lack of a clear mechanism for how ACPs will be vetted and approved.

Recommendation: A coordinated and well-defined research program that explores potential innovations in ACPs should be instituted to examine, supplement, and prioritize a menu of validated, effective measures. This should be undertaken in an expedited fashion, using before-and-after control impact (BACI) studies to rigorously establish effectiveness. Testing should include a diversity of options, including operational curtailments, automated curtailment technologies, deterrent technologies, adjustments in turbine siting, and prey management at the site.

Recommendation: The DRECP should articulate what process it will use to assess and approve ACPs for eagle take minimization and specific project criteria explaining when approved ACPs will

be required. The DRECP needs to articulate a mechanism for scientifically, transparently, and defensibly selecting approved ACPs; this crucial step should be prioritized for expeditious action.

E. The Plan Needs to Revise the Preferred Alternative to Meet the Dual Goals of Protecting Desert Wildlife and Resources and Providing More Efficient Permitting of Renewable Energy Projects within the Plan Area.

As discussed above, we have made a number of recommendations to revise the Preferred Alternative to meet federal and state legal requirements, including changes to Biological Goals and Objectives, governance, adaptive management, and funding. These improvements also will help ensure the DRECP is able to satisfy industry interests, including greater permitting predictability, reduced timeframes and reduced conflict risks.

Below are a number of additional specific recommendations that we believe are important to improve the DRECP, build greater support for the plan, and meet the dual goals of renewable energy development and natural resource conservation.

1. The Covered Species and Natural Community List Must Be Refined to Reflect Current Conditions.

a. Tricolor blackbird.

The tri-colored blackbird was given emergency protection under provisions of CESA on December 3, 2014, by the California Fish and Game Commission in response to a listing petition.

Recommendation: Update the status of the tri-colored blackbird in plan area to reflect emergency protection.

b. Yellow Billed Cuckoo.

The Yellow-billed cuckoo was listed as threatened by the USFWS on October 3, 2014. Designation of critical habitat for the species is underway and the USFWS expects to issue a final rule in 2015. Proposed critical habitat units to date within the DRECP area include 1) South Fork of the Kern River near Weldon and Onyx, 2) Owens River in Owens Valley of Inyo County, 3) Lower Colorado River from near Parker to the Mexican border, 4) Lower Colorado River in the vicinity of Needles, California. Additions to currently proposed critical habitat may occur as a result of additional public review and comment.

Recommendation: Change the federal status of this species to threatened in Table III.7-33, and include all the proposed critical habitat units as proposed ACECs along with conservation management actions needed to conserve the species within the plan area.

c. Native Fish in Amargosa River.

Native fish in the Amargosa River (Amargosa River pupfish and Nevada speckled dace) are not on the covered species list but they are designated as Sensitive Species by BLM. Adding these species is recommended given that Silurian Valley is listed as a Special Analysis Area, has two active applications for a wind and solar project, and is hydrologically connected to Salt Creek and thence the lower Amargosa River. The proposed DFA in the Pahrump Valley is also hydrologically connected with the Amargosa River. These species also warrant Covered Species status in the plan given that is must comply with the provisions of the NCCP Act.

Recommendation: The Plan-Wide BGOs and Conservation Management Actions must address the conservation of these fish species because they are vulnerable to adverse impacts of various stressors including water diversion, water pollution, and invasive species (such as saltcedar) and not simply Covered Activities. Conservation management actions to restore and maintain aquatic habitat for these species should be developed and included in the draft plan.

d. Flat-tailed horned lizard.

On February 12, 2015, the California Fish and Game Commission voted to accept the petition to list the Flat-tailed horned lizard under provisions of the CESA, which triggers a 12-month status review of the species. During this time the species is afforded full interim protection pending a final decision by the commission on its listing.

Recommendation: We recommend the plan be modified to provide sufficient protection for the species from both Covered Activities and non-Covered Activities through appropriate modification of proposed DFAs and additional Conservation Management Actions.

e. Nye milk vetch (Astragalus nyensis).

Nye milk vetch is a California Rare Plant Rank 1B.1 and is has a state rank of S1 and a global rank of G3. It is rare and considered vulnerable to extremely threatened throughout its ecological range which includes California, Nevada, Arizona and Utah. One hundred percent of Nye milk vetch's documented occurrences in California fall within the Charleston View DFA boundary. Between 2010 and 2012, desert botanists surveyed specifically for this plant throughout areas they felt represented appropriate habitat in the eastern Mojave – both California and Nevada. They found one occurrence in Stewart's Valley in Nevada and no other California populations outside of the DFA boundary. DRECP covered activities could potentially extirpate the species from California and push its global population closer to listing or even extinction. Our knowledge of Nye milk vetch ecophysiology and management needs are equivalent to how much we know about other plants on the Covered Species list. Given the generic nature of the plan-wide and step-down BGOs for the 10 plant Covered Species, the DRECP could easily replicate the BGOs of the other 10 plants and include them for Nye milk vetch. The constricted nature of Nye milk vetch in California makes it possible to develop target conservation acreage for the species within the DFA.

Recommendation: Include Nye milk vetch as a covered species and development BGOs for the species similar to the other 10 plant species. Include the CMA for Nye milk vetch that allows a 0.25 mile setback from all occurrences inside DFAs.

f. Crucifixion thorn (Castela emoryi).

Crucifixion thorn is currently addressed in the Draft DRECP as an individual species instead of as a natural community. BLM has previously designated the Crucifixion thorn assemblage as an Unusual Plant Assemblage.

Recommendation: DRECP should address Crucifixion thorn assemblage as a natural community and should add it to the Sonoran-Colorado semi-desert wash woodland scrub (SCOWS) natural community. This would ensure a 200 foot buffer around this unique plant assemblage if it is located on a project site within a DFA.

2. The DFAs must be refined and revised to provide greater clarity as to what land are available for development and what lands must be avoided to protect conservation values.

For the purposes of identifying biological conflicts with the lands designated as potential development areas within the DRECP area, we created a GIS data layer that includes important elements for inclusion in any DRECP reserve design. The conflict data layer includes the following data layers:

- Vegetation: all microphyll woodland with the 200 ft. setback outlined in the CMAs (CMA# AM-PW-1).
- Climate change information: predicted stable ranges for desert tortoise, Mohave ground squirrel and other covered species – see Climate Change comments, supra, for more information.
- Terrestrial Intactness: high terrestrial intactness per logic model produced by Conservation Biology Institute for DRECP[26].
- Conservation Value: high conservation value per logic model produced by Conservation Biology Institute for DRECP[27].
- Mohave ground squirrel: key population centers and linkages[28].
- Desert tortoise: Contiguous high value habitat and habitat linkages per USFWS DTRO[29].

[26] Available for download at: http://drecp.databasin.org/datasets/84ef11e4e8604baab33c2a041d957934
[27] Available for download at: http://drecp.databasin.org/datasets/84ef11e4e8604baab33c2a041d957934
[28] As described in the Draft DRECP Appendix C (BGOs) at p. 146; available for download at: http://drecp.databasin.org/datasets/c6d4382d9cd74318893064aa6cab252b
[29] More information on the linkage dataset available at: http://drecp.databasin.org/datasets/9a5f60c89e284606b3017954c1efebb1; More information on contiguous

- Bighorn sheep: priority patches for protection and restoration, and intermountain habitat[30].

These data were merged into one shapefile and used to identify where the potential development areas would conflict with data for important biological features. Below we outline where conflicts arose with these biological data layers within each DFA and suggest potential refinements of the preferred alternative DFAs. Figure 1 shows where Defenders' biological and ecological conflict layer overlaps with the DFAs in the preferred alternative. Please note that this conflict layer is based on spatial data that includes modeling of predicted habitat and linkages throughout the desert. On the ground information for specific areas may reveal omissions in important biological and ecological values as well as errors of commission where areas included do not, in fact, have high biological or ecological value. The purpose of this conflict layer is to identify those areas that warrant further investigation and potential refinement of the DFAs.

Recommendation: Below we provide a detailed county-by-county analysis of DFAs and more site-specific recommendations based on Defenders' conflict layer as well as other information.

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high value habitat available from DTRO whitepaper: "Connectivity of Mojave Desert Tortoise Populations" (May 2012)

[30] BHS intermountain habitat available at: http://drecp.databasin.org/datasets/18f70788685f4e7985d4a14915524cdd; BHS priority patches for protection and restoration: Creech et al. (2014) "Using network theory to prioritize management in a desert bighorn sheep metapopulation" Landscape Ecology DOI 10.1007/s10980-014-0016-0.

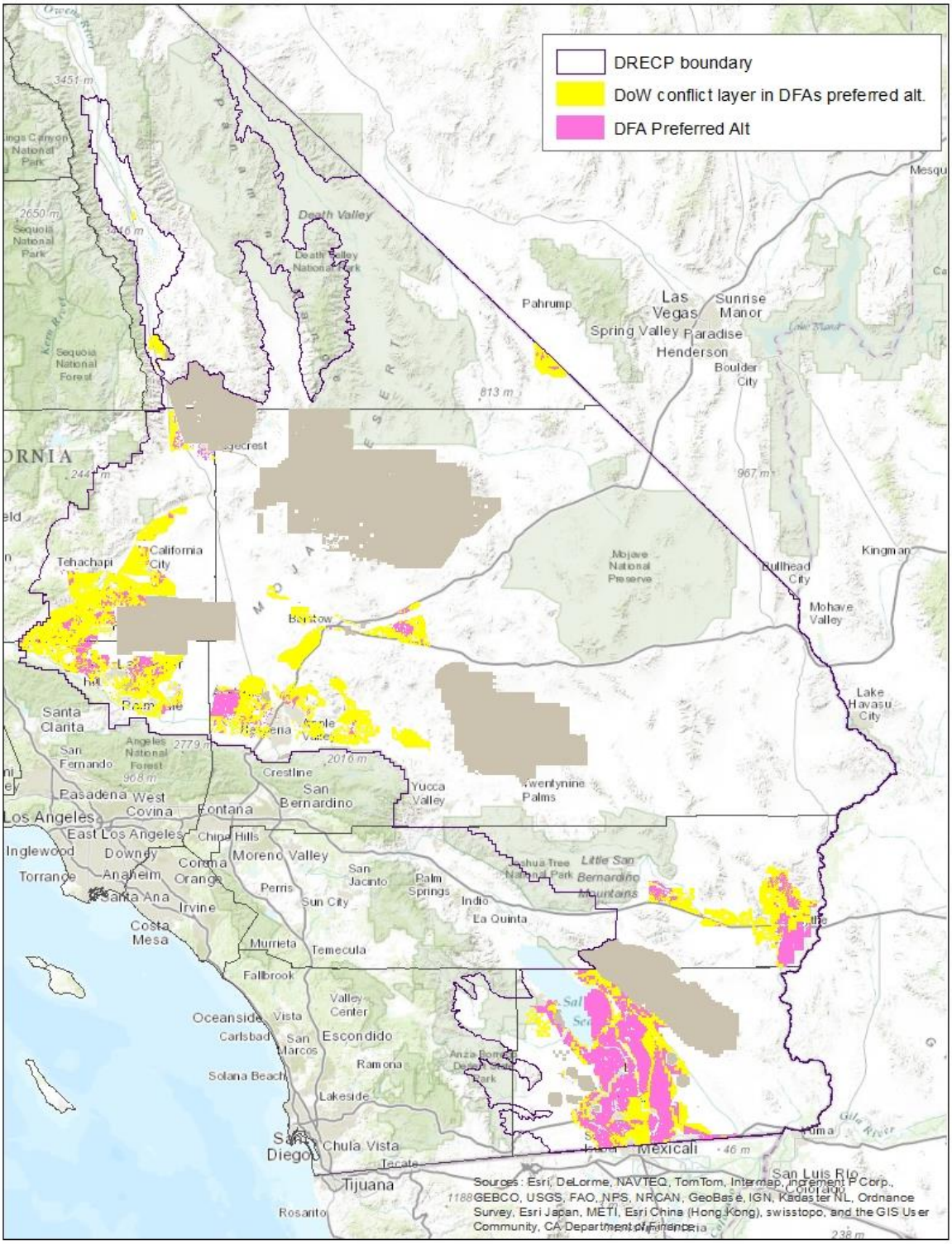

Figure 1. This map shows where Defenders' conflict layer intersects with the proposed DFAs in the preferred alternative. We provide further explanation and recommendations for DFA refinements in the text.

Inyo County: The DFAs in Inyo County significantly overlap with Defenders' conflict layer. Specifically, the DFA in Rose Valley overlaps linkage habitat for Mohave ground squirrel and desert tortoise high value contiguous habitat. Rose Valley is located within a particularly important bird flyway. The draft plan describes this area in the Basin and Range Subregion as very important for bird migration, raptors and Golden eagles, as follows, "Songbirds, shorebirds, and waterfowl pass through Indian Wells Valley and Rose Valley on their way to breeding grounds. The flyway has stop-over riparian and wetland habitat in the Sierra Nevada canyons and at Little Lake and Haiwee Reservoir. Riparian areas here provide important migratory stop-over habitat for the federally listed Least Bell's vireo and Southwestern willow flycatcher. This flyway also provides excellent habitat for Golden Eagles, Prairie Falcons, and other raptors, with nearby cliffs for nesting and the valley floor for foraging. Little Lake Watchable Wildlife Area, close to both water and cliffs, is an exceptional place to view swallows, raptors, and waterfowl." Draft DRECP at II.3-322. We recommend undisturbed and intact public lands be removed from the proposed DFA to ensure it will remain functional habitat to support Mohave ground squirrel populations and facilitate their movements through this habitat linkage. Protection of these public lands will ensure protection of the bird flyway and populations of various species that breed and forage in the area, including golden eagles. We recommend that a modified DFA could include heavily disturbed private lands formerly used for alfalfa production and a mix of private and public lands near Coso Junction. Farther to the north there are disturbed lands near the site of Dunmovin, and north and west of Haiwee Reservoir that may be appropriate for a DFA.

The DFA north of Owen's Valley overlaps with predicted stable range for many of the covered species under mid-century climate scenarios. The DFA in Charleston View[31] shows small acreage not in conflict with Defenders' layer and is generally less pristine private land. However, due to groundwater concerns, this area would only be appropriate for DG or small PV that does not require the use of groundwater.

Kern County: Much of the biological and ecological value layer that we produced overlaps with the DFAs designated in Kern County. This is primarily because the West Mojave is modeled as stable range for many covered species in the DRECP under mid-century climate scenarios. Due to the inherent uncertainty of species distribution models and climate change scenarios, we do not recommend completely eliminating all areas overlapping with our conflict layer but we do urge caution in designating the majority of the DFAs in the West Mojave sub-region of the DRECP as this will create disproportional impacts in this area that has been modeled as stable range for many species under current and future climate change scenarios. Specifically, in the Indian Wells Valley, we recommend refining the DFA to exclude the linkage area identified in the draft DRECP for Mohave ground squirrel along the western edge of the DFA. Additionally, much of the area in the Fremont Valley is overlapping habitat for both Mohave ground squirrel and desert tortoise and development should be appropriately sited to ensure adequate habitat for these species in this sub

[31] Sierra Club does not support any development in Charleston View due to natural resource conflicts.

region. Contrary to what the map shows, we recommend keeping the Tehachapi wind resource area as a DFA specifically for wind re-powering and infill. This area has already been developed with wind resources and it is preferable to place development in areas that have already been impacted rather than expanding to other more pristine areas.

In terms of refinement of the DFA in this area, we recommend using The Nature Conservancy's West Mojave Assessment, locations of operating and approved solar projects, predictions for species stable ranges and information from Kern County to define a reasonable and appropriate DFA in this area. In Figure 2, we show where The Nature Conservancy's high conflict layer overlaps with the DFAs in the Antelope Valley. This would provide a good starting point from which to revise and refine the large DFA in this area to ensure protection of valuable resources now and into the future.

Los Angeles County: Similar to Kern County, the DFAs in Los Angeles County overlap with our conflict layer primarily due to modeling of species predicted stable ranges under climate change scenarios. As mentioned above, we are not recommending removal of all DFA lands overlapping with our conflict layer. Instead, we urge the DRECP agencies to carefully consider potential "refugia" for species in the West Mojave and site development carefully to ensure the elevation gradients and habitat linkages in the West Mojave are adequately protected from renewable energy development on a large-scale. Importantly, the Significant Ecological Areas that have been adopted by Los Angeles County need to be removed from any DFA designation to ensure the conservation investments made in these areas are not undermined by development. We recommend using The Nature Conservancy's West Mojave Assessment, information on known locations of operating and approved solar energy projects, input from Los Angeles County along with the information provided here on predicted stable ranges for species to identify a reasonable and appropriate DFA in this area.

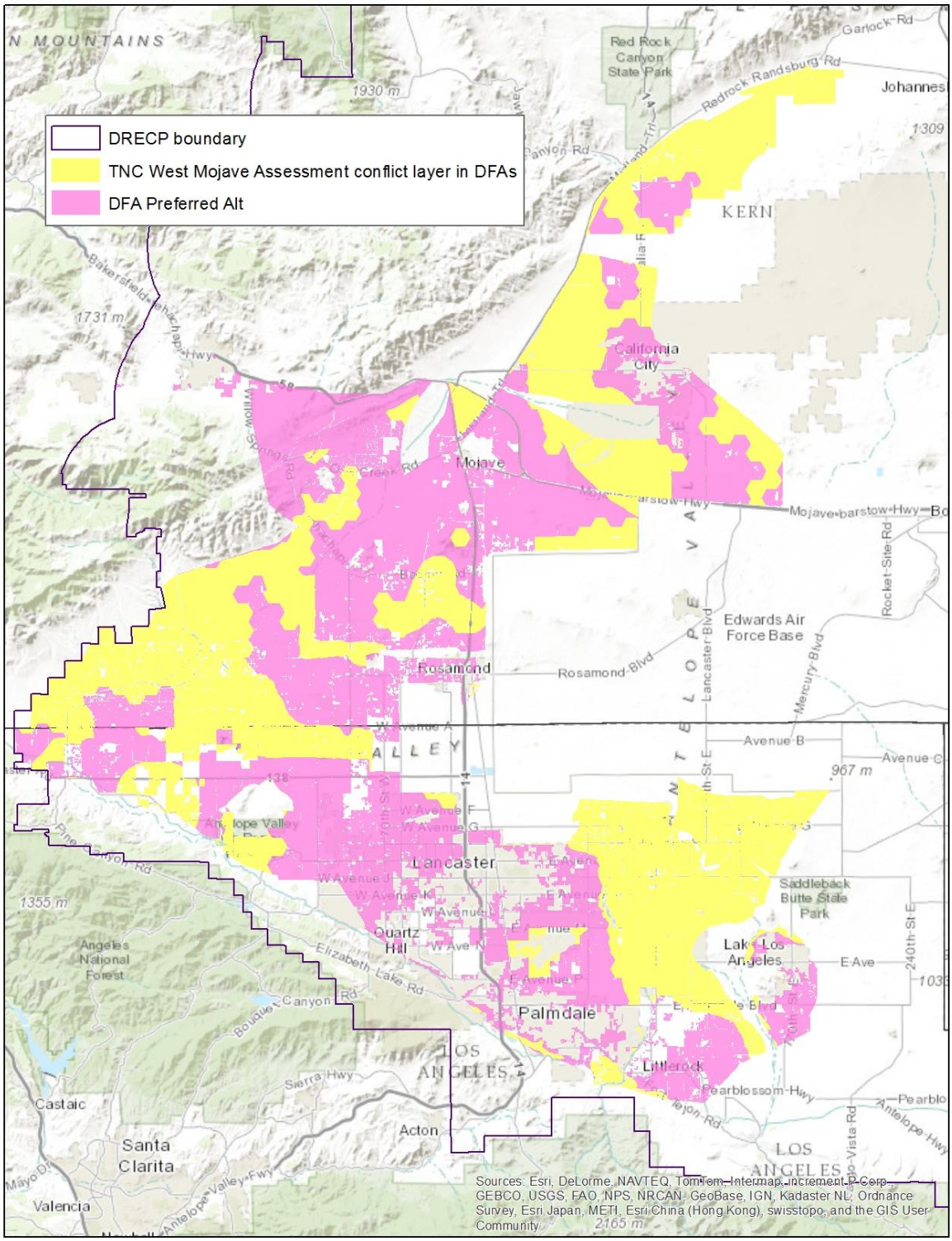

Figure 2. This shows suggested DFA refinements in the Antelope Valley based on information from TNC's West Mojave Assessment high conflict layer.

San Bernardino County: Much of the DFA acreage in San Bernardino County conflicts with Defenders' conflict layer. Specifically, there are important habitat linkages that provide overall desert connectivity that run through Apple and Lucerne Valleys. Also much of the land identified as DFA in San Bernardino County has been modeled as high terrestrial intactness and high conservation value. However, there are some areas that overlap with our biological and ecological conflict layer that we think would be appropriate for a DFA. Specifically, there are four areas where DFAs in San Bernardino County are appropriate from a biological and ecological perspective. Even though much of these DFAs overlap with our conflict layer, we believe that locating DFAs in these areas would not greatly impact species, their habitats or connectivity and would not be appropriate for development.

1) DFA west of I-15 near Victorville/Adelanto/Palmdale: There are previously disturbed lands in this area that are appropriate for renewable energy development. However, consideration of north-south and east-west connectivity is essential and there should be a linkage design through this DFA that fits into the broad picture for overall DRECP connectivity.
2) DFA near Harper Dry Lake/Lockhart area: Mojave solar project is under construction in this area and there are two other projects that have been operating for many years thus making this area an appropriate location for a DFA. Consideration of Mohave ground squirrel habitat and unusual plant assemblages is essential for any development in this region.
3) DFA surrounding Hinkley: Overall this area is more appropriate for development than others. There are modeled habitat linkages for tortoise that move through parts of this DFA that would require appropriate mitigation for impacts and there are also parts of this area that have been designated by BLM as unusual plant assemblages. Assuming implementation of CMAs in this DFA, we consider this an appropriate location for a DFA.
4) DFA triangle east of Barstow bordered by I-40 to the south and I-15 to the north extending east to Newbery Springs: This area, known as the "Dagget Triangle" is appropriate for designation as a DFA due to the presence of previously disturbed land, a solar power tower project that may require re-powering and access to existing transmission capacity.

The other DFAs in San Bernardino County should be heavily refined or removed due to conflicts with existing ACECs, tortoise habitat and important desert wildlife linkages that provide overall landscape integrity for the DRECP. Small acreage of land in Lucerne Valley does not overlap with Defenders' conflict area; however, the local community in this area has already identified lands appropriate for development in their community and thus should be consulted regarding the appropriate location for development in this area.

Riverside County: The main DFA is the Riverside East SEZ from the BLM's Solar Energy Program. A substantial portion of this DFA shows conflict with Defenders' biological and ecological layer. This DFA is located at a key transition point in the CA desert – between the Mojave and the Sonoran desert ecoregions, and provides habitat and connectivity for species such as desert tortoise, Mojave fringe-toed lizard and bighorn sheep. Additionally, this area is important for natural communities such as dry wash woodland (microphyll), sand dunes and the sand transport areas that support them. The main conflicts within this DFA are high terrestrial intactness and high conservation value and habitat connectivity for bighorn sheep and desert tortoise. In order to ensure the long-term viability of these important habitat connections and overall terrestrial intactness, this DFA should be refined by widening the proposed corridors through the DFA. Of particular concern in this DFA are the relatively dense and intact dry wash (microphyll) woodlands along the McCoy wash. There exist few stands of microphyll woodland of this density in the DRECP region and compensatory mitigation may not be an option. Thus, avoidance should be paramount to protecting this unique and important natural community and we do **not** recommend these areas for development.

In Figure 3 we provide specific recommendations for where the DFA should be refined based on analysis of important multi-species linkage areas and density of microphyll woodland.

1. South of Desert Center (Area marked 'A' in Figure 3): Though near already developed areas, extensive stands of microphyll woodlands will need to be destroyed in order to develop projects here. Some MW removal has already occurred. See aerial of inset box (next slide). Redesignate from DFA / SEZ to ACEC to conserve microphyll woodland habitat.
2. Chuckwalla Valley multi-species linkage & Palen Dunes (Area 'B' in Figure 3): This area has been identified as a linkage area between the Palen Mountains to the north and the Chuckwalla Mountains to the south for multiple species in the SC Wildlands desert linkage design. This area is also intermountain habitat for desert bighorn sheep. Additionally, microphyll woodlands bordering the Palen Wilderness Area, rare dune natural communities, a wetland community, and an Aeolian sand transport corridor are all present in this area, making it important to conserve. Much of this area should be redesignated from DFA and Solar Energy Zone ("SEZ") to ACEC.
3. McCoy to Mule Mountains multi-species habitat linkage and microphyll woodlands SW of McCoy Peak (Area 'C' in Figure 3): This area has been identified as a multi-species habitat linkage by SC Wildlands desert linkage. It is also bighorn sheep intermountain habitat. The area just south and west of McCoy peak has dense stands of microphyll woodland that would be difficult to avoid in project siting. Much of this linkage area should be redesignated from DFA/SEZ to ACEC.
4. McCoy Wash (Area 'D' in Figure 3): This area is dense with microphyll woodland, some but not all of which, has been mapped. There are additional stands of microphyll woodland in this area that were not mapped due to budget constraints for the 2013 vegetation mapping effort in this region. These additional stands of MW will require the 200 foot setback per

CMA# AM-PW-1. Additionally, the northern portion of this area is linkage habitat for desert tortoise as well as bighorn sheep.

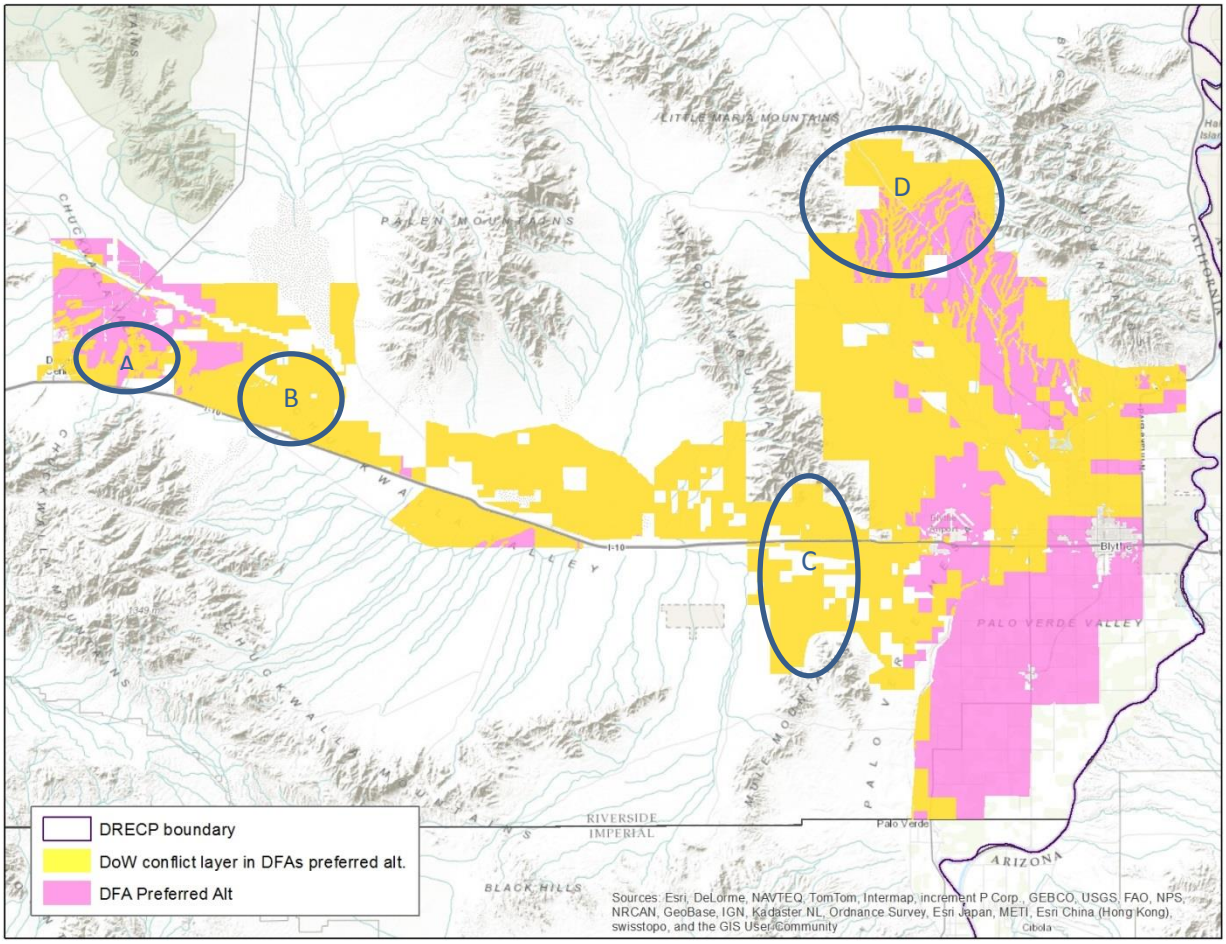

Figure 3. This map shows the Riverside East DFA/SEZ with Defenders' conflict layer and circles indicating areas that need to be refined based on the presence of microphyll woodlands and linkages for multiple species.

Imperial County: The majority of the identified conflicts are on the outskirts of the Imperial Valley where the desert lands have not been converted to agricultural production. However, many bird species use the lands within the agricultural complex and surrounding the Salton Sea as habitat for wintering and/or breeding. The clustering of solar projects in agricultural areas can cause the loss of foraging habitat used by burrowing owl and other sensitive migratory birds. This loss of habitat is particularly critical for the burrowing owl, which is a species of special concern in California. Imperial Valley supports the largest concentrated population of burrowing owls, located primarily within the agricultural portion of the valley. [32]Additional evaluation and more specific mitigation

[32] We encourage the DRECP to consider the map of known burrowing owl occurrence prepared by Audubon through a grant from the Imperial Valley Community Foundation.
http://audubon.maps.arcgis.com/apps/webappviewer/index.html?id=c42324d892f7448489e4bee6ae062e9d

measures should be identified for burrowing owl prior to designation of this area for solar development. Additionally, parts of the agricultural matrix near the Mexico have been identified as potential stable range for multiple bird species under climate change scenarios. We would like to note that while our analysis focused primarily on conflicts with biological and ecological resources, there are on-the-ground conflicts with loss of agricultural land that should be considered in the DRECP, and appropriately mitigated. We recommend the DRECP consider aligning this DFA with the map included in Imperial County's draft General Plan Element Renewable and Transmission Overlay, which, although it continues to allow geothermal on agricultural lands, focuses solar development away from higher-quality agricultural lands. This approach, which would still allow 2500 MW of solar to be developed in Imperial, would more fully address concerns from loss of agricultural lands.

In addition, the DRECP should encourage local mitigation plans within the DRECP area that could provide more specific mitigation measures and management strategies for biotic and abiotic resources in those areas. As an example, the inclusion of the Salton Sea Restoration and Renewable Energy Initiative, Imperial County Renewable Energy Plan and the Salton Sea Authority's revised restoration plan could all serve as a mitigation strategy for renewable energy development around the Salton Sea and exposed playa areas. These plans identify specific mitigation strategies for the development of wetland habitats and air quality mitigation in areas of the playa. It could also provide a potential funding mechanism through mitigation fees for development on the playa and potential revenue sharing of land owner revenue from the resource development.

3. <u>Special Assessment Areas ("SAA"), Future Assessment Areas ("FAA"), Variance Lands, and undesignated lands should be refined to be either DFA or protected conservation lands.</u>

The same biological and ecological resource conflict layer described above was used to suggest refinements, changes in designation, or elimination of Special Analysis Areas, Future Assessment Areas, DRECP Variance lands and undesignated lands.

Recommendation: Below we describe our suggested changes and provide accompanying maps to show their locations.

a) 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. Figure 4 shows where our biological values layer overlaps with undesignated areas. We recommend the agencies re-analyze the areas symbolized in red in Figure 4 and seriously consider including these areas in the conservation reserve design based upon their biological and ecological significance based on the data described above.

Specifically, we recommend the following areas become proposed conservation areas (ACEC and, or NLCS) and managed primarily for species conservation:

- Lands in Indian Wells Valley south of Bowman Road and extending to the El Paso Mountains
- Vegetated lands between Searles Dry Lake and China Lake Naval Air Weapons Station ("NAWS") boundary
- Cadiz Valley
- South and West of Needles to include the Sacramento Mountains
- Area between Whipple Mts. Wilderness and Chemehuevi Mts. Wilderness
- Area south of Whipple Mts. Wilderness (Vidal Valley)
- South of I-40 between Pisgah Crater and Rodman Mts. Wilderness
- Harper Dry Lake Playa

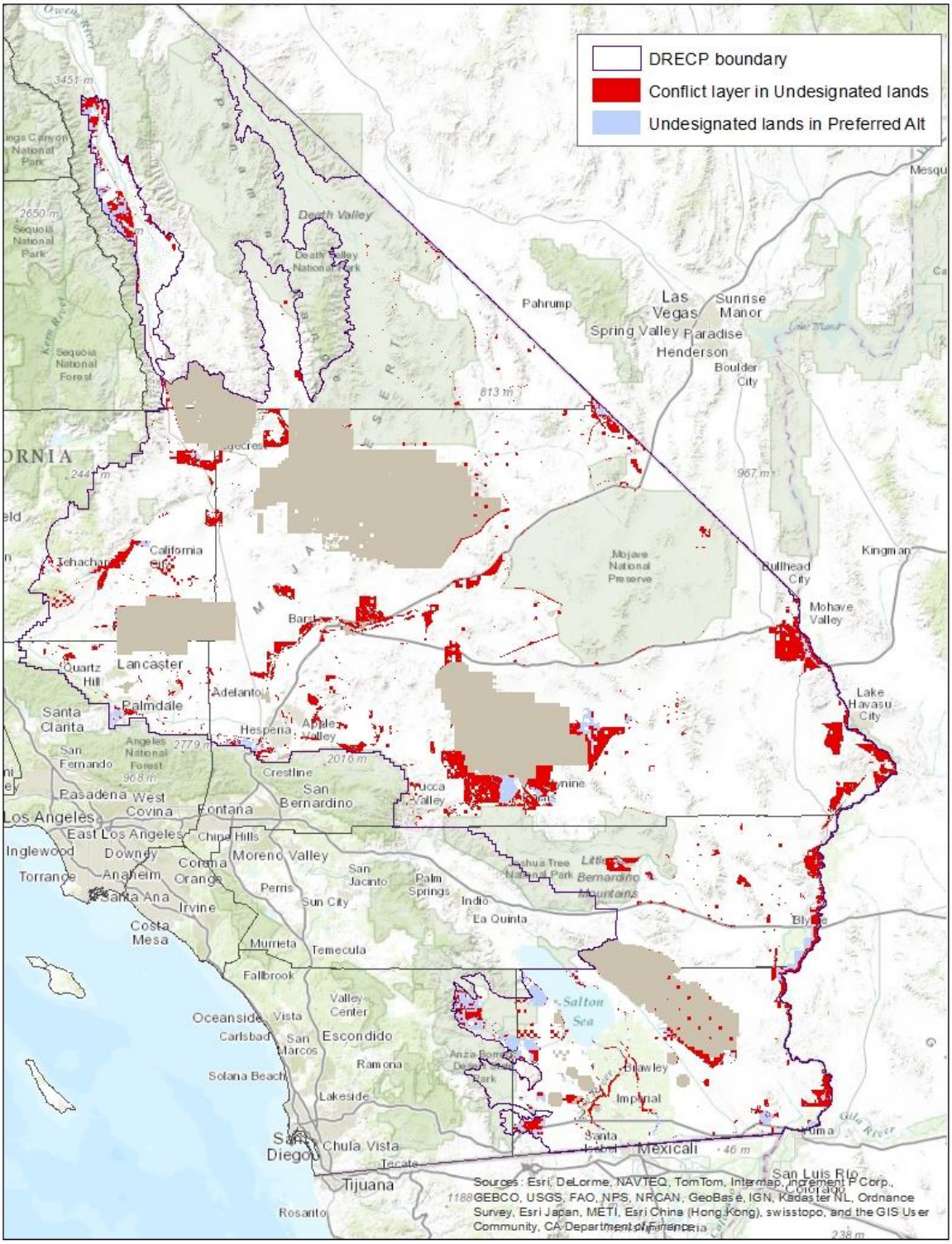

Figure 4. Biological and ecological resources within the undesignated lands are symbolized in red. We recommend further analysis in these areas to identify undesignated lands that should be in the DRECP reserve design.

b) Special Analysis Areas.

Our biological and ecological resource layer conflicts with both of the proposed special analysis areas in the DRECP. Therefore, we recommend that they both be removed and the lands identified for conservation as ACEC, NCL or conservation planning area.

- **Hwy. 395 Corridor**. A north-south block of public land west of Hwy. 395 and north of Kramer Junction that is currently within the MGS Conservation Area. The majority of these lands should be designated as part of the proposed MGS ACEC where Covered Activities and other incompatible uses would be prohibited, subject to a 1% develop limit. Additionally, this area is surrounded by Interagency conservation priority areas and DRECP NCCP Reserve. Creating a cut out for development into the plan-wide priority areas for conservation would undermine the value of the conservation investment in these priority areas. However, there are parcels of land in the southern portion of this SAA, outside of the proposed MGS ACEC, near the current Kramer Junction Solar Thermal power plant, that may be appropriate for renewable energy development.
- **Silurian Valley**. This undeveloped area north of the Hidden Hills Wilderness and south of Dumont Dunes is a known important area for several sensitive bats, is adjacent to an active golden eagle nesting territory in the Silurian Hills and is one of the known habitat linkages for the desert tortoise between the Western Mojave and Eastern Mojave Recovery Units. The entire valley is mapped as intermountain bighorn sheep habitat that provides for movements of animals between the Avawatz, Silurian Hills and Kingston Range.

c) Future Assessment Areas.

Almost all of the lands identified as future assessment areas conflict with our biological and ecological data layer. There is a small amount of acreage in the Cadiz Valley that does not conflict with our data layer but due to the limited transmission and the presence of sensitive lands surrounding the small acreage that does not conflict, we recommend that these areas be removed from consideration as well. Below is additional information on the future assessment areas supporting our recommendation to change these areas to either ACEC, NCL or conservation planning areas in the DRECP:

- Mountain Pass. This area is largely public land south of I-15 and immediately adjacent to the Mojave National Preserve. It is among the higher elevation areas in the plan area and is one of two key bighorn sheep habitat linkages across I-15 that connects herds occupying the Kingston and Clark Mountains. This area also supports unique plant species including old growth black brush.
- Eastern Imperial County. This area, although relatively small, is located south of the Algodones Dunes and is within the current eastern population boundary of the Flat-tailed horned lizard. Given the species is under consideration for listing under the CESA and the

interim protection during the status review of the species, any renewable energy development here would adversely impact the species. Thus, we recommend this area be removed and designated as part of the biological reserve as ACEC and, or NLCS land.

- Southern Sierra Nevada/Tehachapi Mountains. This large expanse of private and public lands is one of the known high-density golden eagle nesting and foraging areas and is within the expanding range areas of the California condor. A multitude of migratory birds use the area during the spring and fall seasons, including the willow flycatcher. Large migratory flocks of Turkey vultures pass through the area as well. The area already includes the North Sky River and Pine Tree wind farms which are known to have killed approximately 10 Golden eagles over the past several years. We recommend this area be designated as part of the biological reserve in the plan area and the private lands designated as a Conservation Planning Area.
- Northern Lucerne Valley. This area is adjacent to the Granite Mountains, known to support high densities of golden eagles and is likely important foraging habitat for golden eagles. This area is also important for overall desert connectivity necessary for species to adapt and respond to climate change.

d) DRECP variance lands.

The DRECP variance lands are a subset of the BLM Solar Program's variance lands and they have been refined and reduced in acreage substantially in the draft DRECP preferred alternative. However, there remain some variance lands that overlap with Defenders' biological and ecological conflict layer. Primarily these DRECP variance lands occur around Mesquite Lake and surround a culturally significant ACEC. We recommend the DRECP variance lands surrounding Mesquite Lake be removed.

4. Future Renewable Energy Technology Changes Need to be Addressed in the DRECP.

The following comments are based on information in Appendix F1 (Methods for MW Distribution). Proposed DFAs, Variance Lands and Special Analysis Areas are assumed to be available for development using all existing technologies (wind turbines, solar PV, solar thermal and geothermal), although in estimating MW generation the analysis in Appendix F1 does account for constraints on wind turbines and solar towers due to DOD conflicts. We recommend current and future technology constraints and opportunities in DFAs, Variance Lands and Special Analysis Areas be clearly identified so that the impact analysis is more realistic and accurate. Future constraints on technology may be further identified as each county completes their renewable energy elements to their general plans. For example, Inyo County's Draft Renewable Energy General Plan Amendment would prohibit any wind energy development county-wide, and Imperial County's Renewable Energy and Transmission Element will refine the areas available for renewable energy development other than geothermal. This is important, not just for identifying constraints and conflicts, but also for recognizing that many DFAs have fairly unique resources—such as geothermal in Imperial—and

that these values should be maximized and encouraged towards a more balanced mix of renewable energy.

There is ample evidence of the incompatibility of wind energy and solar towers as many of the plan areas frequented by migratory birds or are used by Golden eagles for nesting and foraging. For example, in the Basin and Range Subregion (page II.3-322), the Indian Wells Valley-Eastern Sierra-Rose Valley is identified as very important for bird migration – "Songbirds, shorebirds, and waterfowl pass through Indian Wells Valley and Rose Valley on their way to breeding grounds. The flyway has stop-over riparian and wetland habitat in the Sierra Nevada canyons and at Little Lake and Haiwee Reservoir. Riparian areas here provide important migratory stop-over habitat for the federally listed Least Bell's Vireo and Southwest Willow Flycatcher. This flyway also provides excellent habitat for Golden Eagles, Prairie Falcons, and other raptors, with nearby cliffs for nesting and the valley floor for foraging. Little Lake Watchable Wildlife Area, close to both water and cliffs, is an exceptional place to view swallows, raptors, and waterfowl."

Yet the draft plan proposes a large DFA in Rose Valley located within the above-described area, with no apparent constraints on the type of renewable energy technology. This calls into question the value of the plan to provide for constraints to ensure the protection covered species that are particularly vulnerable to the impacts associated with wind turbines and solar towers.

Recommendation: We recommend a thorough analysis of technology-compatibility relative to the Biological Goals and Objectives and elimination of those that would cause significant adverse impacts to Covered Species, Natural Communities and high quality scenic areas. There are clear examples of these impact issues associated with existing and proposed projects (e.g., North Sky River wind, Pine Tree wind, Ivanpah SEGS, Hidden Hills solar and Palen solar projects). These generation technology issues need to be avoided for the plan to be successful and achieve the stated Goals and Objectives.

5. Groundwater Impacts Must Be Considered in the DFAs.

TNC has submitted extensive comments on groundwater issues in the DRECP. We adopt and incorporate by reference those comments.

6. The DRECP Must Include the Additional Identified Key Areas in the Conservation Strategy/NCCP Reserve.

In addition to the areas already discussed above for inclusion into the NCCP Reserve, we would also like to recommend all areas currently being administered by BLM for conservation purposes in the California desert should be identified as part of the Interagency Conservation Priority Areas and DRECP NCCP reserve design. These lands include:

- All designated ACECs within the CDCA which protect a variety of resources.

- All designated Desert Wildlife Management Areas (DWMAs) within the CDCA which were designated to conserve the desert tortoise and its critical habitat with the intent that they be managed to support both survival and recovery of the desert tortoise.
- All BLM designated Conservation Areas for imperiled plants and wildlife. For example, the BLM designated the Mohave ground squirrel conservation area in the West Mojave Plan Amendments to the CDCA plan. The MGS conservation area was designated "to facilitate protective management for this species and serve to prevent further declines and assist the California Department of Fish and Game. A goal of the CDCA Plan is to prevent rare species from declining to the point of becoming federally listed as threatened or endangered." WEMO ROD at 15.
- All seeps, springs, wetlands and perennial riparian areas.

Additionally, we recommend that the DRECP agencies reanalyze the Unusual Plant Assemblages based on updated vegetation mapping information and designated as ACECs in the reserve design. Wildlife Habitat Management Areas should also be re-analyzed using the best available information on habitat connectivity for covered species and designated as ACECs in the reserve design.

The map in Figure 5 shows where existing conservation designations are located in relation to the DRECP NCCP reserve and the interagency conservation priority areas. These light green areas should be included as part of the NCCP reserve design and be included in the priority areas for durable conservation.

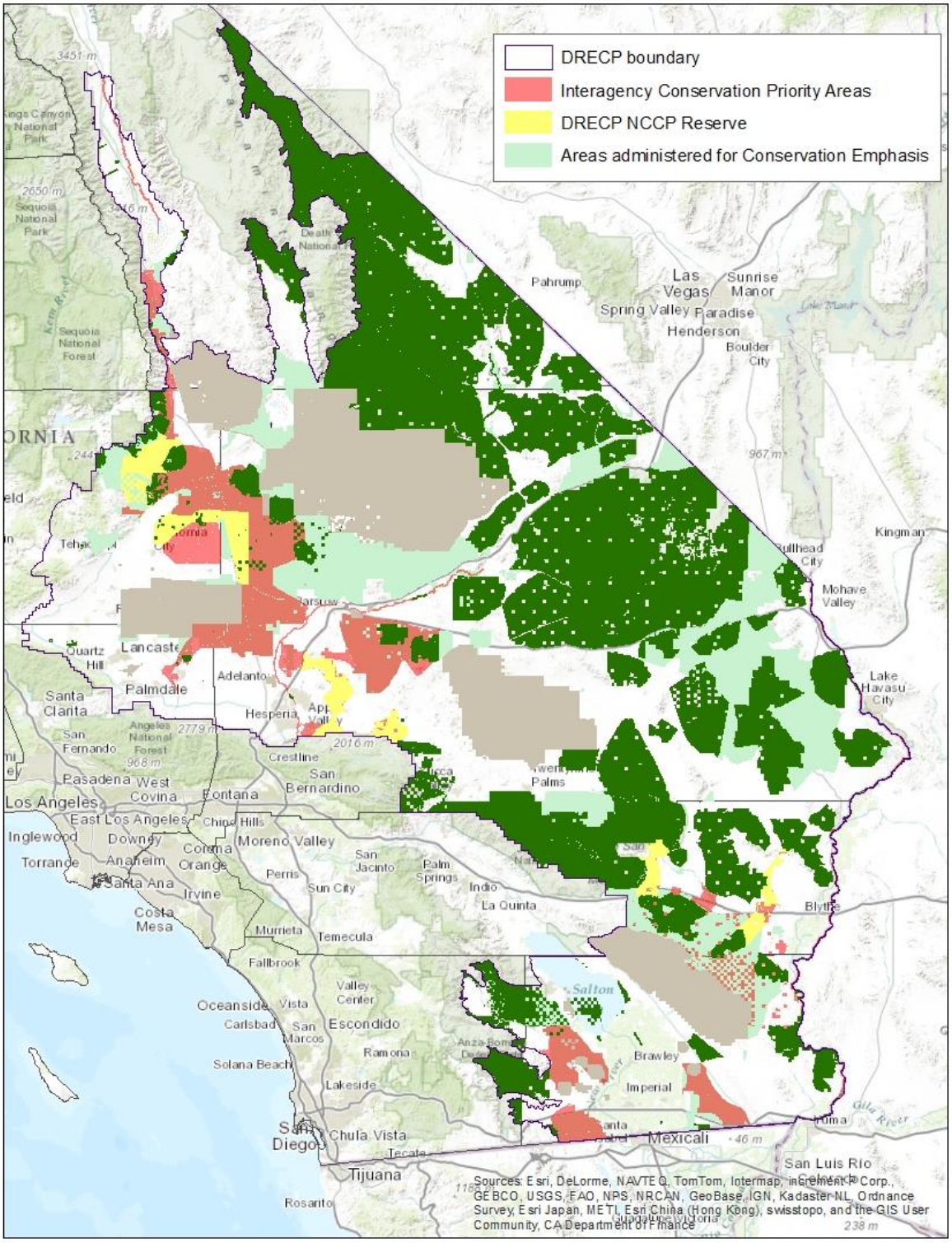

Figure 5. The light green represent areas that are currently being administered by BLM for conservation emphasis and should be included in the Interagency conservation priority areas (Conceptual NCCP reserve) and receive durable protective measures.

7. The DRECP May Need an Alternative State Endangered Species Permitting Framework.

The DRECP was conceived to be an NCCP under state law. As such, this plan is subject to rigorous conservation standards under the NCCP Act. As discussed above, the Draft DRECP fails to meet those standards due, in large part, to the complexity of this plan, the size of the planning area, the cost of implementation, difficulties in county implementation, a serious lack of funding, and a limited scope of the Covered Activities.

In the event that one or more of these problems becomes insurmountable, we would advocate that the DRECP Agencies look for an alternative state endangered species permitting approach instead of trying fit this "square" plan in the "round" NCCP hole. It has never been our intent that the DRECP undermine the fundamental and strong conservation standards in the state NCCP Act.

However, while this comment letter has detailed many changes that need to be made to a final DRECP, we do not want to lose the potentially significant conservation benefits associated with this plan if these NCCP issues cannot be resolved. For example, if the necessary improvements are made the DRECP Conservation Strategy, this strategy and reserve design should not be abandoned in the event that durability, implementation and/or funding issues cannot be adequately addressed to meet the NCCP Act standards.

Therefore, we urge the DRECP Agencies to work with us to formulate an alternative to the NCCP that would retain the overarching conservation strategy while providing for permitted take of covered species under the California Endangered Species Act ("CESA"). One approach could be that the DRECP Conservation Strategy could serve as a regional advanced mitigation program and guide future county specific NCCPs that would encompass more than renewable energy development. The DRECP could still provide CESA take for renewable energy projects while allowing for mitigation on public lands and an "in lieu" mitigation fee for developers. This concept is still under development, but could offer an alternative permitting pathway that retains the dual goals of the DRECP.

F. The DEIS/DEIR Must Be Revised to Comply with the California Environmental Quality Act ("CEQA") and National Environmental Policy Act ("NEPA") Requirements.

The fundamental purpose of CEQA and NEPA is to ensure that agencies consider, mitigate, and disclose to the public potentially significant adverse impacts on the environment before approving or implementing a project. Their requirements are not mere hoops to jump through, but are intended "to afford the fullest possible protection to the environment within the reasonable scope

of the statutory language." Friends of Mammoth v. Board of Supervisors, 8 Cal.3d 247, 259 (1972). As articulated by the legislature, CEQA is designed to prevent public agencies from approving projects if "feasible" alternatives or mitigation measures would substantially lessen the significant environmental effects." Pub. Res. Code § 21002. Another key goal is to inform decision-makers and the public about the potentially significant environmental effects of proposed projects. See, e.g., 14 Cal. Code Regs. §15002. Finally, CEQA and NEPA both require consideration of a reasonable range of alternative actions that might achieve similar goals with less environmental impact. See, e.g., 40 C.F.R. §1502.14. In several key respects, the DEIS/DEIR falls short of meeting CEQA/NEPA standards.

1. The DEIS/DEIR Must Revise the Baseline.

Both NEPA and CEQA require that the DRECP be analyzed against the existing environmental conditions (the "environmental baseline"), in order that the plan's environmental impacts can be meaningfully analyzed and compared to alternatives. 40 C.F.R. § 1502.15; CEQA Guidelines § 15125(a); see County of Amador v. El Dorado County Water Agency, 76 Cal.App.4th 931, 952 (1999); Neighbors for Smart Rail v. LA County Metropolitan Transit Authority, 57 Cal. 4th 310, 315 (2013). Under CEQA, the DEIR must "delineate environmental conditions prevailing absent the project, defining a 'baseline' against which predicated effects can be described and quantified." Neighbors for Smart Rail, 57 Cal.4th 439, 447 (2013) (citing Communities for a Better Environment v. South Coast Air Quality Dist., 48 Cal.4th 310, 315 (2010)). The purpose is to provide a "realistic baseline that will give the public and decision makers the most accurate picture practically possible of the project's likely effects." Neighbors for Smart Rail, 57 Cal.4th at 449 (citing Communities for a Better Environment, 48 Cal. 4th at 322, 325, 328).

The DRECP's Appendix Q provides an overview of the Biological Baseline. This component of the plan is one of the foundational documents that establish the condition and trend of covered species and natural communities in the plan area. It must account for the effects of all existing land uses which will be essential in disclosing the effects of the actions associated with each alternative on covered species and natural communities. Furthermore, this information will be essential in identifying conservation management actions needed to achieve the plan-wide biological goals and objectives. As currently written, Appendix Q does not adequately account for the condition and trend of these resources and, therefore, it has led to inadequate conservation management actions necessary to achieve plan goals. Below are comments on Section 6 of Appendix Q, the Anthropogenic Land Uses and Influences.

A. Section 6.4 Utilities and Infrastructure. The quantitative impacts of existing utilities and infrastructure, including facilitating the expansion of off-road vehicle use and access to remote and sensitive areas in the plan area is currently absent from the analysis. Such impacts affect certain species more than others, such as the desert tortoise, golden eagle and desert bighorn sheep, for example. The cumulative adverse impact of utilities and infrastructure, including its facilitation of greater off-road vehicle use, on covered species

and natural communities needs to be analyzed and incorporated into the baseline biology report.

B. Section 6.5 Livestock Grazing. The quantitative impacts of existing livestock grazing on covered species and natural communities in the plan area are currently missing from the analysis. In addition, the effects of this use of particularly vulnerable species such as the desert tortoise, Mohave ground squirrel and desert bighorn sheep, needs to be included. For the effects of livestock and livestock grazing on bighorn sheep, please see the Desert Bighorn Sheep Conservation Strategy. Particular attention to the effects of competition for space and forage resources is essential.

C. Section 6.8 Off-highway Vehicle Use. The quantitative impacts of existing off-highway vehicle use on covered species and natural communities are currently missing from the analysis. Particular attention to the impacts of this activity on desert tortoise, golden eagle and desert bighorn sheep is important.

Recommendation: Revise Appendix Q to include a quantitative analysis of the impacts of existing stressors on covered species and natural communities so that their current condition and trend in the plan area is known. Integrate this information into both the cumulative impact analysis for actions proposed in the plan alternatives as well as conservation management actions needed to achieve plan-wide biological goals and objectives.

2. No Action Alternative Must Be Revised.

The No Action Alternative suggests that all forms of renewable energy development are allowed over large expanses of the plan area when, in fact, solar and geothermal energy are more limited on public land. Figure II.2-1 shows lands available for renewable energy development under the No Action Alternative (pink-colored areas), but it fails to reveal that solar energy development is excluded from much of the area by the Solar PEIS ROD. The BLM Solar Energy Plan allowed for solar development only within Solar Energy Zones (approximately 158,000 acres) and in Variance Lands (approximately 200,000 acres) only if certain fairly stringent conditions are met. In addition, Figure II.2-1 should also indicate that geothermal energy development on public lands is limited to those areas specifically designated for such use under BLMs leasing program. Wind energy development is the only renewable energy activity potentially allowable on the full range of BLM-managed lands, but military activities have restricted such development over larger portions of the plan area due to impact on radar interference and some low-level flight areas within Military Operating Areas. Further, wind resources are insufficient over large expanses of the plan area to support commercial development and electricity generation. Such areas should be identified as non-viable even under the No Action Alternative. Additionally, the 'no action' alternative calls for a much-reduced amount of geothermal development as compared to the action alternatives, without supporting this rationale. Also, the 'no action' alternative assumes the rate of renewable energy development in the Plan area will continue, unfettered, at the pace to date, despite the absence of

the federal incentive programs such as the 30% federal investment tax credit (expiring at the end of 2016) and the ARRA 1603 t program, which in large part led to the earlier development.

a. Treatment of NLCS:

With regards to conservation, the no action alternative assumes no additional conservation other than existing conservation designations (including existing NLCS units), and any additional conservation which occurs through project-level mitigation. However, as discussed previously, the 2009 Omnibus Public Lands Management Act, referenced, in addition to specific lands within the CDCA, an additional class of lands unique to the CDCA that were included and described as the public lands managed by BLM for conservation purposes. BLM is proposing to use the DRECP as a mechanism to describe and designate these additional class of lands as NLCS through a LUPA. If the no action /no DRECP alternative went forward, the BLM would still be required to designate these lands, increasing the conservation within the no action alternative.

b. Treatment of WHMAs:

WHMAs exist throughout the CDCA portion of the plan area, designated by BLM in the 1980 CDCA Plan, and as amended many times during the 35 years since the plan was initially published. WHMAs are one of several conservation designations used by BLM to direct specific management goals, objectives and actions to specific areas. Under the draft plan, WHMAs are identified but not considered as existing conservation areas. We recommend that all WHMAs be recognized as conservation areas under the No Action Alternative. By policy, BLM does not allow WHMA management actions to override Multiple Use Class Guidelines of the CDCA Plan, thus exposing them to adverse impacts from a variety of multiple uses, but they do allow for further management constraints on multiple uses so that maintaining, protecting and enhancing wildlife habitats can be achieved under multiple use principles. There are several existing Wildlife Habitat Management Areas within the Riverside East SEZ where renewable energy projects have been authorized and many are pending.

3. <u>The DEIS/DEIR Must Be Revised to Adequately Analyze Cumulative Impacts</u>.

One of fundamental issues with the impact analysis is that it does not analyze the condition and trend of covered species and natural communities and the cumulative impact of non-covered activities such as mining, livestock grazing, pipelines, water diversions, groundwater pumping and off-road vehicle use. The effects of these activities and their role in shaping the environmental baseline and trend on covered species and natural communities and the cumulative impact of reasonably foreseeable development needs to be addressed. This will help define the necessary conservation management actions needed to achieve plan-wide biological goals and objectives.

4. <u>The DEIS/DEIR Must Be Revised to Adequately Analyze Biological Impacts.</u>

The NCCP Act requires that conservation actions under the plan be sufficient to recover listed species to the extent they no longer require protection under CESA. This is the same goal of the federal ESA as well as BLM management policy as per Manual 6840. The effect of the draft plan on listed species and their habitats, combined with their condition and trend (baseline), is not sufficiently disclosed. Most importantly, cumulative impact of the plan on state and federal listed species, federal critical habitat and legally protected species (e.g., golden eagle) needs to be disclosed and the degree to which the cumulative effects will contribute to, or retard the recovery of listed species and the viability of legally protected species.

5. The DEIS/DEIR Must Be Revised to Adequately Analyze Groundwater Impacts.

The plan area overlies numerous groundwater basins and, to the extent known, their condition and trend relative to water quality and quantity is reported. A substantial number of them are have unknown condition and trend. The sustainability of water quality and quantity, and recovery of basins with poor water quality and overdraft, is largely absent relative to proposed activities in DFAs. Furthermore, there are insufficient measures proposed to ensure that water quality and quantity goals and objectives will be achieved under the plan. In one proposed DFA, for example, the Rose Valley groundwater basin, the condition is reported as stable and that no water used to support renewable energy development. This is not the case here because beginning in 2009, pumping of large quantities of groundwater began to support geothermal power plants in the Coso Known Geothermal Resource Area both on Navy and public lands. To date approximately 15,000 acre-feet of groundwater has been pumped to support geothermal operations. In the DEIS for proposed geothermal leasing in Rose Valley (Haiwee Geothermal Leasing Project), BLM concluded that the existing groundwater pumping in Rose Valley was stressing the aquifer and no additional pumping could be sustained. Of particular importance in their analysis was the relationship of the groundwater to the naturally occurring wetland at Little Lake. However, the draft plan includes multiple alternatives in which a DFA would be designated overlying much of Rose Valley and there is no indication in the analysis how groundwater could be utilized without causing additional or cumulative impact to water quality and quantity including groundwater-dependent resources such as Little Lake wetlands and their associated species of flora and fauna.

The draft plan fails to recognize that the existing CDCA Plan includes management guidelines necessary to achieve management goals and objectives for groundwater. The draft plan simply states that goals and objectives for management of water resources are those associated with Standards and Guidelines for Livestock Grazing (see page II.3-402). The plan needs to account for existing management goals and guidelines for land use activities that may affect groundwater. These requirements from the CDCA Plan (Multiple Use Class Guidelines – Water Quality, page 15) are as follows:

- Limited Use Class Lands: Provide for the protection and enhancement of surface and groundwater resources except for instances of short-term degradation caused by water development projects.

- Moderate Use Class Lands: Minimize degradation of water resources.
- Controlled Use Class Lands: Maintain and enhance surface and groundwater.

Wilderness Areas: Federally reserved water rights were established for all BLM wilderness areas in the CDCA and the Mojave National Preserve under provisions of the California Desert Protection Act of 1994. These reserved water rights have not been fully quantified or inventoried, as special management is required to ensure these rights are not impacted by land use activities on both federal and non-federal lands.

Wild and Scenic Rivers: Wild and Scenic River segments in the CDCA have Instream Flow Rights as of the date of their designation by Congress, much the same as for designated wilderness areas. In the plan area, segments of the Amargosa River have been designated under the Wild and Scenic Rivers Act.

Public Water Reserve #107: PWR #107 was established under a 1926 Executive Order that withdrew and reserved water at springs and waterholes on public lands in sufficient quantity to meet the purpose of the withdrawal.

CMAs proposed for the management of water resources and specifically groundwater and groundwater-dependent features (see Draft DRECP at II.3-404 to 412) appear relatively thorough, but we are concerned that the complexity of the studies and research necessary to satisfy them will lead to a fallback solution of monitoring and adaptive management in the absence of definitive information. This could lead to unfortunate and unrecoverable impacts to these resources due to the long-timeframes needed for groundwater levels and dependent resources to recover from excessive use. By the time monitoring established that an unacceptable impact occurs, and an adaptive management plan is developed and implemented, the impacts would continue to occur, potentially for decades or centuries. It is highly likely that most groundwater in the CDCA is relatively old, some of which accumulated in basins during the pluvial period tens of thousands of years ago.

G. The DRECP Can Be An Opportunity to Better Integrate Transmission Development with Energy, Land Use, and Natural Resource Planning.

We incorporate by reference the letter submitted by Sierra Club, et. al., dated February 23, 2015, on the transmission aspects of the DRECP. (Attachment 6).

H. The DRECP Must Improve Its Consideration of Climate Change Issues.

Consideration of climate change impacts on species and their habitats in planning a conservation reserve for the DRECP is essential and will improve the effectiveness of the overall conservation planning approach. We are pleased to see that climate change is addressed in many of the plan-wide goals at the landscape, natural community and species level. We also agree that the Monitoring and Adaptive Management Plan for the DRECP should have a focus on monitoring and managing for

the impacts of climate change on drought, fire regimes, hydrology, natural communities and covered species. However, it is not clear what methodology was used to integrate the various climate models in Appendix P (Climate Change) into the reserve design planning process. We are also concerned that the DRECP, when implemented, will not achieve the Plan-Wide Biological Goals and Objectives related to climate change. The Step-down BGOs, which will be implemented by the DRECP, do not explicitly include goals and objectives related to climate change. Furthermore, we find the treatment of climate change in the CMAs and the MAMP to be vague and too general to allow for real response to the real impacts climate change will have on ecological processes, natural communities and covered species.

1. The DRECP must integrate climate change biology into reserve design planning.

It is unclear how the various climate change models outlined in Appendix P (Climate Change) were used in the planning process to develop the Reserve Design Envelope and the various step-down reserve designs for the NCCP. Simply including climate change considerations as a general reserve design principle is not sufficient documentation for how climate change biology informed the actual design of the conservation reserve within the DRECP.

Recommendation: Provide explicit and clear description of the methodology used to integrate the various climate change modeling outputs into the design of the Reserve Design Envelope and the various step-down NCCP reserve designs. For example, a map showing the various climate change elements (i.e. predicted stable range for driver species, elevational gradients, physical refugia, climate refugia, areas of slow climate velocity) within the Reserve Design Envelope is necessary to understand how the Reserve Design actually meets the various plan-wide goals related to climate change at the landscape, natural community and species level.

2. The DRECP must use the best available science to identify predicted stable range for covered species.

Fortunately, there is a growing body of research dedicated to understanding climate models and their impacts on bioclimatic variables that predict species habitats. We appreciate the description provided in Appendix P on Climate Change models and climate futures in the California deserts. Omitted from Appendix P is one of the most relevant pieces of research to the DRECP - a project funded by the California Energy Commission on the Cumulative Biological Impacts of Solar Energy Projects in the California Desert.[33] In Chapter 4 of this report, the authors looked at predicted species habitat ranges in historic and mid-century time periods using five alternative climate models assuming business as usual emission scenarios. The results of these models, publically available on Databasin[34],

[33] Davis F, Soong O, Stoms D, Dashiell S, Schloss C, Hannah L, Wilkinson W, Dingman J. 2015. Cumulative Biological Impacts Framework for Solar Energy Projects in the California Desert. California Energy Commission. Forthcoming.
[34] Animal species distribution models (2/2014): http://databasin.org/galleries/2ee6818fc9d5400da6fc27b6859af699

show predicted historic, current and mid-century ranges for covered species in the California desert. The data also shows the level of climate model agreement across the species ranges. We can have more confidence in areas where three or more climate models show agreement in predicted presence of species habitat.

Using this data, Defenders of Wildlife conducted an additional analysis to determine the location of species' predicted "stable ranges" – those areas where the current and mid-century predicted habitat overlaps. We looked specifically at the places where the three latest-generation (CMIP5) General Circulation Models (GCMs) showed agreement in predicted current and future species habitat. We looked at desert tortoise and Mohave ground squirrel predicted stable ranges individually. Additionally, we looked at areas where multiple covered species predicted stable ranges overlapped.

The results of this analysis show that many species predicted stable range is in the West Mojave (**Figure 6**). Overlap between species' predicted stable range and DFAs, SAAs, FAAs and DRECP variance lands primarily occurs in the West Mojave. This suggests that placing a heavy emphasis on land use conversion to solar energy in the West Mojave may further jeopardize species ability to withstand climate change.

We also looked at where species predicted stable ranges overlapped with the Interagency Conservation Priority Areas (or, the Conceptual NCCP Reserve Design) to identify places that should definitely remain a priority for conservation within the DRECP (**Figure 7**). Much of the Interagency conservation priority areas in the West Mojave show up as important predicted stable range for covered species. Additionally, the Interagency Conservation Priority areas identified in the Ord-Rodman ACEC and Johnson Valley seem to support predicted stable ranges for covered species.

Recommendation: This analysis is an example of the type of in-depth analysis that is required to meet the stated climate change goals at the landscape, natural community and species level. It is essential that detailed analysis be done to show how the proposed reserve design will conserve species under our current climate conditions as well as predicted future climate scenarios.

Plant species distribution models (2/2014):
http://databasin.org/galleries/f6344e81da864023a9fb550231fdcafc

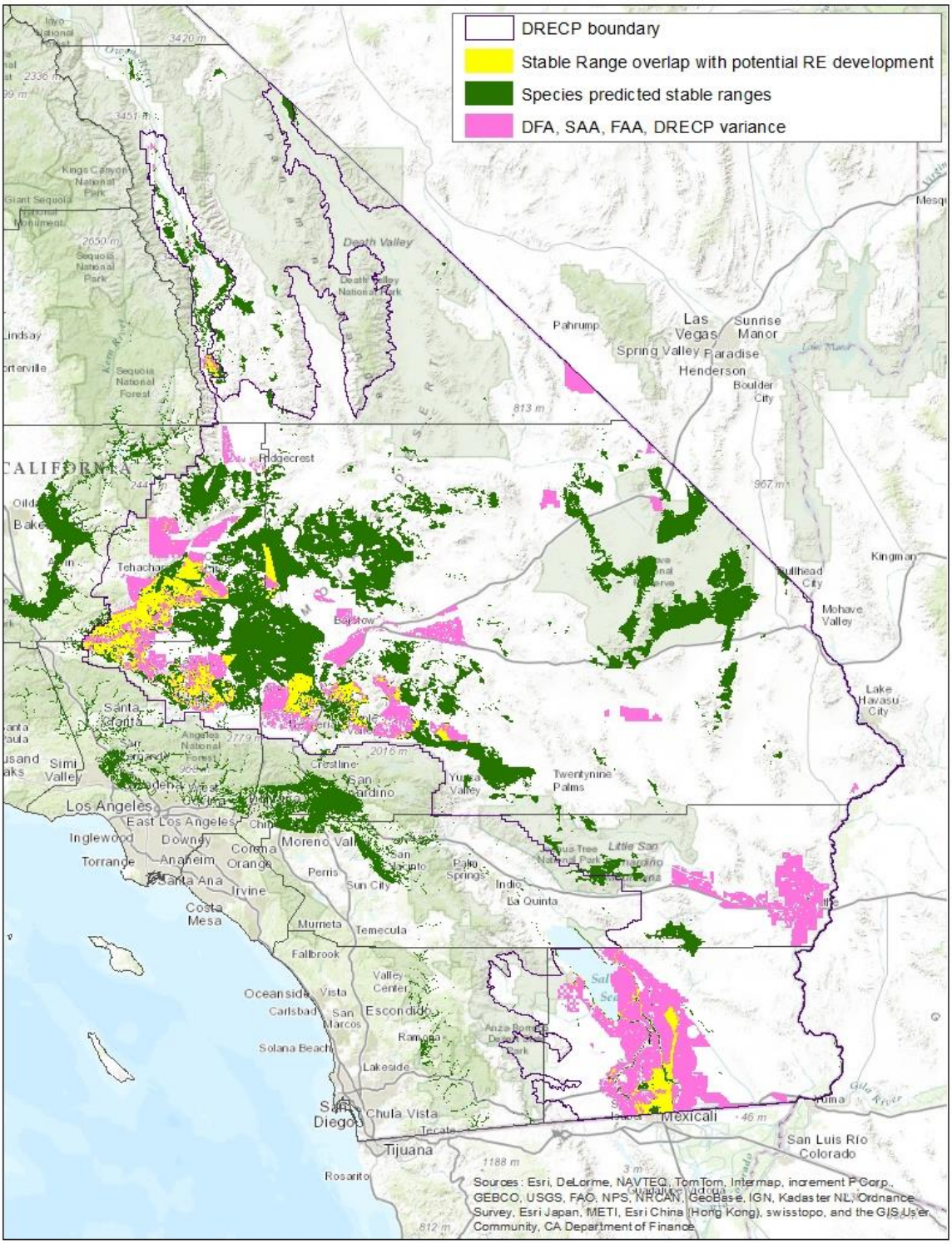

Figure 6. Species Predicted Stable Ranges overlap with DFAs and other potential development areas in the DRECP. Yellow indicates places where stable range overlaps with DFAs.

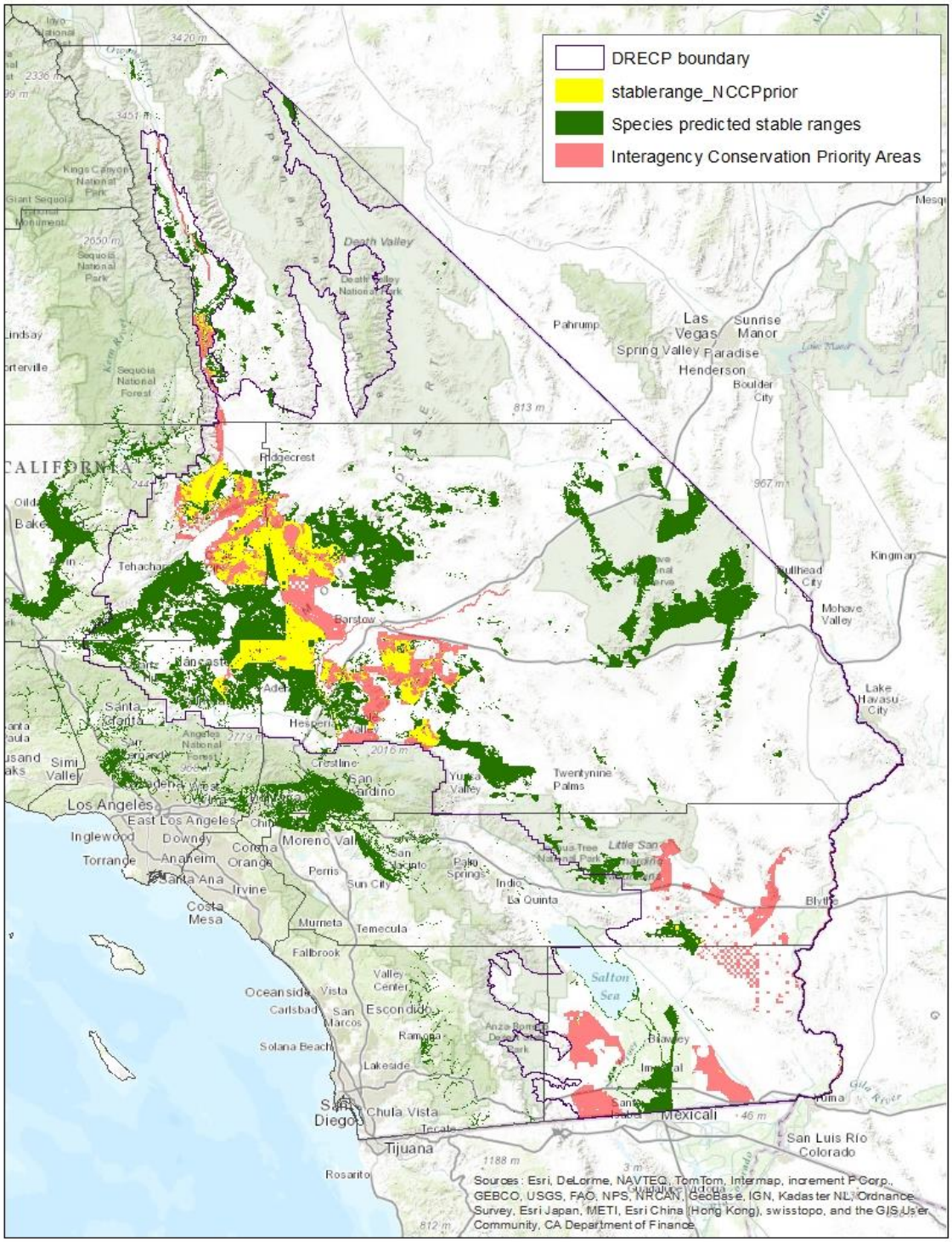

Figure 7. Yellow areas indicate where predicted species stable ranges and overlap with the "Interagency Conservation Priority Areas" or the "Conceptual NCCP Reserve Design" for the Preferred Alternative.

3. The DRECP must clarify how the Monitoring and Adaptive Management Plan will address climate change.

The MAMP for the Draft DRECP states that it is integral to addressing the biotic and abiotic effects of climate change that are anticipated to occur during the term of the DRECP and beyond, and that it will provide the framework for changing implementation approaches where needed. We support having a robust MAMP to accomplish this goal, but do not see in the Draft DRECP any detailed explanation for how the MAMP will do this. The MAMP needs to provide a detailed explanation listing which climate change indicators will be monitored and how information gained from monitoring will trigger changes in the implementation of the plan and/or the management of conservation reserve for the DRECP. The Draft DRECP discusses the potential impacts of climate change on the desert landscape, ecological processes, natural communities and covered species, but it does not address how these impacts will be monitored and managed to provide the necessary assurances for the long-term survival of covered species. The Draft DRECP is far too general with regards to monitoring impacts of climate change on prolonged drought, fire regimes and invasive grass species. Instead of providing detailed monitoring plans, the plan simply states that it will "monitor the occurrence" of these ecological processes.

Recommendation: The Draft DRECP must provide detailed description for how the DRECP will monitor the impacts of climate change on the desert landscape, ecological processes, natural communities and covered species. Which specific elements will be monitored and how? How will the DRECP incorporate and use this information to change implementation or management of the conservation reserve?

4. The DRECP must complete a more thorough impacts analysis of desert wildlife linkages.

Throughout the Draft DRECP, the importance of landscape connectivity and habitat linkages is mentioned with regard to their importance in the reserve design considering the impacts of climate change. Wildlife linkages support climate adaptation and provide opportunities for species to move to new areas that support a climate in which they can survive. We agree that landscape connectivity and habitat linkages are critical to ensuring species survival under climate change scenarios. However, the draft DRECP does not provide a thorough analysis of the existing habitat linkages and overall landscape connectivity. Considering the importance of habitat connectivity for adaptation to climate change, it is essential that all identified wildlife habitat linkages are avoided. If an identified linkage is impacted, the DRECP must provide justification and explanation for why this linkage was disrupted and how the overall landscape connectivity will remain intact.

Figure 8 below provides a spatial analysis of where the DFAs and other potential development areas proposed in the Preferred Alternative overlap with identified linkage networks – both SC Wildlands,

"A Desert Linkage"[35]; and USFWS Desert tortoise habitat linkages[36]. As is shown on the map, many of the proposed development areas overlap with these identified linkage areas, including Charleston View, Mountain Pass, Silurian Valley, Tehachapi to Edwards AFB, 395 corridor, Lucerne and Johnson Valleys and portions of the Riverside East SEZ.

Recommendation: The DRECP must provide an analysis of the impact this will have on overall desert connectivity and the ability of species to adapt and move in response to climate change.

[35] 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 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/.

[36] Averill-Murray, R.C., et al. (2013) *Conserving population linkages for the Mojave desert tortoise*. Herpetological Conservation and Biology 8(1):1-15.

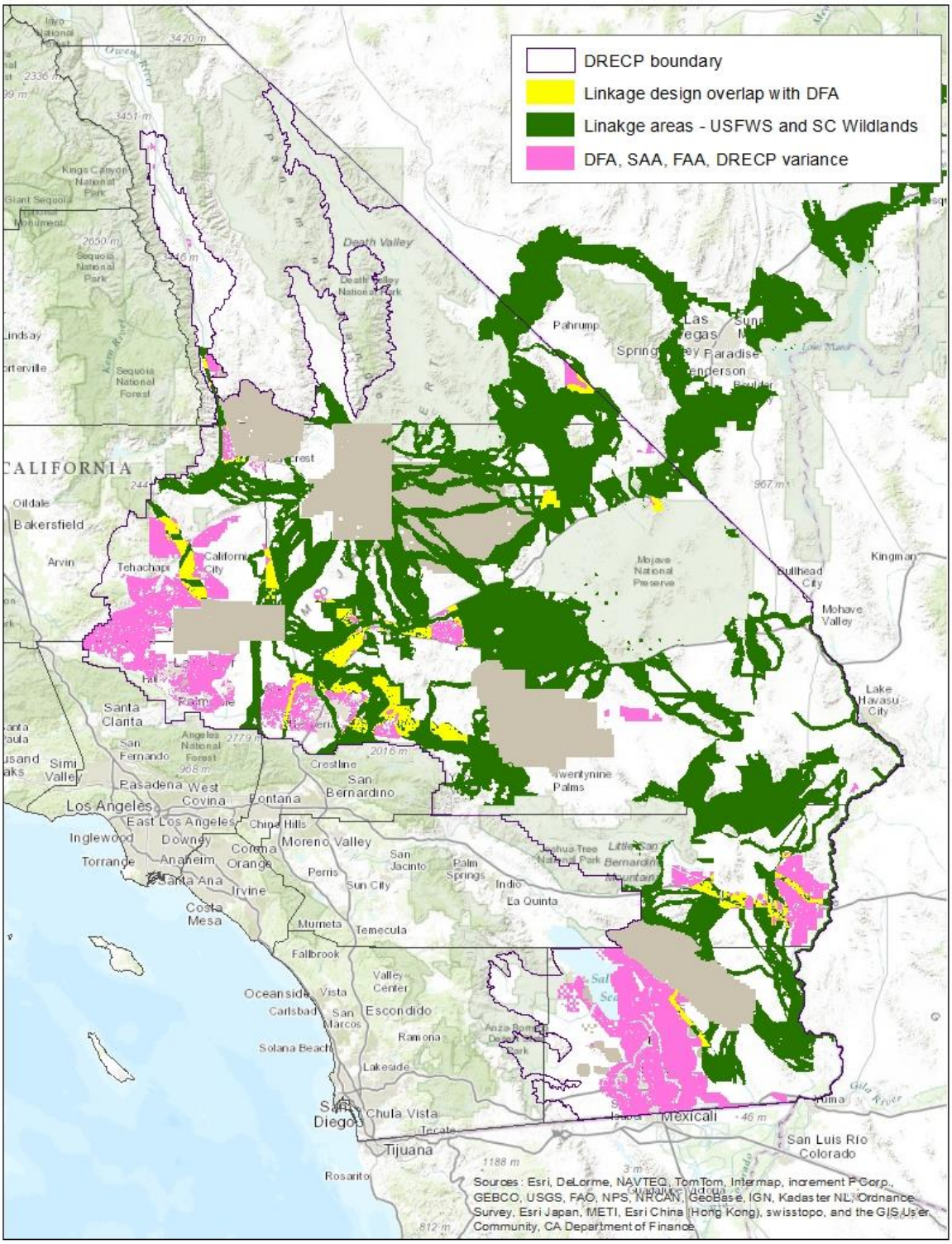

Figure 8. Yellow areas indicate where linkage designs are obstructed by potential development areas in the Preferred Alternative.

IV. CONCLUSION

We appreciate the work done by the DRECP Agencies to complete the Draft DRECP and make it available for public comment. We understand the complexity and challenges posed by a plan of this size and scope. We look forward to working with the DRECP Agencies to address the issues raised in this letter and complete a final DRECP that will promote sustainable renewable energy development while conserving our precious desert resources.

Sincerely,

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Appendices:

Appendix A. List of renewable energy projects in the DRECP area that are operational, permitted or under construction

Appendix B. The Nature Conservancy and Defenders of Wildlife methodology for setting quantitative BGOs

Appendix C. National Conservation Lands – Thank you list

Appendix D. National Conservation Lands – Wish list

Attachments:

Attachment 1: Defenders of Wildlife Wind and Solar Leasing Rule comment letter (December 16, 2014)

Attachment 2: A Conservation Plan for Desert Bighorn Sheep in California (February 2012 Draft)

Attachment 3: NGO DRECP Durability MOU comment letter (February 12, 2015)

Attachment 4: Letter to BLM Desert Advisory Committee from Lorelei Oviatt, Director, Planning and Community Development Department, Kern County (March 15, 2014)

Attachment 5: Memorandum from Director Dale Hall to Assistant Regional Directors, "Final General Conservation Plan Policy" (October 5, 2007)

Attachment 6: NGO DRECP Transmission comments (February 23, 2015)

Appendix A. List of Renewable energy projects operational, under construction or permitted

Solar			
Public Land			
Project Name	**MW**	**Acres**	**Date Permitted**
Blythe Solar Power Project	485	4138	Permitted 8/1/2014
Desert Harvest	150	1208	Permitted 3/13/2013
McCoy	750	7700	Permitted 3/13/2013
Ocotillo Sol	20	100	Permitted 4/7/2014
Stateline Solar Farm	300	1685	2/14/2014
Silver State South	250	2400	2/14/2014 NV project with 100% power delivery to CA Utilities
Arizona (private land)			
Agua Caliente Solar Project	290	2400	2011. AZ project will 100% power delivery to PG&E in CA
Kern County (private land)			
Project Name	**MW**	**Acres**	**Date Permitted/Status**
RE Columbia I	20	165	Permitted 12/6/2011
RE Columbia II	20	132	Permitted 12/6/2011
RE Columbia III	10	68	Permitted 12/6/2011
RE Great Lakes	5	40	Permitted 12/6/2011
RE Rio Grande	5	47	Permitted 12/6/2011
Beacon Solar	250	2320	Permitted 10/1/2012

Springbok Solar	500	2298	Permitted 3/27/2014
Los Angeles County (private land)			
Project Name	**MW**	**Acres**	**Date Permitted/Status**
Lancaster WAD	5	38	6/11/2014
Antelope Solar Greenworks	52	256	6/11/2014
Rutan	4	16 City of Lancaster	2013
West Antelope Solar Project	20	178	2/12/2014
Alpine Solar Project	92	800	3/30/2011
Antelope Valley Solar Project	650	1311 LA Co. 3592 Kern Co.	10/19/2011
Imperial County (private land)			
Project Name	**MW**	**Acres**	**Date Permitted/Status**
Campo Verde Solar Project	139	1443	Permitted 2013
Centinela Solar Project	275	2067	Permitted 12/2011
	150	1208	
Imperial Solar Energy Center South	200	947	Permitted 7/2011
Imperial Solar Energy Center West	250	1130	Permitted 8/2011
San Bernardino County (private land)			
Project Name	**MW**	**Acres**	**Date Permitted/Status**

Lightsource Renewables	40	350 (S. of Kramer Jct.)	2011
Boulevard Assoc.	20	191 (N. of Kramer Jct.)	2011
Silver Valley	20	105 (Newberry Springs)	2011
Solutions for Utilities I & II	2	22 (Newberry Springs)	2011
Soltech Solar	2	14 (Newberry Springs)	2011
Abengoa Mojave Solar	250	1765	2011
Watts	3	26 (El Mirage)	2012
Victor Dry Solar Farm	10	40	2013
LSR Kramer South	20	40	2013
Deep Creek Road Solar	2	20	2013
Avalon Solar	2	18 (Apple Valley)	2013
Total MW Solar	**5263**		
Wind			
Public Land			
Project Name	**MW**	**Acres**	**Status**
Alta East	153	1999 BLM 593 private	Permitted 5/24/2013
Ocotillo Express	315	12,436	Permitted 5/11/2012
Tule Wind	186	12,239	Permitted 4/10/2012
Kern County (private land)			
Project Name	**MW**	**Acres**	**Date**

			Permitted/Status
Pacific Wind Infill	151	8300	10/26/2010
Lower West Wind	14	185	7/12/2011
Jawbone/Rudnick	39	640	9/13/2011
Clearvista	20	226	9/13/2011
Morgan Hills	200	3604	10/25/2011
Catalina	200	7440	12/6/2011
Avalon	300	7369	12/11/2012
Addison	100	1325	5/13/2014
Rising Tree	150	4019	5/13/2014
Wind Stream Energy Repower	190	3000	2014
Difiwind VI Repower	1	487	2014
PdV (Manzana)	300	5280	7/29/2008
Total MW Wind	**2319**		
Geothermal			
Public Land			
Project Name	**MW**	**Acres**	**Date Permitted/Status**
Coso (Navy 1)	90		1987
Coso (Navy 2)	90		1989
Coso (BLM)	90		1988
Imperial County (private land)			
Heber Plant	52		1985
Heber II	51		1993

Heber South	14		2008
Del Ranch (Houch)	38		1989
JM Leathers	38		1990
Ormesa 1E	10		1988
Ormesa 1H	12		1989
Ormesa 1	44		1986
Ormesa 2	18		1987
Salton Sea Units 1-5	170		Operational beginning 1982-2000
Second Imperial			
Vulcan	35		1986
GEM Resources II	18		1989
GEM Resources III	18		1989
Del Ranch (Hoch)	38		1989
Sig C Binary	40		1993
Gould	10		2006
North Brawley	50		2009
CE Turbo	10		2000
Total MW Geothermal	**936**		
Grand Total MW	**8518**		

Appendix B. Recommended Quantitative Biological Goals and Objectives for Covered Species.

The table below shows the recommended quantitative BGOs for the 37 covered species. These were developed using the guidelines for Ecoregional Conservation Plans used by The Nature Conservancy, World Wildlife Fund and many other conservation organizations and government agencies in the United States and around the world. These guidelines are detailed in ***Drafting a Conservation Blueprint: A Practitioner's Guide to Planning for Biodiversity***, by Craig Groves (2003, Island Press, 457 pages)[1]. The information used gathered to determine the quantitative BGOs included:

1. Determine if the range of the species was widespread, limited, peripheral or endemic.
2. Determine if the species' distribution: large patch (>10,000 acres), small patch (1,000 acres), linear (riparian or along desert washes) or point (dependent on spring, seeps or unique soil types).
3. Determine species global and state rarity rankings according to the Natural Heritage Programs ranking system used by the California Natural Diversity DataBase (CNDDB), NatureServe, Nevada Heritage Program, and other state Heritage programs.
4. Determine whether each species was federal listed as Endangered (E), Threatened (T). If not, determine whether state-listed as threatened or endangered (S), or listed as candidate species (C) by USFWS or the State.

We used the following guidelines to recommend conservation goals for each species:

1. Widespread, large patch species with a significant portion of their range outside of the DRECP area were assigned a habitat protection objective of 25%.
2. Widespread, large patch or small patch species that have a large portion of their entire population within the DRECP area were assigned a habitat protection objective of 50%.
3. Widespread, small patch species that have a large portion of their range in the DRECP area and which are either documented as significantly declining in abundance or federally or state listed as Endangered or Threatened were assigned habitat protection objectives of 75%.
4. Widespread species known only from point locations (e.g. bat species with few known winter or maternal roost sites) were assigned habitat (roost site) protection objectives of 90%.
5. Species with Limited or Endemic Distributions, and which are known to have relatively few populations or relatively few individuals were assigned habitat protection objectives of 90%; those with even fewer populations or individuals were assigned goals of 95%.
6. Species endemic to the DRECP study area and with one known population were assigned a habitat protection objective of 100%.

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[1] The Nature Conservancy. 2000. Designing a Geography of Hope: Guidelines for Ecoregion-Based Conservation. Volumes I & II. (authors: Craig Groves, Laura Valutis, Diane Vosick, Betsy Neely, Kimberly Wheaton, Jerry Touval and Bruce Runnels). The Nature Conservancy, Arlington, VA.

The methodology for establishing biological goals and objectives should be evaluated and should be seen as the absolute minimum values to be used to express a hypothesis of what is needed to ensure the long-term viability of the species. Defenders of Wildlife proposed higher BGOs than those that resulted from using the guidelines above for seven species where we have either more expertise or greater programmatic focus. The species, the proposed goal changes, and the rationale for those goal changes are listed below.

1. Desert Tortoise
   Goal based on "Drafting a Conservation Blueprint" methodology: 50%
   Defenders of Wildlife proposed goal: 65%
   Rationale: Widespread Range, Large Patch Distribution, G4, S2, Threatened under ESA. Mojave desert tortoise population is in decline and requires recovery in addition to conservation. Habitat loss and fragmentation is one threat that can be addressed relatively simply through durable and enforceable habitat conservation. Other threats to this species are harder to address (drought, disease, climate change, predation).
2. Burrowing Owl
   Goal based on "Drafting a Conservation Blueprint" methodology: 25%
   Defenders of Wildlife proposed goal: 40%
   Rationale: Widespread Range, Large Patch Distribution, G5, S2, BLM Sensitive Species. Burrowing Owl population is in decline in its native habitat in California. The last stronghold for the species is in the agricultural matrix of Imperial Valley which lies within the DRECP are. While not a natural landscape, migratory Burrowing Owls from other regions depend on the Imperial Valley as their wintering grounds.
3. Golden Eagle
   Goal based on "Drafting a Conservation Blueprint" methodology: 25%
   Defenders of Wildlife proposed goal: 40%
   Rationale: Widespread Range, Large Patch Distribution, G5, S3, BLM Sensitive Species. Golden Eagles are heavily impacted by both wind and solar. Wind has direct impacts on Golden Eagles while solar results in loss of foraging habitat. Factors: Ongoing impacts to golden eagles in the plan area, the fact that many golden eagles migrate to the plan area from other regions, and their relatively low population density in the CA desert.
4. Swainson's Hawk
   Goal based on "Drafting a Conservation Blueprint" methodology: 25%
   Defenders of Wildlife proposed goal: 40%
   Rationale: Large Patch Distribution, G5, S2, Threatened. Swainson's Hawk are heavily impacted by both wind and solar. Wind has direct impacts on Swainson's Hawk while solar results in loss of foraging habitat.
5. Desert Pupfish
   Goal based on "Drafting a Conservation Blueprint" methodology: 95%
   Defenders of Wildlife proposed goal: 100%
   Rationale: Limited Range, Point Location, G1, S1, Endangered. Desert Pupfish are in decline

and live in a very limited range, dependent on groundwater resources. This species requires not only conservation but recovery.

6. Owen's pupfish
   Goal based on "Drafting a Conservation Blueprint" methodology: 95%
   Defenders of Wildlife proposed goal: 100%
   Rationale: Limited Range, Point Location, G1, S1, Endangered. Owen's Pupfish is highly endangered and in decline in its limited range. It is dependent on groundwater resources Similar to the Desert Pupfish, this species requires not only conservation but recovery.
7. Mohave ground squirrel
   Goal based on "Drafting a Conservation Blueprint" methodology: 90%
   Defenders of Wildlife proposed goal: 95%
   Rationale: Endemic, Large Patch Distribution, G2/G3, S2, Endangered. Mohave ground squirrel faces many threats in its endemic West Mojave habitat. The species is in decline due to a suite of synergistic threats. Similar to desert tortoise, habitat fragmentation and destruction is just one of many threats, but this can be relatively easily alleviated by setting aside intact habitats with durable and enforceable protection.

Table 1. Covered species for the DRECP with recommended quantitative BGOs represented as the percentage of the known habitat area necessary to ensure long-term viability of the species. * Indicates that the goal has been raised based on recommendations

Number	Species	Range	Distribution	G Rank	Status	Recommended Goal	Notes
1	*Gopherus agassizii* Desert Tortoise	Widespread	Large Patch	G4S2	T	65%*	Listed species, but ranging across four states (CA, NV, UT and AZ)
2	*Phrynosoma mcallii* Flat-tail horned lizard	Limited	Small Patch	G3S2	C	75%	2 ecoregions, recently listed, but declining due to habitat conversion
3	*Uma scoparia* Mojave fringed-toed lizard	Endemic	Small Patch	G3G4	C	75%	More populations than Flat-tail horned lizard, but only in Mojave ecoregion
4	*Batrachoseps stebbinsi* Tehachapi Slender Salamander	Endemic	Small Patch	G2S2	T	90%	Few populations and endemic to this portion of the Mojave ecoregion, so higher goal than Mojave fringed-toed lizard
5	*Toxostoma bendirei* Bendire's Thrasher	Limited	Large Patch	G4G5	S	35%	Found in 2 ecoregions, many populations, not imperilled
6	*Athene cunicularia* Burrowing Owl	Widespread	Large Patch	G5S2	S	40%*	Widespread in several ecoregions, sensitive to loss of agricultural habitat
7	*Laterallus jamaicensis coturniculus* California Black Rail	Limited	Linear	G4T1	T	75%	Found only in two ecoregions but not common in either, habitat is threatened by water use and drought
8	*Gymnogyps californianus* California Condor	Limited	Large Patch	G1S1	E	95%	Obviously imperiled and

Number	Species	Range	Distribution	G Rank	Status	Recommended Goal	Notes
							sensitive to disturbances throughout its range
9	*Melanerpes uropygialis* Gila Woodpecker	Limited	Small Patch	G5S1S2	E	50%	Many populations, secure, couple of ecoregions
10	*Aquila chrysaetos* Golden Eagle	Widespread	Large Patch	G5S3	S	40%*	Widespread in several ecoregions, sensitive to disturbance of breeding habitat and poaching
11	*Grus canadensis tabida* Greater Sandhill Crane	Widespread	Large Patch	G5T4	T	50%	Widespread in several ecoregions but significant number of population overwinters in CA
12	*Vireo bellii pusillus* Least Bell's Vireo	Widespread	Small Patch	G5T2	E	75%	Numerous populations, but declining and listed
13	*Charadrius montanus* Mountain Plover	Widespread	Small Patch	G2S2	C	50%	Widespread but significant amount of populations utilize Salton Sea and Antelope Valley
14	*Buteo swainsoni* Swainson's Hawk	Widespread	Large Patch	G5S2	T	40%*	Widespread species, declining but secure, ag habitats important
15	*Agelaius tricolor* Tricolored Blackbird	Endemic	Linear	G2G3S2	C	75%	Declining species, endemic, wetland habitats threatened in range
16	*Coccyzus americanus occidentalis* Western Yellow-Billed Cuckoo	Widespread	Linear	G5T3	E	50%	Widespread but declining and Western population recently listed, riparian habitat threatened by drought and water drawdown in CA
17	*Empidonax traillii*	Limited	Linear	G5T1	E	75%	Less widespread than

Number	Species	Range	Distribution	G Rank	Status	Recommended Goal	Notes
	(extimus) Southwestern Willow Flycatcher						Yellow-billed cuckoo, but more threatened in habitat type and sensitive to disturbances during breeding,
18	*Rallus longirostris yumanensis* Yuma Clapper Rail	Limited	Linear	G5T3	E	75%	Habitat type threatened by water overuse and drought in CA range
19	*Cyprinidon macularius* Desert Pupfish	Limited	Point location	G1S1	E	100%*	Highly threatened by drought and water overuse, few locations well known
20	*Siphateles bicolor mohavensis* Mohave Tui Chub	Endemic	Linear	G4T1	E	75%	Endemic to Mojave, more populations than Desert Pupfish, threatened by drought and water overuse.
21	*Cyprinodon radiosus* Owens Pupfish	Endemic	Point location	G1S1	E	100%*	Highly threatened by drought and water overuse, few locations well known
22	*Siphateles bicolor snyderi* Owens Tui Chub	Endemic	Linear	G4T1	E	75%	Endemic to Mojave, more populations than Desert Pupfish, threatened by drought and water overuse.
23	*Ovis canadensis nelsoni* Desert bighorn sheep	Widespread	Large Patch	G4T4	S	25%	Widespread species, not threatened
24	*Macrotus californicus* California leaf-nosed bat	Widespread	Point location	G4	S	90%	Maternal and winter roosting caves well known and easily protected for otherwise widespread species
25	*Xerospermophilus mohavensis* Mohave ground	Endemic	Large Patch	G2G3S2	E	95%*	Endemic to West Mojave, lots to be learned about population dynamics and

Number	Species	Range	Distribution	G Rank	Status	Recommended Goal	Notes
	squirrel						what constitutes appropriate habitat
26	*Antrozous pallidus* Pallid bat	Widespread	Point location	G5	S	75%	Maternal and winter roosting caves well known and easily protected for otherwise widespread species, more known populations than Townsend's or CA leaf-nosed bats
27	*Corynorhinus townsendii* Townsend's big-eared bat	Widespread	Point location	G3G4	S	90%	Maternal and winter roosting caves well known and easily protected for otherwise widespread species
28	*Calochortus striatus* Alkali mariposa lily	Endemic	Small Patch	G2S2	S	75%	Very few populations, not much known about ecological needs or trends, threatened by drought and water overuse
29	*Opuntia basilaris var. treleasei* Bakersfield cactus	Endemic	Small Patch	G5T1	E	90%	Highly threatened in known locations, declining and listed as endangered
30	*Eriophyllum mohavense* Barstow woolly sunflower	Endemic	Small Patch	G2S2	S	75%	Few populations, endemic, same status as Alkali Mariposa lily
31	*Cymopterus deserticola* Desert Cymopterus	Endemic	Small Patch	G2S2	CS	75%	Few populations, endemic, same status as Alkali Mariposa lily
32	*Gilia maculatus* Little San Bernardino Mountain Gilia	Endemic	Small Patch	G2S2	S	75%	Few populations, endemic, same status as Alkali Mariposa lily

Number	Species	Range	Distribution	G Rank	Status	Recommended Goal	Notes
33	*Mimulus mohavensis* Mojave monkeyflower	Endemic	Point location	G2S2	S	90%	Sparse distribution, known populations easily protected
34	*Hemizonia mohavensis* Mojave tarplant	Limited	Small Patch	G2G3S2	S	60%	In at least two ecoregions, so lower goal than Alkali Mariposa Lily
35	*Sidalcea covillei* Owens Valley checkerbloom	Endemic	Small Patch	?	S	75%	Little info on this species (not on NatureServe), so deferred to other rare plants to set goal
36	*Erigeron parishii* Parish's daisy	Endemic	Small Patch	G2S2	T	75%	Few populations, endemic, same status as Alkali Mariposa lily
37	*Astragalus tricarinatus* Triple-ribbed milkvetch	Endemic	Point location	G1S1	E	100%	Single known population, highly threatened

Appendix C. National Conservation Lands in the Preferred Alternative that Defenders supports

Afton Canyon
Amargosa River region
Amboy Crater
Ayres Rock
Big Morongo Canyon
Black Top Buttes/Mesa
California Valley
Chemehuevi Valley
Chicago Valley
Chuckwalla Bench region (including Chuckwalla and Little Chuckwalla Mountains)
Conglomerate Mesa
Dublin Hills
Fossil Falls
Indian Pass/Milpitas Wash
Inyo Mountains (eastern slope)
Little Cowhorn Valley
Middle Knob (near Tehachapi)
Mojave Trails/Rte. 66 (significant portions)
Panamint Valley
Patton Military Camps (are all protected?)
Rainbow Basin
Shadow Valley
Ship Mountains
Short Canyon
Silurian Valley (significant portions)
Trona Pinnacles
Upper McCoy Valley
White Mountains (eastern slope)/Cottonwood Creek
Whitewater Canyon

Appendix D. Additional places for National Conservation Lands designation in the DRECP

Active sand dunes
Avawatz Mountains (including "Bowling Alley")
Big Maria Mountains and surrounding flats
Bristol Lake (excluding mineral leasing and salt mining areas)
Cadiz Valley/Iron Mountains
Coso Range area (including Olancha Dunes - not including OHV area)
Danby Lake
Desert Tortoise Natural Area (ACEC)
Eagle Mountain
Existing critical habitat
Joshua tree woodland habitat
Lower Centennial Flat
Lucerne Valley wildlife linkages
Malpais Mesa (including northwestern Talc City Hills, Santa Rosa flat & Conglomerate Mesa)
Microphyll woodlands
Morongo Basin wildlife linkages
Mule Mountains
Orocopia Mountains area
Palen Lake
Pinto Mountains area
Pisgah Valley (ACEC)
Red Mountain
Riparian areas
Riverside Mountains area
Rodman Mountains area (lands abutting existing Wilderness)
Rose Valley/McCloud Flat (area in DFA)
Sacramento Mountains
Silurian Valley (including BLM Special Analysis Area and additional acreage)
Slate Range
Soda Mountains – south slope
Sperry Hills/Kingston Range
Tehachapi Mountains and Southern Sierras – areas of conservation interest
Valley Mountain
Vidal
Wildlife Linkages
Whipple Mountains area

Attachment 1: Defenders of Wildlife Wind and Solar Leasing Rule comment letter (December 16, 2014)

National Headquarters
1130 17th Street, N.W. | Washington, D.C. 20036-4604 | tel 202.682.9400 | fax 202.682.1331
www.defenders.org

December 16, 2014
Director (630) Bureau of Land Management
U.S. Department of the Interior
1849 C St. NW., Room 2134LM
Washington, DC 20240
Attn: 1004-AE24
Via *www.regulations.gov* (Docket ID BLM-2014-0002).

Re: Competitive Processes, Terms, and Conditions for Leasing Public Lands for Solar and Wind Energy Development and Technical Changes and Corrections (79 Fed Reg 59022)

Mr. Brady:

On behalf of Defenders of Wildlife, the Sierra Club, and the National Parks Conservation Association please accept and fully consider these comments regarding the Bureau of Land Management's (the Bureau or BLM) Proposed Rule on Competitive Processes, Terms, and Conditions for Leasing Public Lands for Solar and Wind Energy Development and Technical Changes and Corrections, Docket No. 1004-AE24 / 79 Fed. Reg. 59,022 – 59,085 (September 30. 2014) ("Proposed Rule"). The recommendations provided in our comments below will help ensure that this rule will effectively "facilitate responsible solar and wind energy development" through the "use of preferred areas for solar and wind energy development" that avoid and minimize impacts on wildlife and other natural resources. 79 Fed Reg. 59,022.

The public lands under the jurisdiction of the BLM are home to some of the most unique and sensitive resources in the United States, including some of the best habitat and corridors for imperiled wildlife species. These lands also offer substantial solar and wind resources to generate clean, renewable energy. As the Department of the Interior (the Department) moves forward with advancing the President's goal of permitting 20,000 megawatts of renewable energy on our public lands by 2020, the Department and BLM should continue to advance policies that embrace a landscape-scale approach to effectively direct development to locations on the public lands that reduce the likelihood of conflict between renewable energy development and conservation objectives.

Critical to a successful landscape approach is ensuring that renewable energy project planning and development is informed by the energy development and conservation goals and objectives for a particular landscape. Adopting a landscape approach allows public land agencies, energy developers, and other stakeholders to identify upfront strategies to: (1) avoid development in priority areas including crucial wildlife habitats and corridors; (2) direct development to, and incentivize development in, areas with excellent renewable energy resources and the lowest possible conflicts with conservation values; (3) minimize impacts on-site through project-specific best management practices; and (4) when

remaining unavoidable impacts warrant mitigation, off-set impacts with effective and durable off-site, compensatory mitigation that advances specific and measurable conservation goals for the identified landscape by protecting, restoring and improving management of priority areas.

The proposed regulatory amendments provide a foundation for implementing a landscape-scale approach to affirmatively direct development to lands most suitable for wind and solar development "based on a high potential for energy development and lesser resource impacts." 79 Fed. Reg. 59,034. This approach is consistent with direction in the Federal Land Policy and Management Act (FLPMA) that the BLM make management decisions based on "a combination of balanced and diverse resource uses that takes into account the long term needs of future generations for renewable and non-renewable resources."[1]

I. Definition of a Designated Leasing Areas

In an effort to "facilitate responsible solar and wind energy development and to receive fair market value for such development" the BLM's proposed rule looks to "promote the use of preferred areas for solar and wind energy development and establish competitive processes, terms, and conditions (including rental and bonding requirements) for solar and wind energy development rights-of-way both inside and outside these preferred areas." 79 Fed. Reg. 59,022. These preferred areas would be called "designated leasing areas" (DLA).

The proposed rule's definition of DLA is inconsistent throughout the document. We have provided several examples of this inconsistency below:

> 79 Fed Reg. 59,024: "The proposed 43 CFR 2801.5 would define 'designated leasing area' as a parcel of land with specific boundaries identified by the BLM land-use planning process as being a preferred location, conducted through a landscape-scale approach, for solar or wind energy where a competitive process must be undertaken." [emphasis added]
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> 79 Fed. Reg. 59,030: Section IV General Discussion defines " 'designated leasing area' as a parcel of land with specific boundaries identified by the BLM land use planning process as being a preferred location for solar or wind energy development that must be leased competitively." The section goes on to read "[s]imilar to right-of-way corridors, designated leasing areas would be identified as appropriate area for development while minimizing cultural and environmental impacts through avoidance, minimization, and compensatory mitigation." [emphasis added]
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> 79 Fed. Reg. 59,032: Section IV. General Discussion, Section-by-Section Analysis for Part 2800, the following definition is provided: "'Designated leasing area' is a new term that means a parcel of land which specific boundaries identified by the BLM's land use plan process as being an area (e.g., SEZ) established, conducted through a landscape-scale

[1] 43 CFR § 1601(i).

approach, for the leasing of public lands for solar or wind energy development via a competitive offer."

79 Fed. Reg. 59,034: "The BLM would identify designated leasing areas as preferred areas for solar or wind energy development, based on a high potential for energy development and lesser resource impacts."

79 Fed. Reg. 59,065: The proposed regulatory text for 2801.5 provides the following definition of a DLA: "a parcel of land with specific boundaries identified by the BLM land use planning process as being a preferred location for solar or wind energy development that must be leased competitively."

The BLM should utilize one consistent definition that ensures that DLAs represent areas of "lesser resource impacts" for solar and wind energy development projects. In addition, we recommend that BLM provide a definition for the term "preferred location" in the regulatory text. This addition would provide clarity with respect to the areas where we want to devote BLM resources and direct renewable energy through financial and other incentives.

We recommend the BLM utilize the following proposed definitions for DLAs and Preferred Locations respectively:

43 CFR 2801.5 would define "'designated leasing area' as a parcel or several contiguous parcels of land with specific boundaries identified by the BLM land-use planning process as being a Preferred Location for solar or wind energy development where a competitive process must be undertaken."

43 CFR 2801.5 would define a "'Preferred Location' as a least conflict area identified through a landscape-scale approach that represents high potential value for wind or solar energy development and avoids, minimizes, and effectively compensates impacts on cultural and environmental resources."

A. <u>Application to existing Solar and Wind policies</u>

a. The Leasing Rule Must be Consistent with Solar Energy Program

The concept of preferred locations for development is consistent with the zone-based approach adopted in the BLMs Western Solar Energy Program, and in the preamble, the BLM asserts that "designation of SEZs…provides the foundation for initiating a Bureau-motion competitive process for offering lands for solar energy development within the SEZs." 79 Fed. Reg. 59,022.

In October 2012, the BLM finalized more than four years of work to establish a coherent set of policies governing large-scale solar energy development on the public lands when it signed a Record of Decision

(ROD) formally establishing a new western solar plan.[2] The ROD describes the Interior Department's decisions regarding utility-scale solar energy development on BLM-administered lands in six southwestern states. The ROD documents the BLM's decisions, which consist of land use plan amendments that establish the foundation for a comprehensive Solar Energy Program. In addition, although the BLM had existing guidance for solar energy, the ROD also describes updated and revised BLM policies and procedures related to solar energy development on public lands.

The ROD states, "[t]hese policies and procedures provide internal administrative guidance to the BLM regarding the processing of Right of Way (ROW) applications for utility-scale solar energy projects."[3] The proposed action and alternatives, including both land use decisions and policies, were evaluated through the preparation of the *Final Programmatic Environmental Impact Statement for Solar Energy Development in Six Southwestern States* (Solar PEIS).

It is incumbent on the BLM to ensure that the proposed regulatory changes support the policies adopted in the Solar PEIS and Record of Decision. In particular, to ensure consistency with the Solar Energy Program, the rule should establish a framework that ensures:

- Solar Energy Zone development is prioritized over applications on variance lands;
- Regional Mitigation Strategies for solar DLAs should be completed prior to an offer of competitive interest; and
- All future utility-scale solar energy development must be in conformance with the exclusions adopted through the ROD (*see* Tables A-1 and A-2) and the associated land use plan amendments.

b. Uncertain Application to Wind Energy Development

As noted in the proposed rule, wind energy is not currently using the same approach as solar, though "similar efforts could be initiated by the BLM for designated wind development areas that may be identified in the future." 79 Fed. Reg. 59,022.

First, BLM should provide more clarity regarding the general framework it will employ when identifying DLAs for wind development. The Wind PEIS' primary objective was to identify lands to be excluded from land development and provides no analysis to support the designation of preferred locations for wind development that would be suitable for DLAs. Furthermore, the Wind PEIS explicitly states that "[n]one of the proposed amendments [to the 52 BLM land use plans assessed in the PEIS] address designation of lands for competitive ROW bidding processes."[4]

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[2] U.S. Dep't of the Interior Bureau of Land Management, *Approved Resource Management Plan Amendments/Record of Decision (ROD) for Solar Energy Development in Six Southwestern States* (October 2012) [herein ROD]

[3] ROD at 1.

[4] U.S. Dep't of the Interior Bureau of Land Management, *Final Programmatic Environmental Impact Statement on Wind Energy Development on BLM-Administered Lands in the Western United States,* ES 3 (Volume 1) (June 2005).

In addition, the preamble and proposed regulatory text fails to reference the U.S Fish and Wildlife Service's (FWS) land-based Wind Energy Guidelines (WEG).[5] FWS' WEG is a valuable tool that provides useful guidance for siting and operating wind energy facilities to avoid and minimize wind wildlife conflict. It is the result of a collaborative effort among FWS, developers, conservation organizations, and third party scientists. The tiered approach adopted in the WEG provides a scientifically-based decision framework for collecting information in increasing detail to evaluate risk and make siting and operational decisions. As such, we recommend that any framework for identifying DLAs incorporate the WEG's approach for identifying low wind-wildlife conflict areas.

B. Features of DLAs

a. Criteria For Identifying DLAs

No details are provided in the draft regulation about what criteria will be used to identify a designated leasing area. The draft directs the reader to Section 2802.11 for factors the BLM will consider when determining which lands may be suitable for right-of-way corridors or designated leasing areas: "The BLM may determine locations and boundaries of right-of-way corridors or designated leasing areas during the land use planning process" and "when determining which lands may be suitable…the factors the BLM considers include…(3) physical effects and constraints on corridor placement or leasing areas due to geology, hydrology, meteorology, soil, or land forms."43 CFR 2802.11(a) & (b)(3).

For utility-scale solar, the BLM adopted the following criteria for solar energy zones: "SEZs should be relatively large areas that provide highly suitable locations for utility-scale solar development: locations where solar development is economically and technically feasible, where there is good potential for connecting new electricity-generating plants to the transmission distribution system, and where there is generally low resource conflict."[6]

For wind energy development on the public lands, no such criterion is established and often data is not available at the appropriate scale. While we support the concept of directed development for wind, we believe it will be difficult for BLM to adequately identify preferred areas for wind development that will garner adequate interest from developers under a framework similar to BLM's Solar Energy Program. Avoiding and minimizing wildlife impacts from wind has been particularly challenging because we do not have a good understanding of the relationship between pre-construction activity and post-construction impacts, particularly with respect to bird and bat collisions. In addition, as demonstrated by FWS' land-based WEG, understanding potential conflicts at a site often requires multiple years of pre-construction monitoring to identify potential risk factors based on seasonal use landscape-scale factors that may attract raptors, bats, and other migratory birds. Impacts to avian species can vary intensely over a relatively small geographic area, making it difficult to identify broad swaths of land as low-impact.

b. Tailored DLA strategy for wind energy development

[5] U.S. Fish & Wildlife Service, *Land-Based Wind Energy Guidelines* (March 23, 2012) (*available at* http://www.fws.gov/windenergy/docs/WEG_final.pdf).
[6] Solar PEIS at ES-7.

We encourage BLM to think thoughtfully about what DLAs may mean for wind and how this may differ from "solar zones." Wind is a very different technology than solar and most wind development currently occurs on private lands. Siting wind turbines is a very site-specific endeavor. Development typically occurs based on a two-step process. Wind developers first conduct intensive site testing before committing to develop a project. Wind resources can be much more variable across a geographic area than solar, and developers complete a significant amount of meteorological due diligence to identify wind speeds at various hub heights at different locations to maximize the efficiency and output of facilities. As such, viable project areas are identified based on fine-scaled meteorological data; mapped wind classes alone do not provide data, and therefore, the scale necessary to entice serious development interest. Hence, unless BLM gathers this detailed information (which can be incredibly costly and time-consuming), we question whether a DLA auction would be successful under the proposed framework.

Additionally, wind technology is rapidly changing, opening up lower class wind sites for profitable development. Collectively these circumstances make identifying DLAs for wind incredibly difficult and resource intensive at this time.

Accordingly, we believe BLM needs an innovative and tailored solution for directing and incentivizing least-conflict wind development. We believe that the leasing rule should adopt a different strategy for wind development in DLAs to accommodate for the siting differences and provide wind developers with adequate incentives for least conflict development.

Specifically, we recommend that BLM retain the discretion to structure the DLA-leasing process for wind in accordance with the two-phased wind development approach discussed above. Phase I would consist of a competitive leasing process only for the authorization to conduct short-term site-specific testing in DLAs—rather than auctioning the actual lease for development. Under the proposed regulation, these ROWs would be generally consistent with those contemplated under proposed 2806.68 "Rent for Wind Energy development testing grant(s)." Note this competitive process would only be mandatory for testing grants or leases within areas that meet the definition of DLAs, and as such, must have been identified through the land use planning process as Preferred Locations for wind development using a landscape approach.

The successful bidder in the Phase I competitive process would then be granted a ROW to pursue site specific testing. This ROW would specify the areas for site testing, include certain conditions and provisions for acceptable testing practices, and limit the length of the testing period. The ROW should also include a requirement for the proponent to conduct site specific wildlife and other on-the ground natural resource surveys concurrently with wind testing to facilitate future environmental review should the developer want to eventually proceed to the second phase. This is very important as sensitive avian species may require long surveys to determine site use.

The bonus bid paid in the competitive auction for the permit to conduct such site-specific testing should generally be proportional to the probability of identifying sufficient low-conflict wind resources at the site. If the probability of commercial resource discovery is high, we anticipate that the bonus payment

will be high based on market demand. The project proponent would also be subject to a ROW rental fee commensurate with the nature and level of use during the testing period.

The second phase would relate to the lease for the actual project development. It would begin after the site-specific testing is completed, should the developer be interested in pursuing wind energy development on the site based on the results of the Phase I testing. During Phase II, the developer would make the results of their site testing, and environmental resource assessments publicly available in exchange for a *preferred right* to enter into a lease. Note that this preferred right would not guarantee lease issuance. Prior to authorizing any project development at the site, BLM would complete an environmental analysis of the proposed project's potential impacts based on the site specific environmental assessments completed by the developer and other best available science in compliance with the National Environmental Policy Act ("NEPA").[7] Hence, BLM should retain discretion to deny a lease under this approach should the natural resource studies indicate site specific impacts are greater than anticipated. We believe this discretion is incredibly important given the site specific data needed to assess potential wind-wildlife risk as described above.

This preferred right could take many forms. It could represent a non-competitive right of first refusal. It could also represent a discount for the bonus bid to compensate the developer for the costs incurred during the site testing phase should BLM want to initiate a second competitive process for the long-term development lease. However, if site specific data confirms that the area represents a Preferred Location for wind development, the developer would qualify for a lease which includes terms and conditions consistent with those contemplated for DLAs in the proposed rule. Again, this opportunity would only be available for parcels previously designated as DLAs through a land management process. The developer would also still be required to complete robust pre-construction surveys consistent with FWS' WEG and Eagle Conservations Plan Guidance and other guidance and policy documents as applicable.

Note that our proposed approach still requires BLM to identify upfront preferred areas for wind development based on landscape scale assessments prior to offering site testing permits competitively. Accordingly, BLM will need to invest in new tools and assessments to ensure that it can appropriately identify these potential areas. To this end, we encourage BLM to continue investing in wind wildlife research and its state planning efforts. In addition, BLM should invest in the collaborative efforts of other agencies such as FWS and Department of Energy to improve our understanding of wind-wildlife conflicts and identify preferred landscape features for least conflict wind development.

c. Distinguishing a DLA from a Non-DLA

The BLM provides no details on what characteristics distinguish a DLA from a non-DLA. It is our understanding that the BLM does not intend for DLAs to be a standalone designation, but a catch all phrase for designations of lands made through a variety of planning efforts (*e.g.*, Desert Renewable Energy Conservation Plan, Development Focus Areas; Solar Energy Program, Solar Energy Zones). If this is in fact the case, the final rule should make clear that DLAs are not, in and of themselves, designations for competitive leasing.

[7] 42 U.S.C. § 4321 *et seq*.

If BLM is adopting a catch-all approach, there is a significant need for established criteria to clarify what planning designations are eligible for DLA incentives (discussed below). In the absence of additional criteria about what distinguishes a DLA from a non-DLA, there is little clarity what will qualify as a DLA. While we acknowledge that designations may take on different names, the BLM needs to ensure that DLAs do not simply perpetuate project by project development and that appropriate sideboards are established so that the rule facilities, and does not undermine, a directed development approach. Guiding development to lands of least conflict should be better for wildlife, energy developers, utilities, and investors because it offers a more efficient way to get environmentally-sustainable renewable energy on line and greater certainty for all involved. It also helps ensure that new transmission corridors and lines are directed to facilitate renewable energy development in least conflict areas and that a regional approach to mitigation can be implemented. Developing a set of criteria can promote consistency in DLAs across states and regions, while providing some degree of flexibility.

In particular, we recommend the BLM use the following factors when identifying DLAs:

1. Generation should be developed either on already-disturbed land or in areas of lower biological value, and conflict with both biological resources should be minimized.

2. Areas identified for generation should have high-quality solar and/or wind energy resources.

3. Generation should be sited close to existing transmission and in areas which could be accessed with minimal upgrades or improvements.

4. Generation should, to the maximum extent possible, be aggregated to avoid transmission sprawl, reduce cost, and reduce disturbance across the planning area. This principle aims to minimize disturbance to valuable biological, cultural, recreation, and visual areas.

d. Prioritization of DLAs over Non-DLAs

As currently drafted, the proposed rule lacks any information about whether, and how, the BLM will prioritize review of DLA leases over non-DLA applications. We strongly urge the BLM to include language in the rule clarifying its intent to prioritize and direct agency resources toward DLA leases, ahead of non-DLA applications. Prioritization of DLAs over non-DLAs is consistent with the policies adopted in the solar energy program (*see*, e.g. ROD at 177 ("ROW applications in variance areas will be deemed a lower priority for processing than applications in SEZs")).

To carry out the intent of directing development to DLAs, it is important the BLM direct organizational capacity and resources to DLAs. We recommend that 2809.10, General Provisions for the Competitive Process for Leasing Public Lands for Solar and Wind Energy Development Inside Designated Leasing Areas, be modified to include a subpart explicitly stating that the BLM will prioritize NEPA analysis and application processing for leases inside of DLAs ahead of grant applications on non-DLA lands.

C. <u>Incentives for DLAs</u>

Critical to carrying out the intent of facilitating responsible solar and wind energy development is providing the appropriate incentives. To encourage development interest in DLAs, "the proposed rule also includes provisions to provide incentives for leases within [these areas]." 79 Fed. Reg. 59,022-59,023. We support the use of incentives for applications inside DLAs, including: variable bonus bid offsets; discounted nomination fee; longer phase-in periods and 30 year fixed term leases.

a. Variable Offsets

One proposed incentive is the use of "variable offsets" within a DLA under proposed 2809.16. "A successful bidder for lands inside a designated leasing area may quality for variable offsets totaling up to 20 percent of the total bid" as "an incentive for development inside designated leasing areas and benefits to the general public" including "better resource protection, more efficient use of the public lands, and an increased likelihood of project development." 79 Fed. Reg. 59,030. The variable offsets are offered to promote "thoughtful and reasonable development based on known environmental factors and impacts of different technologies." 79 Fed. Reg. 59,052. We strongly support proposed offsets that account for wildlife and other biological conflicts, including offsets for preferred solar or wind energy technologies that "would efficiently use public lands for reduce impacts to identified resources." *Id.* In addition to the already identified factors, we recommend the following be added as potential variable offsets:

- A draft Bird and Bat Conservation Strategy for the project site;
- A commitment to a specific ROW lease condition to obtain a Bald and Golden Eagle Protection Act Permit;
- A plan to employ best available operational minimization strategies; and
- An agreement to: (1) conduct monitoring and research consistent with the land-based WEG and Eagle Conservation Plan Guidance, (2) provide this monitoring data to the public to facilitate greater understanding of the wildlife impacts, and (3) implement avoidance measures to avoid impacts.

b. Fixed Bonding Amounts

As an incentive for DLAs, the BLM proposes fixed bonding amounts within DLAs, as described in IV, General Discussion. BLM's proposed standard bond amount for energy development would be $10,000/acre for solar and $20,000/authorized turbine for wind. 79 Fed. Reg. 59,030. These fixed bonding amounts are purportedly based on BLM's review and assessment of the decommissioning costs associated with a handful of existing projects. However, the results of BLM's analysis for solar ranged from between $10,000-$18,000/acre and ranged between $22,000-$60,000/turbine for wind. As such, we are perplexed as to why BLM chose standard bonding amounts that are at the lower range or even below the lower range of its cost analysis. While we appreciate the benefit the BLM is looking to bestow upon developers in DLAs, given the relative newness of the technologies we are concerned this approach does not adequately account for changed or unforeseen circumstances. The incentive should be the certainty associated with a fixed amount, not in the issuance of insufficient bonding

requirements. We recommend the BLM reevaluate these standard amounts and identify a range more commensurate with actual costs of decommissioning.

c. Compensatory Mitigation for DLA Development

BLM should identify more explicit procedural and substantive requirements with respect to mitigation. Section III, General Comments, identifies concerns raised about the ability of the BLM to mitigate impacts to resources under a competitive leasing process. In response, the BLM clarifies that "all grants and leases for solar and wind energy right-of-way authorizations would be expected to implement best management practices and mitigation as identified within the ROD for the Wind [PEIS] or Solar [PEIS]" and that "any additional site-specific NEPA requirements associated with an individual project could result in the identification of further mitigation measures, if applicable." 79 Fed. Reg. 59,026. These actions alone are not sufficient.

Various efforts are underway to identify mitigation opportunities at a landscape level.[8] Regional mitigation, for example, is also being considered as part of the Desert Renewable Energy Conservation Plan. The BLM is in the process of finalizing its Offsite Mitigation Manual, which we expect will provide guidance to the BLM on how to (1) develop Regional Mitigation Strategies, (2) incorporate regional mitigation into the land use planning process, and (3) identify and implement appropriate mitigation measures for particular land-use authorizations. Implementing a regional approach to mitigation for the public lands is necessary if the BLM is to strike the "careful balance between the development and protection of the public lands that the BLM is charged with overseeing." 79 Fed. Reg. 59,027. As such, BLM should include a procedural requirement in the proposed regulation that a regional mitigation strategy must be finalized before the initiation of a competitive leasing process. This approach also benefits project proponents with enhanced certainty regarding compensatory mitigation costs.

Specifically, we recommend that BLM revise 2809.12(b) as follows (changes indicated in red):

> "2809.12 How will BLM select and prepare parcels?...(b)The BLM and other Federal agencies will conduct necessary studies and site evaluation work (including applicable environmental reviews and public meetings) and publish the availability of a final regional mitigation strategy, before offering lands competitively."

Substantively, it is important that these regional mitigation strategies are based on sound science and are linked to conservation objectives for the planning region in a transparent manner. Ultimately, BLM must be able to demonstrate that impacts are truly unavoidable, compensatory actions appropriately mitigate residual impacts, and the net effect is at a minimum no net loss, and preferably a conservation gain to the resource of concern.

In addition, we must stress that we do not support incentivizing development in DLAs through mitigation discount factors. It is critical that compensatory mitigation costs are sufficient to fully offset

[8] *See, e.g.,* Secretarial Order No. 3330 (Oct 31, 2013); Dep't of Interior, *A Strategy for Improving the Mitigation Policies and Practices of the Department of the Interior* (April 2014).

impacts of development regardless of whether in DLAs or outside of them. The incentives in DLAs should arise from the existence of a clear regional mitigation strategy, quick approval of mitigation requirements and certainty for associated cost. Furthermore a discount factor is unnecessary since mitigation costs should be naturally less costly for DLA development regardless of any artificially imposed discount factors due to the least-conflict characteristics of the site itself.

BLM should also clarify how and when compensatory mitigation costs pursuant to the regional mitigation strategy will be paid. The proposed leasing rule indicates that when determining the minimum bid, the authorized officer may consider values that include *inter alia* "other environmental and mitigation costs of the parcel." 79 Fed. Reg. 59,038. However, it is unclear whether this statement is referencing a factor for consideration when BLM establishes the minimum bid (similar to BLM's consideration of projected future lease payments when establishing the minimum bid) or whether the actual payment of mitigation costs will be embedded into the minimum bid. If it's the latter, BLM must ensure that it is explicit on this point to ensure those costs are accounted for and diverted to real on – the-ground compensatory mitigation activities rather than the US Treasury.

V. Prioritization for Non-DLA Applications

First and foremost, we must reiterate our comments above that this rule should provide robust incentives to direct development to DLAs over non-DLAs where applicable. However, we acknowledge that development may still be appropriate in certain low-conflict sites that have not yet been designated as DLAs. However, we expect that since new DLAs have and will be designated through multiple avenues, and the amount of land in question is finite, these locations will be limited and the exception, rather than the rule.

To ensure responsible, thoughtful development outside of DLAs, we support BLM's general intent in the proposed rule to provide incentives to direct development to least-conflict sites for projects proposed outside a DLA. While this intent is clearly stated throughout the preamble, we have concerns that the regulation itself falls short of realizing this intent. As described further below, there are several components of the proposed regulation which should be refined and expanded to ensure that the final regulation sufficiently directs development away from sites with the potential for high resource conflict.

The proposed rule's primary method of incentivizing lower-conflict development outside of DLAs is through the codification of categories of screening criteria for prioritizing and processing such applications. Specifically, the proposed rule identifies three categories of screening criteria – high, medium and low priority. The preamble indicates that "[p]riortizing applications would focus the BLM's efforts on those applications that are likely to have lesser resource conflicts before those with potentially greater impacts." 79 Fed. Reg. 59,028. This in turn is anticipated to incentivize development in lesser conflict areas due to shorter permit review and greater predictability.

While we support BLM's objective to focus its efforts, and in turn incentivize low-conflict projects, the proposed screening criteria must be refined and expanded to better capture wildlife and other natural resource conflicts. Sufficiently comprehensive and clear screening criteria are necessary to ensure adequate consideration of potential conflict with important natural resources, consistency across field

offices and robust transparency for stakeholders and developers. In addition, comprehensive screening criteria are valuable for providing adequate certainty for developers wishing to pursue permitting incentives through objective guideposts that direct them to least conflict project sites. These screening criteria are a critical part of providing clarity to applicants regarding how they can maximize the likelihood of timely permit approval through low-conflict alternatives. Experience has demonstrated that early identification of potential impacts to sensitive wildlands and wildlife habitat associated with proposed renewable energy projects affords the opportunity to focus on avoiding, minimizing and mitigating project impacts, and therefore the greatest likelihood for successful completion. Significant resource limitations at federal and state agencies responsible for reviewing projects strengthen the case for such an approach.

However, the proposed screening criteria lack sufficient detail for objective categorization and also fail to capture several wildlife risk factors – particularly for avian and bat risk. Moreover, we have concerns that many of the screening criteria and their respective categories are not entirely consistent with BLM's Western Solar Energy Program and IM 2011-061. The Interior Department, BLM and other agencies continue to make great scientific strides in the development of sophisticated landscape scale assessments and geospatial mapping. Our recommended changes below were developed to more fully incorporate best available science and current policy into the screening criteria.

Below we have provided recommended revisions and additions to the proposed high, medium and low screening criteria under §2804.35 to facilitate low-conflict development and improve transparency and certainty. We have also added a fourth "exclusion" category to BLM's framework. We believe adding such a category is incredibly valuable to ensure consistency with the Western Solar Energy Program. In addition, we believe this fourth category also provides additional transparency to applicants where applications will be denied due to a finding of incompatible use. We also urge BLM to broaden the applicability of the exclusion criteria employed in the Solar Energy Program for wind development as well. We believe these exclusion criteria represent high resource conflict areas for wind energy development as well and thus should be applied to both types of development.

Note, we have also added several criteria to ensure that state wildlife and conservation priorities are fully incorporated into BLM's application review. BLM should make it clear to applicants that existing federal and state requirements for obtaining permits for survey and removal of protected species of plants and animals apply. This is particularly relevant in California because of the presence of federal and state threatened and endangered species and a variety of fully protected species under the California Fish and Game Code.

In addition to our recommended changes to the screening criteria themselves, BLM should provide regulatory text to clarify that where a project application meets screening criteria for more than one category, the lowest priority category will govern. For example, a site that is designated as VRM Class IV (a high priority screening criteria), and no surface occupancy for oil and gas development (a low priority screening criteria), should be categorized as "low priority." We recommend that BLM revise § 2804.35 as follows to incorporate this recommendation (proposed changes in red text):

> "The BLM will prioritize your application by placing it into one of four categories and may re-categorize your application based on new information received through surveys, public meetings, or other data collection, or after any changes to the application. The BLM will categorize your application based on the following screening criteria; where an application meets screening criteria for more than one category, the lowest priority category will govern."

Our recommended changes to BLM's proposed screening criteria for the four categories appear in the left column while the rationale for any changes or additions appears in the right column. Note, for easy comparison any recommended changes to BLM's proposed rule's screening criteria appear in red.

Proposed screening Criteria for high-priority applications:	Rationale for proposed change
(1) ~~Lands specifically identified for solar or wind energy development, other than designated leasing areas;~~	We recommend that BLM delete this as a screening criteria from the high priority application category due to its lack of specificity and potential broad application. It is unclear what this criteria encompasses and the criteria could be reasonably interpreted to mean variance lands identified under the solar PEIS or lands that were not excluded from wind energy development pursuant to the wind PEIS. However, these variance and non-excluded lands have been subject to various levels of conflict screening and upon further review, some of these sites may be found to have a medium or high potential for conflict. For example, BLM recently denied a variance land application in the Silurian Valley when it was determined that a solar energy development would "would not be in the public interest after undergoing a rigorous review process in accordance with the BLM's Western Solar Plan."[9]]. BLM determined that "impacts to the Silurian Valley, a largely undisturbed valley that supports wildlife, an important piece of the Old Spanish National Historic Trail, and recreational and scenic values, had too great of an impact on the resources." Hence, this screening criteria, as currently written, could send a misleading message to developers and encourage them to invest heavily in sites where development may not be appropriate. This would frustrate BLM's intent to develop a clear, consistent and transparent framework.

[9] http://www.blm.gov/ca/st/en/info/newsroom/2014/november/siluranvalley.html

(2) Previously disturbed sites or areas adjacent to previously disturbed or developed sites;	No Change
(3) Lands currently designated as Visual Resource Management Class IV;	No Change
(4) Lands identified as suitable for disposal in BLM land use plans.	No Change
(5) Repowering existing wind or solar development ROWs	The Department of Energy predicts that repowering will be a major focus for developers over the next decade – particularly for wind development. Repowering initiatives should be considered as an important factor for identifying high priority applications since these efforts typically provide increased generation output, result in minimal additional land disturbance, and in some cases can reduce wildlife impacts from baseline conditions.
(6) Lands adjacent to designated transmission corridors.	This criteria is consistent with BLM's IM 2011-061 and we recommend that BLM codify it in this rule.
(7) Locations that minimize construction of new roads and/or transmission lines.	This criteria is consistent with BLM's IM 2011-061 and we recommend that BLM codify it in this rule.
(8) For wind development, lands that meet criteria for "low probability of significant adverse impacts" under FWS' Land-Based Wind Energy Guidelines.	FWS' land based Wind Energy Guidelines (WEG) is a valuable tool that provides a broad overview of wildlife conservation for siting and operating wind energy facilities. It is the result of a collaborative effort among FWS' developers and third party scientists. The tiered approach provides a decision framework for collecting information in increasing detail to evaluate risk and make siting and operational decisions. Under the Guidelines, after the appropriate level of review, projects with a low probability of significant adverse impacts are generally considered appropriate for development. Given the importance of these guidelines and their acceptance by a diverse range of stakeholders including USFWS and developers, we encourage BLM to incorporate the WEG into the screening criteria. Furthermore, as described herein, adherence to such guidelines will also facilitate the application review process with respect to interagency coordination and compliance with wildlife laws and regulations.
(9) Wind energy development that is compatible with other non-conservation land-uses, including minerals extraction, livestock grazing, and recreational use.	This addition is consistent with the Wind PEIS which indicates that "[t]o the extent possible, wind energy projects shall be developed in a manner that will

	not prevent other land uses, including minerals extraction, livestock grazing, recreational use, and other ROW uses."[10]

Screening Criteria for medium priority applications	Rationale for proposed change
(1) BLM special management areas that provide for limited development, including recreation sites and facilities;	No change
~~(2) Areas where a project may adversely affect conservation lands, to include lands with wilderness characteristics that have been identified in an updated wilderness characteristics inventory;~~	We recommend that this screening criteria be moved to the low priority category consistent with the framework in the Solar PEIS and BLM's Restoration Design Energy Project (RDEP). These conservation lands generally have characteristics that increase the probability of wildlife conflict.
~~(3) Right-of-way avoidance areas;~~	This criteria was moved to the exclusion category consistent with the Solar PEIS.
(4) Areas where project development may adversely affect resources and properties listed nationally such as the National Register of Historic Places, National Natural Landmarks, or National Historic Landmarks;	No change
~~(5) Sensitive habitat areas, including important eagle use areas, priority sage grouse habitat, riparian areas, or areas of importance for Federal or State sensitive species;~~	We recommend that this screening criteria be moved to the low priority category to ensure consistency with BLM and other FWS and Department policies as described below. Sensitive habitat areas generally have characteristics that increase the probability of wildlife conflict and developing these areas will likely impact species of concern.
(6) Lands currently designated as Visual Resource Management Class III;	No change.
(7) Department of Defense operating areas with land use or operational conflicts; or	No change.
(8) Projects with proposed groundwater uses within groundwater basins that have been allocated by state water resource agencies.	No change.

Screening Criteria for low priority applications	Rationale for proposed change
(1) Lands near or adjacent to lands designated by Congress, the President, or the Secretary for the protection of sensitive viewsheds, resources, and values (e.g., units of the National Park System, Fish and Wildlife Service Refuge System,	No change

[10] Wind PEIS at 2-7.

some National Forest System units, and the BLM National Landscape Conservation System), which may be adversely affected by development;	
(2) Lands near or adjacent to Wild, Scenic, and Recreational Rivers and river segments determined suitable for Wild or Scenic River status, if project development may have significant adverse effects on sensitive viewsheds, resources, and values;	No change
~~(3) Designated critical habitat for federally threatened or endangered species, if project development is likely to result in the destruction or adverse modification of that critical habitat;~~	This criteria was moved to the new exclusion category consistent with identified exclusions under BLM's Solar Energy Program.
(4) Lands currently designated as Visual Resource Management Class I or Class II;	No Change
~~(5) Right-of-way exclusion areas;~~	This criteria was moved to the new exclusion category consistent with identified exclusions under BLM's Solar Energy Program.
(6) Lands currently designated as no surface occupancy for oil and gas development in BLM land use plans.	No change
(7) Areas where a project may adversely affect conservation lands, Research Natural Areas, and lands with wilderness characteristics that have been identified in an updated wilderness characteristics inventory;	We recommend that this criteria be moved from the medium priority category to the low priority category consistent with the Solar PEIS and RDEP. These lands generally have characteristics that increase the probability of wildlife conflict.
(8) Sensitive habitat areas including, but not limited to: • Areas identified by state wildlife agencies as of high importance to species of greatest conservation need, in accordance with State Wildlife Action Plans and areas scored as priority 1 and 2 in the Western Governor's Crucial Habitat Assessment Tool (CHAT). • Important eagle use areas • For wind development, areas near or adjacent to bat hibernacula • For wind development, Key Raptor Areas[11] shown to support high raptor use	We recommend that this screening criteria be modified and moved from the medium category to the low priority category to better incorporate BLM, FWS, and state priorities and policies. Our rationale for particular additions are as follows: • State Wildlife Action Plans and the Western Governor's Crucial Habitat Assessment Tool (CHAT) provide important information regarding crucial wildlife habitat and corridors across the west. As such, we recommend that BLM ensure that these valuable information sources are appropriately utilized when evaluating and

[11] We note that key raptor areas (KRAs) were defined in Olendorff and Kochert (1992), Raptor Habitat Management on Public Lands: a Strategy for the Future, as areas that include: areas with unusually high nesting populations, important raptor migration points, winter concentrations areas, or areas where consideration of raptors is a key issue in resource management or activity plans. The authors recommended maintaining an inventory of the Key Raptor Areas, to be updated every 5 years and used to inform management decisions. It is unclear whether BLM is maintaining this inventory and making the geospatial available West-wide. We recommend that the agency do so in order to comply with its inventory and management responsibilities under FLPMA, and to ensure the best available data for the management of raptors, many of which are BLM Special Status Species and may be particularly vulnerable to wind development.

• Areas near or adjacent to microphyll woodlands. • Audubon Important Bird Areas	prioritizing wind and solar applications on public lands. Lands scored as priority 1 and 2 generally correspond with important habitat that should be conserved and restricted from commercial development. • Important eagle use areas: under FWS' Eagle Conservation Plan Guidance, important eagle use areas are categorized as high risk sites for eagles. For consistency purposes, we recommend that BLM identify these areas as low priority in the final Leasing rule. • Key Raptor areas: Similar to important eagle use areas, these are important areas for raptor use and concentration and believe such areas increase the potential for avian conflict from wind development. • Microphyll woodlands: Microphyll woodlands are of special importance to wildlife and are known to yield a high diversity. This habitat provides shelter and forage for all types of desert wildlife, and as such, should be considered a low priority for wind and solar development. • Audubon Important Bird Areas: The Important Bird Areas Program by Audubon is an effort to identify and conserve areas that are vital to birds and other biodiversity.[12] Given their significant importance, we urge BLM to discourage development in such areas by categorizing them as a low application priority.
(9) Mapped migratory corridors and avian migratory stopovers.	This addition is consistent with existing FWS policies for assessing conflict for wind and solar energy development. For example, FWS' Eagle Conservation Plan Guidance for Land-based Wind Energy asserts that mapped migratory corridors and avian migratory stopover sites "provide important foraging areas for eagles during migration…[and] the presence of a migration corridor or stopover site on or near a proposed wind development project could increase the probability of encounters between eagles and wind turbines."[13] The presence of migratory corridors and stopover sites could also

[12] Audubon, Important Bird Areas Program, http://web4.audubon.org/bird/iba/ (last visited 12/1/2014).
[13] U.S. Fish and Wildlife Service, *Eagle Conservation Plan Guidance Module 1-Land-based Wind Energy,* 12 (version 2) (April 2013).

	increase potential for avian conflicts for solar development. While significant uncertainty remains regarding the causes of reported avian mortalities at solar facilities, an April 2014 FWS report concluded that solar photovoltaic plants and concentrating solar trough plants may pose a specific hazard for water birds who mistake the reflective panels for a large body of water.[14]

Screening Criteria for Exclusion Category	Rationale for proposed change
Areas that are excluded from solar or wind development based on land use plan designations, and other applicable law and policies, including but not limited to: • Right-of-way exclusion and avoidance areas; • Areas of Critical Environmental Concern designated for wildlife or important habitat conservation, • Lands acquired or donated for conservation purposes; • Lands identified and withdrawn for compensatory mitigation purposes under a regional mitigation strategy, species translocation program, or other similar mitigation plan or program; • All lands identified for exclusion either under the Solar Energy Program or the Wind PEIS. • Lands for which a previous renewable energy development application has been denied based on an incompatible use finding and the current project proponent fails to provide significant new information showing a substantially reduced risk of such conflict. • Designated Sage grouse Priority Habitat.	In addition, we recommend that BLM identify a fourth exclusion category to incorporate factors that will warrant an incompatible use finding for solar or wind development. This category will put project proponents on notice that applications falling under this category will be denied. Again, clarity, consistency and transparency are important components for an effective and efficient permitting program. It is important that BLM resources are not wasted on reviewing projects where an application denial is imminent. We ask that BLM be judicious in devoting agency resources to a site where a renewable energy development project has previously been denied due to identified resource conflicts. We find it to be an impractical use of agency resources for BLM to continually review applications for areas already deemed unsuitable for wind or solar development. As such, BLM should reject applications in these areas unless the proponent can show significant new information showing that their plan of development have significantly lesser impacts on important environmental and cultural resources.

[14] *Avian Mortality at Solar Energy Facilities in Southern California: A Preliminary Analysis*, Rebecca A. Kagan, Tabitha C. Viner, Pepper W. Trail, and Edgard O. Espinoza National Fish and Wildlife Forensics Laboratory (April 7, 2014).

VI. Pre-Application Process for Non-DLA Applications

a. Information Required to Categorize Applications

We are pleased to see BLM codify its pre-application and screening approach to projects outside DLAs. BLM will need site-specific information from the applicant in order to appropriately categorize and prioritize projects. §2804.10(c)(1) specifies that the BLM will accept a non-DLA ROW grant application only if "[t]he written proposal addresses known potential resource conflicts with sensitive resources and values that are the basis for special designations or protections, and includes applicant proposed and proven measures to avoid, minimize, and mitigate such resource conflicts." We support the inclusion of this requirement early on in the application process for non-DLA lands. For this pre-application process to be effective, BLM must ensure the information required pursuant to §2804.10(c)(1) is consistent with the screening criteria and adequately supports BLM's thorough evaluation and determination of the appropriate application priority category. Accordingly, BLM should provide additional detail on the type of information that will be required by the applicant pursuant to §2804.10(c)(1). This is necessary to provide developers adequate guidance regarding the type and detail of information that BLM expects in a ROW application. BLM should tailor these requirements to facilitate an expeditious priority category determination for application processing.

We encourage BLM to adopt the tiered risk analysis in FWS' Land-Based WEG as the standard for the level of pre-construction due-diligence necessary for applications. This tiered approach provides a decision framework for collecting information in increasing detail based on risk to make siting and operational decisions. The level of information collected varies based on site-specific characteristics relevant to potential risk for adverse ecological effects. While the land-based WEG was developed specifically for wind development, we believe much of the approach can also be incorporated when evaluating applications for solar development.

b. Procedures for Prioritization of Applications

We believe more clarity is also necessary regarding the operationalization of the proposed rule's application prioritization concept. Proposed §2804.25(d)(ii) indicates that BLM will "[a]pply screening criteria to prioritize processing applications with lesser resource conflict priority over applications with greater resource conflicts." However this regulatory text leaves several unanswered questions. For example, how will staff's time be allocated within field staff among projects based on priority and time of submission? Will staff working on a medium conflict priority project completely shift focus if a high priority application is submitted? Will staff or work load be shifted across different field offices if certain field offices have a disproportionate number of high priority applications as compared to others, which may have more medium or low-priority applications? How will other important non-renewable energy BLM projects be prioritized against processing low or medium-priority applications?

This added clarity is important to provide assurance to developers and other stakeholders that their efforts and investments in low-conflict projects will be rewarded adequately with appropriate staff attention and permit efficiencies. This is particularly important in a time of increasing agency demands

and decreasing budgets. Without this assurance, we fear that the rule will fall short of providing the incentives needed to direct development to lower conflict locations.

c. Early and Robust Public Stakeholder Participation

We must stress the importance of public stakeholder engagement during the pre-application process. Adequate public transparency and opportunity for stakeholder participation is an important component of facilitating low-conflict development. As BLM acknowledges in the preamble, "most solar and wind energy development projects are large scale projects that draw a high level of public interest" and it is important that the public is involved early in the process. 79 Fed. Reg. 59,037. As such, we support the rule's requirement that BLM will hold a public meeting in the area affected by the potential right of way for all solar and wind applications. *See* proposed §2804.25(d)(2)(i).

The timing of this public meeting is critical and should occur before the Plan of Development has been finalized to incorporate stakeholder concerns early in the process when modifications are least costly and burdensome. Moreover, BLM must release enough site- and project-specific information at this public meeting to facilitate a meaningful dialogue. This includes information such as proposed technology, turbine or solar panel installation locations, and the results of preconstruction monitoring data.

We also urge BLM to hold a written comment period after the public meeting to allow stakeholders to provide written comments on the proposed application and to respond to new information presented in the public meeting. Specifically, these written comments could help BLM evaluate the proposed priority category for the application, recommendations on site location, and specific recommendations for avoidance and minimization measures (e.g., micro-siting turbines, technology, curtailment, etc.).

Lastly, we strongly encourage the agency to include non-governmental stakeholders including environmental and conservation organizations in pre-application meetings.

d. Early and Effective Interagency Coordination

We support the proposed regulation's requirement under §2804.10(b)(1)&(2) for mandatory pre-application meetings with BLM, and other Federal, State, tribal and local governments to facilitate coordination. These meetings provide the opportunity for BLM and other governmental agencies to identify potential environmental impacts and wildlife conflicts on the front end before significant investment has been made in project development. These meetings should be structured carefully to ensure that participating agencies are given the project information necessary such that they can meaningfully assist BLM with their evaluation of whether the application should be denied based on the proposed screening criteria pursuant to §2804.25(d)(2)(iii).

It is imperative that these pre-application meetings facilitate adequate engagement FWS as well as state, local, and tribal fish and wildlife agencies. This is particularly important for projects that may adversely affect protected species such as federally endangered or threatened species, bald and golden eagles, migratory birds, and certain candidate species. In many instances, early engagement with these

agencies will provide additional scientific information to help BLM appropriately categorize applications and provide recommendations for reducing conflict. This early collaboration should also provide early notice to project proponents regarding the need for any FWS authorization such as incidental take statements or permits under the Endangered Species Act or the Bald and Golden Eagle Protection Act. These meetings should also include discussions regarding opportunities for BLM and FWS to synchronize environmental review and leverage resources.

e. Denial Authority

It is important that the proposed rule provide sufficient authority and procedures to efficiently and expeditiously deny applications that have a high potential for resource conflict as early as possible. This ensures that BLM focuses its limited capacity on projects with a higher probability of success and provides developers the early guidance they need regarding viable projects. Dragging out an application process that will ultimately end in a permit denial is a waste of time and money for BLM, developers, and interested stakeholders. Accordingly, we support proposed §2804.25(d)(2) which asserts that after evaluating the application based on the "information provided by the applicant and the input of Federal, State, and local government agencies, tribes, and comments received in pre-application meetings held under § 2804.10(b) and the public meeting held under §2804.25(d)(2)(i), the BLM will either deny [the] application or continue processing it."

While we support this early application triage, we urge BLM to provide more clarity and transparency regarding what projects will warrant a denial at this point versus further processing with respect to resource conflicts. The proposed §2804.26(a)(7) simply provides a general "catch all" for high resource conflicts by allowing BLM to deny an application when its evaluation of the application made under §2804.25(d)(2)(iii) [the screening criteria evaluation] provides a basis for denial." However, this vague language provides little clarity for applicants and stakeholders since the screening criteria are designed primarily to establish application priority and do not set any clear lines with respect to when an application warrants denial.

Providing additional clarity on projects warranting early denial is also an important reason why we have recommended an additional fourth exclusion category described above. We also recommend that BLM employ a rebuttable presumption that all applications in the low-priority category warrant denial unless there is a sufficient rationale showing that the proposed development does not represent an incompatible use given resource values and potential conflict.

f. Due Diligence time constraints

In the preamble, the BLM explicitly requested comment regarding:

> "establishing in the final rule a provision that would limit the time for applicants to begin conducting necessary resource studies. The deadline could be specific, for example 1 year after the BLM accepts an application. Alternatively, a time limitation could be stated in more general terms that would provide for greater flexibility on a case-by-case basis. Under this proposal, the failure to begin conducting such studies in

> the specified time frame could result in the BLM's denial of an application unless the BLM had previously agreed to a longer period of time at the request of the applicant." 79 Fed. Reg. 59,037-59,038.

We believe that such a time limit is prudent for inclusion in the final rule given how many projects have lagged in the application queue without any serious progress. While we don't have any specific recommendation for a precise deadline, BLM should strongly consider the typical time necessary to complete site surveys for species. Many of these surveys are seasonally dependent (e.g., eagles and desert tortoise). Also, retaining and finalizing assessment scope with qualified/permitted biologists can take time and sometimes future iterative site specific studies are necessary to refine conclusions pursuant to FWS' land-based WEG. Typically, developers need 2-3 years to adequately complete these studies so any time limit must accommodate this environmental resource study period.

g. Compensatory Mitigation for Non-DLA applications

BLM should include enforceable provisions for mitigation in the agency's grants for rights-of-way. In many cases, BLM will not be able to meet its obligations under existing law without including mitigation conditions in right-of-ways. FLPMA requires that BLM manage the public lands "in a manner that will protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resources, and archeological values. . . ." 43 U.S.C. §1701(a)(8). FLPMA requires BLM to avoid damage to these values where possible. To the extent a proposed solar or wind right-of-way cannot avoid damage to one of these values, FLPMA requires BLM to include enforceable conditions to monitor and mitigate any damage.

We share BLM's desire for a comprehensive advance landscape-scale mitigation approach to public land use as reflected by BLM's efforts with respect to the development of its offsite regional mitigation manual. With this in mind, we strongly recommend BLM complete its regional mitigation strategies prior to processing non-DLA applications. In places where a an overarching regional development and mitigation strategy is not yet in place, we urge BLM to continue working towards the development of these strategies outside of the DLA context and embed this framework into the application approval process. In certain circumstances, BLM may even be able to integrate mitigation for DLAs and non-DLAs into one broader regional mitigation strategy.

However, we realize that certain applications for non-DLAs may be in regions where a regional mitigation strategy is not yet available. As such, BLM needs to develop a clear mitigation framework for projects in non-DLAs to ensure that these ROWs adhere to BLM's statutory obligations and are consistent with land management conservation goals and objectives. We ask BLM to proceed cautiously and define consistent mitigation principles and standards for project approval. Without clear standard mitigation criteria, mitigation decisions can appear to be ad-hoc rather than consistent and predictable, giving rise to concern that some decisions may be heavily influenced by political or other inappropriate considerations. Accordingly, we recommend that BLM adopt clear standards for mitigation that incorporate the following concepts:

- Achieve a net positive conservation gain through employing the full mitigation hierarchy (avoidance, minimization and compensatory mitigation).
- Integrate existing mitigation programs and processes where applicable. This may include established regional mitigation strategies, and other established mitigation programs (e.g., state mitigation program, mitigation banks, habitat exchanges, etc.).
- Use a landscape-scale approach to inform mitigation consistent with the Department's Landscape Scale Mitigation Strategy: The mitigation hierarchy should be applied based on conservation objectives in land use plans derived by a landscape scale approach. Compensatory mitigation should be sited in locations that have been identified to most likely successfully and fully compensate losses to resources.
- Ensure that mitigation is durable: Compensatory mitigation actions must be supported by management, legal, and financial assurances that ensure that the compensatory mitigation benefits will be effective and in place for the duration of the associated development impacts.
- Compensatory mitigation actions should have a reasonable probability of success and the associated benefits must be measurable based upon reliable, repeatable, and quantitative science-based methods.
- Ensure that compensatory mitigation is additional: Actions proposed as compensatory mitigation should provide benefits beyond those that would be achieved if the mitigation actions had not taken place and should exceed what is otherwise required by federal, state, and local regulations.
- Ensure transparency, and adequate stakeholder engagement.
- Ensure consistency with state requirements: Compensatory mitigation must be sufficient to satisfy state requirements, especially in California where impacts to listed species, rare natural communities and waters of the state need to be fully mitigated. This should be made clear so that applicants are fully aware of the full array of potential compensatory mitigation requirements.

VI. Terminology – "lease" versus "grant"

BLM's should modify its use of the terms "lease" and "grant" in the proposed regulation to provide clarity regarding the distinction between the two terms and reduce confusion. The proposed rule differentiates the types of rights-of ways granted to renewable energy projects depending on whether the site is within or outside of a DLA. The preamble asserts that "BLM intends to differentiate the solar and wind energy development rights-of-way issued inside a designated leasing area under new subpart 2809 as leases, which would be a type of grant with specific requirements." 79 Fed. Reg. 59022 (emphasis added).

While the preamble defines a lease as "a type of grant", it frequently uses the term lease as a type of right of way (ROW) which is distinct and apart from grants throughout the proposed rule (i.e., "§ 2807.21 May I assign or make other changes to my grant or lease?" (emphasis added)). However, in certain sections, the regulation also refers to a "grant" as an umbrella term to encompass both "non lease grants" and "lease grants" (i.e., "Note, the term 'grant' is used when referencing section 2803.10

above and in paragraph 2809.11(c). This is because throughout this part, including section 2803.10, the term grant includes all right-of-way authorizations, including leases.").

To remedy this confusion, we ask BLM to adopt a consistent framework for these terms that consistently differentiates them. The easiest approach would be to consistently refer to the term ROW lease as a property instrument that is distinct and apart from a ROW grant. BLM should also refrain from using the term grant as a catch all for both leases under § 2809 and grants issued for projects outside of DLAs.

VII. Conclusion

Thank you for your thorough consideration of these important comments. Please contact us if we can provide more information.

Sincerely,

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AND ON BEHALF OF

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Attachment 2: A Conservation Plan for Desert Bighorn Sheep in California (February 2012 Draft)

A CONSERVATION PLAN FOR DESERT BIGHORN SHEEP IN CALIFORNIA

CALIFORNIA DEPARTMENT OF FISH AND GAME

February 2012 Draft

EXECUTIVE SUMMARY

Desert bighorn sheep in California live primarily on islands of mountain habitat in a sea of low lying desert. Alone each of these islands supports too few sheep to persist as populations. The pervasive force of genetic drift alone would erode the genetic diversity of each population until inbreeding depression resulted in extinction. Instead, these mountain ranges are linked to each other through intermountain migration in a network known as a metapopulation. That intermountain migration is what allows the persistence of the individual populations and the metapopulation. Because of the fundamental importance of intermountain movements of desert bighorn sheep to their persistence, this conservation plan is a metapopulation plan that focuses substantially on that essential intermountain migration by sheep.

Desert bighorn sheep in the southeastern desert region of California were once one large metapopulation. Major highways have been documented to terminate migration and gene flow and have split this metapopulation into six metapopulation fragments. This plan focuses on four contiguous metapopulation fragments in the southeastern corner of the state. First, it elucidates the intermountain habitat that is critical to continuing gene flow in metapopulation fragments so as to prevent further fragmentation. Second, it considers possible actions to reverse past fragmentation and re-establish migration across freeways in key locations. Third, it focuses on maintaining genetic diversity in each metapopulation fragment by enhancing connectivity and gene flow, while also attempting to maximize the stability and size of existing populations. Actions to achieve this include strategically placed water developments, elimination of competition from cattle and burros, and elimination of the risk of introduced diseases.

This plan translates a conservation strategy into specific actions on a localized basis. There is great variation in bighorn sheep habitat across the deserts of southern California. This plan elucidates key variation that is important to conservation and analyzes needed actions relative to their importance to metapopopulation processes, giving the highest priority to actions that will produce the greatest return at the metapopulation level.

This plan also recognizes the critical importance of data development. Some of this involves population monitoring information, while other data collection concerns specific research projects, the results of which will determine the most appropriate and cost effective path for achieving conservation goals outlined in this plan.

PLAN STRUCTURE

The structure of this plan is designed to serve a wide variety of readers of varying levels of time commitment. The plan progresses through a series of sections, each of which builds on the previous. First is the Background Information section, which lays out the scientific basis on which

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this plan is built. This section has three subsections. The first contains the pertinent basic biology of bighorn sheep, which is a scientific review. The second focuses on desert bighorn sheep in California and lays out some information about these sheep that is important to conservation planning. The third subsection is a summary of background information from the first two subsections that is important to the next sections on conservation planning.

Following the Background Information is a short section that identifies the key conservation challenges for this animal and lays out the conservation goals. This is followed by another short section that outlines strategies for achieving conservation goals. This is followed by a long section that translates those strategies into on-the-ground actions. This implementation section is organized regionally by metapopulation fragments, but ultimately considers individual herd units or in some cases groups of herd units. Each metapopulation subsection begins with a regional discussion of that fragment and the general conservation challenges involved. This implementation section ends with a compilation of all conservation actions called for and prioritizes them into three groups based on relative importance to metapopulation processes. Following the implementation section is a section on monitoring and research needs. Next is a time line for management, and data development actions by five year units for the next 15 years. Finally, there are two appendices. One concerns the results of some extinction model testing and refinement that figure importantly in this planning process. Second is an appendix on climate change that dissects this question relative to which climate variables are important to the biology of desert bighorn sheep, and analyzes pertinent long term climatic data from the California desert region. Both were relegated to appendices because their contents were considered too technical for the body of a planning document.

For those who cannot commit the time to read this entire plan, there are multiple possible alternatives to capture the essence of the information in the plan. The shortest approach is to read just the executive summary. The next shortest approach would be to read these sections: (1) Summary of Background Information; (2) Conservation Challenge and Goals; (3) Conservation Strategies; and (4) the action timeline. Metapopulation fragment discussions at the beginning of each subsection of the Implementation section could be added to this list. Additional material to read will depend on the interest of the reader; Desert Bighorn Sheep in California and Monitoring and Research and might be the next level of additional reading.

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SCOPE OF PLAN

The geographic scope of this plan is limited to a core subset of the original distribution of desert bighorn sheep in the southeastern corner of California that mostly shares a similar climatic regime and is geographically contiguous. As such, it does not include historic ranges of desert bighorn sheep in northeastern California, all of which are currently vacant. It also does not include the Sweetwater Mountains, which are shared with Nevada and may have once been used by Sierra Nevada bighorn sheep. Further south, this plan briefly discusses populations in the Transverse Range at the western edge of historic distribution, but ultimately eliminates them from planning considerations because the habitat and conservation challenges there are so different due to notably higher rainfall. Finally, the bighorn sheep that inhabit the Peninsular Ranges at the southwestern boundary of the distribution of desert bighorn sheep in California also are excluded from this planning effort because they are covered already under a Recovery Plan as an endangered distinct population segment. The separate subspecies of bighorn sheep in the Sierra Nevada is similarly covered under its own Recovery Plan.

The temporal scope of this plan is the next 50 years with a re-assessment of progress and the plan direction at 15 and 30 years, and plan revision at either of those reviews if deemed appropriate.

BACKGROUND INFORMATION

This plan is built on a scientific foundation of what is currently known about desert bighorn sheep in general and more detailed information about this animal in California. This section on background information is organized accordingly, beginning with more general information, followed by a section specific to California. At the end is a third section that summarized the key elements of the previous two sections that are important foundational information for the planning part of this document.

Habitat

Ecological Niche and Basic Habitat Components

Two adaptations of bighorn sheep define their basic habitat requirements. The first is their agility on precipitous rocky slopes, which is their primary means of evading predators. The second is their keen eyesight, which is their primary sense for detecting predators. Short legs and a stocky build provide a low center of gravity and allow agility on steep rocks, but preclude the fleetness necessary to outrun coursing predators in less rocky terrain. Consequently, bighorn sheep select mostly visually open habitats that allow detection of predators at sufficient distances to allow adequate lead time to reach the safety of precipitous terrain. Optimal bighorn sheep habitat is visually open and contains steep, generally rocky, slopes. Large expanses lacking precipitous escape terrain can represent substantial barriers to movement, with the consequence that preferred bighorn sheep habitat is discontinuous and their population structure is one of natural fragmentation (Bleich et al. 1990a). Much of the desert bighorn habitat in California can be viewed as islands of preferred habitat in a sea of desert.

One apparent adaptation to the naturally fragmented habitats that bighorn sheep commonly occupy is a conservative behavior known as philopatry – a reluctance to disperse from their home range. This makes bighorn sheep relatively slow to colonize unoccupied habitat (Geist 1967, 1971). This behavior has important implications relative to metapopulation dynamics discussed below. However, desert bighorn sheep do regularly cross intermountain desert habitat that lies between patches of preferred habitat. This intermountain migration occurs more frequently than once thought, and is essential to metapopulation dynamics discussed below.

The many islands of suitable desert bighorn sheep habitat across the southwestern U. S. and northern Mexico vary considerably in size and other features, including other habitat variables important to bighorn sheep, such as forage and water. Consequently, habitat patches vary considerably in their ability to support bighorn sheep populations.

Forage Resources

Bighorn sheep are ruminant herbivores that possess a large rumen and reticulum relative to body weight (Krausman et al. 1993). This permits flexibility in plants consumed and, notably, allows the digestion of graminoids (grasses, sedges, and rushes) in all phenological stages (Hanley

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1982). This flexibility in food consumption, in turn, allows flexibility in habitats utilized for feeding. Bighorn sheep are very discriminating feeders that select the most nutritious forage from what is available. One result is that the species composition of their diet varies greatly seasonally and regionally and can range from largely graminoids and forbs to predominantly browse (Krausman et al. 1989). In years when adequate fall rainfall initiates annual plant species, these make up a large proportion of the diet during the growing season; but, they can also be consumed a great deal in dried form during the hot season. Of particular note is catclaw acacia (*Acacia greggii*). This is a very deep rooted deciduous species in the pea family that maintains green leaves throughout the hot season when other plant species have largely ceased growing. Bighorn sheep substantially enhance the nutritional quality of their diet in the hot season by consuming catclaw acacia where it is present.

Forage Growth and Bighorn Sheep Nutritional Patterns

Vegetation growth and stature in deserts are limited primarily by inadequate soil moisture during much of the year, mediated by seasonal temperature patterns (hot summers). Desert bighorn sheep life history and demographic (vital) rates are greatly affected by rainfall patterns because diet quality (nutrient intake) at any point in time is dependent on the amount of green, growing vegetation in their habitat from which they select their diet (Wehausen 2005). Summer rainfall occurs largely as localized cloud bursts from monsoonal moisture that moves into the desert from a variety of southern sources (Gulf of Mexico to the Pacific Ocean). When those storms hit mountain ranges occupied by bighorn sheep, much of the water leaves that habitat as flash floods, while hot temperatures quickly evaporate what moisture penetrates the soil. Consequently, there is little forage growth and associated increase in diet quality for bighorn from most summer rain (Wehausen 2005). In contrast, cool season storms produce soaking rains that are geographically widespread and are derived from moisture that moves across California mostly from the north and west. Because cooler temperatures preserve soil moisture and temporally extend its availability for plant growth, the major nutrient pulse for desert bighorn sheep occurs in winter and spring (Wehausen 2005). In the Mojave Desert the amount of October-April rainfall that enables forage growth during the winter-spring growing season is highly variable, and bighorn sheep nutrient intake correlates strongly with that rainfall variation (Wehausen 2005), as does lamb recruitment and overall population dynamics (see below). Timing of rainfall in the cool season also plays a role. When cool season rainfall in the Mojave Desert is partitioned into key months of highest influence on diet quality in the growing season, two distinct and biologically meaningful periods emerge: early rainfall (October-November) that primarily enhances bighorn sheep nutrition through germination of annual forage species; and rain in later months (January-February) that enhances diet quality later in the growing season through its effects on perennial species that initiate growth later in winter, while also extending somewhat the growth of annual species in years in which they are present (Wehausen 2005).

The timing of rainfall was also important for bighorn sheep diet quality in a more northern Great Basin desert ecosystem on the Mount Baxter herd winter range at the eastern base of the Sierra Nevada. There the winter and early spring diet quality for bighorn sheep was driven primarily by when the first soaking storm occurred that initiated plant growth of cold tolerant species that bighorn sheep first fed on (Wehausen 1992a). In contrast to similar studies of bighorn sheep diet quality further south in the Mojave Desert, the amount of precipitation was not an important variable. However, that result was an artifact of an altitudinally migratory population that moved to higher elevations before soil moisture began limiting forage growth.

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In both of these desert ecosystems, variation in precipitation was the major variable influencing diet quality. However, in both ecosystems there was also a weak, but significant temperature effect. For the Sierra Nevada winter range, colder winter temperatures slowed down plant growth and delayed the rise in diet quality (Wehausen 1992). For the more southern Mojave Desert ecosystem, the same relationship was apparent early in the winter when plant growth was also temperature limited. However, in that southern ecosystem warmer temperatures in late winter and early spring were associated with lower subsequent diet quality apparently because of more rapid depletion of limited soil moisture and its effect on plant growth (Epps 2004).

Habitat Selection

Bighorn sheep are primarily diurnal, but may be active at night under certain conditions (Krausman et al. 1985, Miller et al. 1984). Coupled with their strong reliance on keen eyesight to detect predators, diurnal behavior minimizes predation risks. Nights generally are spent on safer rocky slopes, while bighorn sheep may venture away from rocky escape terrain to feed during daylight. How far they venture from safer habitat varies and is influenced by visual openness; the further away they can detect predators, the further they may venture from safe escape terrain. However, additional variables appear to influence habitat selection relative to escape terrain and visual openness, including wind, gender, season (e.g. whether vulnerable young are present), and abundance of predators.

Bighorn sheep commonly exhibit seasonal changes in habitat use that reflect various resource needs. The level of dietary nutrient intake for bighorn sheep is determined by the availability of green, growing forage species. Following the first cool season rains, some females select south facing habitats at the lowest available elevations, where new forage growth first becomes available due to warmer temperatures. It may be primarily females closest to parturition that feed in those habitats because of elevated nutrient needs. In the absence of early rains and new forage growth on sloped habitat, females at the end of gestation may seek forage of higher nutrient content in low lying washes. A particularly high mortality of both lambs and adult females occurred among bighorn sheep translocated into a fenced enclosure in the Whipple Mountains of California apparently because fencing precluded the full use of such habitats by females during late gestation and early lactation (Berbach 1987). This speaks to the critical importance of such habitats, even if they are used only briefly.

Prior to parturition, and for a few days after giving birth, bighorn sheep females sequester themselves on steep escape terrain that is particularly safe from predators. Following that birthing period, groups of ewes with small lambs congregate in nursery groups and continue to occupy steeper habitat with a high safety level relative to predators. Sometimes they will leave groups of lambs on safe terrain while they feed in less steep terrain. This steeper terrain used in the early lamb rearing period is often referred to as lambing habitat. In some areas ewes even cross to a safer neighboring mountain range to bear and rear their lambs (Jaeger 1994). However, where ewes rear their lambs can vary from year to year depending in part on where the most nutritious forage is.

Habitat selection during the hot season is greatly influenced by surface water (Bleich et al. 1997). Females and associated sheep typically begin shifting their distribution toward areas containing surface water in April or May depending on temperature, elevation, and the abundance and persistence of spring forage growth. Full use of water typically commences when daily high

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temperatures reach about 100F, and declines at the end of the hot season coincident with declining high temperatures, but may continue into winter if forage remains dry due to lack of rain. During the heat of summer females typically come to water to drink about once every three days, but that will vary with temperature. Under very hot conditions bighorn sheep can visit water at night (Miller et al. 1984).

Male and female bighorn sheep commonly live in separate groups during much of the year (Geist and Petocz 1977, Wehausen 1980, Bleich et al. 1997, Ruckstuhl 1998; Mooring et al. 2003), and often select different habitats. Desert bighorn females frequently are found in steeper, safer habitats with more escape terrain than males, not only in the lamb rearing season (Bleich et al. 1997). Habitat selection by males expands during the breeding season in summer and fall to overlap habitats utilized by females.

Surface Water Use

During the cooler months of the year desert bighorn sheep mostly meet their water needs from forage consumed (Turner 1973) and drink water only when new growth is lacking on forage. In contrast, during the hot season they regularly visit springs and other sources of water to drink. One result is that summer home ranges typically include only habitat within a relatively short distance from water (Blong and Pollard 1968, Leslie and Douglas 1979, Cunningham and Ohmart 1986, Krausman et al. 1999, Longshore et al. 2009). When the extreme hot and dry conditions of summer abate as a result of more dispersed water (summer rain) or lower water need (cooler temperatures), desert bighorn sheep quickly expand their home ranges to utilize habitat further from the core water sources. That they so limit home ranges to be close to water during the hot season suggests an important physiological benefit from drinking, given multiple reasons why such a high concentration of sheep might be disadvantageous (e.g. competition for limited forage resources and predation).

Toward the end of the first half of the twentieth century, wildlife biologists familiar with desert ecosystems initiated programs to expand the availability of surface water. Those programs were based on the (sometimes unstated) hypothesis that surface water was a key factor limiting some wildlife populations. Quail were the first focal species, but other species, including bighorn sheep (Halloran and Deming 1958, Blong and Pollard 1968), soon followed (Krausmann et al. 2006). Various types of water systems have been built that provide bighorn sheep drinking water in the hot season from impounded rain water or water tapped from high water tables (Bleich 1982, Bleich and Weaver 1983, Bleich et al. 1982a, Lesicka and Hervert 1995). Hundreds of such systems have since been built in states with desert bighorn sheep, and many bighorn sheep use such systems every summer to meet water needs and, occasionally, in cooler seasons if forage moisture is inadequate.

Because such water developments are mostly on public lands, they have become controversial and viewed positively or negatively by people from different backgrounds. On the negative side they have been viewed as artificial developments of questionable and possibly negative value (Broyles 1995, Broyles and Cutler 1999), especially in areas classified or thought of as wilderness (Czech and Krausmann 1999), potentially created only to increase populations for hunting. On the positive side, water developments have been viewed in some situations as replacing water sources that have been lost over time due to various influences, and as helping to conserve genetic diversity in metapopulations by maintaining connectivity through stabilization of

DRAFT

bighorn sheep population sizes (Longshore et al. 2009), thereby helping secure the future of an animal that has suffered many setbacks that can be traced to various human influences of the recent past.

A fundamental question raised in this debate is whether there is an actual demographic effect of adding water (Broyles and Cutler 1999). While there are many desert bighorn sheep populations that appear to have increased in size after water was provided, this question lacks a definitive answer because of the complexity of factors affecting population dynamics, of which the availability of nutrients in the cool season is particularly influential (see below). Thus, any conclusion that a population increased because of added water must first dismiss the alternative explanation that the increase occurred simply because there was a period of better forage growth; such analyses have been lacking. Conclusive evidence that providing water increases bighorn sheep populations really needs an experimental design with adequate replication that includes multiple treatment and control populations, ideally including no treatments until after all populations have been studied in detail for numerous years to develop an understanding of statistical relationships between environmental variation (e.g. rainfall in certain months) and demographic vital rates. This also has not happened. The only study using such an experimental design was far too short to answer this question, and concluded as much (Cain et al. 2008).

Given those scientific limitations, it is necessary to approach the topic of drinking water for desert bighorn by making what inferences are possible from available facts through the consideration of pertinent questions. Turner (1973) studied the water physiology of desert bighorn sheep under water deprivation and rehydration, and concluded that they could not survive without drinking during the hot season, requiring a total daily water intake from all sources of 3-4% of body weight. Krausman et al. (1985) questioned Turner's (1973) general conclusion about the absolute need for desert bighorn sheep to drink during summer after their research found that two adult female bighorn sheep from a small population in the Little Harquahala Mountains of Arizona did not drink at all during 10 days in summer, and in fact had no available surface water.

However, because some desert bighorn sheep can survive in some situations without drinking water does not imply that making water available will not increase and help stabilize populations; these are different questions. There may be important differences in demographic vital rates between populations with and without drinking water that result from that difference alone. Turner's (1973) water physiology findings suggest that sheep that do not drink during the hot season will be under considerable physiological stress. Among his findings was a significant drop in forage intake under water deprivation. Insufficient drinking water may be a strong selective force that allows only individuals with optimal physiological health to survive, resulting minimally in higher mortality rates for lambs and older adults.

Most lamb mortality in desert bighorn sheep occurs in spring as ambient temperatures increase, coincident with declining availability of water and nutrients in forage (Wehausen 2005). In contrast, Wehausen (1997) reported for one desert bighorn population in California that the lamb:ewe ratio did not change during summer, except in 2 years when notable declines occurred; in both of those years a water source used heavily by a significant proportion of that population dried up in summer (J. Wehausen, unpubl. data). What this suggests is that where desert bighorn are well hydrated there is no difference between lambs and ewes in summer mortality (both apparently low), whereas under conditions of water deprivation lambs have a notably higher mortality rate than adult females. Carcasses sometimes found around dried up water sources suggest that mortality of adult

DRAFT

sheep also can increase in the absence of water in some situations (Dolan 2006). These findings suggest that there are demographic differences that distinguish populations with and without drinking water. Indeed, prior to the addition of man-made water sources, all desert ranges in California that lacked any known reliable surface water supported at most only very small populations of bighorn sheep. Epps et al. (2004a) found the lack of reliable surface water to be a statistically significant factor associated with higher extinction probability for desert bighorn sheep populations in California. Further, small bighorn sheep populations inhabiting desert ranges lacking water may persist because of a rescue effect provided by immigrants from neighboring ranges that have water and larger, more stable, populations. The Little Harquahala population in Arizona that Krausmann et al. (1985) studied appears to be an example.

In short, drinking water appears to enhance physiological health of sheep, and that physiological health appears to increase the efficiency of populations at converting forage resources into sheep (i.e. higher and more stable population densities) through higher lamb recruitment and adult survivorship. What this suggests is that it is a false dichotomy to cast surface water and nutrient availability as competing hypotheses relative to controlling factors of population dynamics. Instead, through the concept of efficiency in converting nutrients into sheep they can both be important, interacting factors. In addition, well spaced water sources within mountain ranges will spread bighorn sheep across habitat otherwise used little during the hot season, and this also should lead to higher population sizes through the use of more forage resources (Bleich et al. 2010).

This view of the role of surface water in the population ecology and habitat use of desert bighorn sheep will be used as the basis of conservation planning in this document. Like all scientific explanations of cause and effect, it can be viewed as hypothesis; however, it is considered here to be the hypothesis most consistent with available demographic, behavioral, and physiological data.

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Social Behavior

Bighorn sheep exhibit a variety of behavioral adaptations to avoid predation. One such adaptation is group living (Hamilton 1971, Alexander 1974); groups provide more eyes and ears, allowing members to spend less time surveying for predators (vigilance) and more time feeding. Two studies of this phenomenon found that increases in group size of up to six (or more) bighorn sheep conferred an advantage in a measured decline in the proportion of time an individual allocated to vigilance (Berger 1978, Risenhoover and Bailey 1985), while data from Mooring et al. (2004) extended this group size advantage somewhat further to group sizes of 9. Mooring et al (2004) also found that on a combined level group vigilance (the advantage of more eyes and ears) continued to increase up to their maximum group size of 45 sheep. Desert bighorn sheep group sizes do occasionally reach those large group sizes, suggesting a behavioral advantage. Another advantage of group living is the dilution effect: the probability that an individual is the one killed should a predator make a successful attack (Hamilton 1971). This advantage also continues to grow with increasing group sizes. What limits group sizes is the spatial distribution of preferred forage bites. The largest groups occur during the peak of the growing season and group size shrinks to a minimum during the hot season.

Life History

Bighorn sheep primarily give birth to single young with a low incidence of twins (Buechner 1960); but twinning rate may be higher in some situations than previously recognized (Spalding 1966, Eccles and Shackleton 1979), including desert bighorn following consecutive years of high nutrient intake resulting from high cool season rainfall. Bighorn sheep occupying warmer desert mountain ranges typically have protracted lambing seasons that in some situations last 6 months. This contrasts with bighorn sheep that live under colder winter temperature regimes, where birthing occurs during short periods in late spring and early summer (Thompson and Turner 1982, Bunnell 1982, Rubin et al. 2000, Wehausen 2005). Desert bighorn sheep in California inhabit widely varying climatic regimes from low elevation hot Sonoran desert to cold alpine desert, and exhibit high variation in the timing of lambing seasons that is correlated with those climatic differences (Wehausen 2005). Birthing in more southern populations in California can begin as early as December (and occasionally November) and typically extends into May, but with a small amount (ca. 2-5%; Witham 1983, Rubin et al. 2000) of summer lambing primarily in August and September. Desert bighorn populations living in colder habitats exhibit shorter lambing seasons that begin later, the most extreme of which in California occurs in the White Mountains, where the season lasts about 2.5 months beginning in the second half of April (Wehausen 2005).

Timing of ovulation and lambing is influenced by prior nutrient availability, with later birthing apparently a consequence of lower body reserves resulting primarily from nutrient intake and expenditures in the prior year (e.g. lactation; Wehausen 1984a, 1996). One result is that the peak in lambing can shift about a month from year to year (Witham 1983, Wehausen 2005), and occasionally more, depending on nutrient availability the previous year(s).

The gestation period for bighorn sheep is approximately 174 days (Shackleton et al. 1984, Hass 1995). Consequently, the rut can begin as early as the beginning of summer in the southern desert region following growing seasons of high nutrient availability, but as late as the end of October in the White Mountains. For most desert bighorn in California the rut peaks during summer.

Desert bighorn females typically first conceive as yearlings and bear their first lamb at about two years of age. Under poor nutrient conditions some young females may delay this a year. Pregnancy rates in desert bighorn sheep appear to be consistently high, approaching 90% (Bunch et al. 1986, Borjesson et al. 1996). Where lambing seasons are long, the influence of a year of poor nutrient availability appears to be later ovulation and conception, rather than a decline in pregnancy rates. Very high recruitment rates can occur in years of favorable spring nutrient availability that follow a year of very poor nutrient intake, suggesting that pregnancy rates are not limiting. However, this may not hold for multiyear droughts.

Many desert bighorn sheep females live into their teens and occasionally reach late teens. Unlike bighorn sheep in cold climates, desert bighorn sheep females in warm desert ecosystems can maintain full reproductive output to the end of their lives.

Population Dynamics

Caughley (1976) listed three potential goals of traditional wildlife management: to increase the size of a valued but small population, to decrease the size of an undesirable population, or to

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extract a regular yield from a population. While the field of conservation biology might expand those goals to consider genetic diversity as well as metapopulation, community, and ecosystem considerations, conservation planning and actions in general revolve substantially around the dynamics of the populations in question. Consequently, a good understanding of what factors potentially and actually drive the dynamics of populations in question is essential as the basis of conservation planning.

Populations change in size over time through gains and losses of individuals through reproduction, immigration, mortality, and emigration. While migration and resulting natural colonization in desert bighorn sheep (see below) occurs at a higher rate (Epps et al. 2010) than suggested by Geist (1971), immigration and emigration by females are nevertheless sufficiently infrequent events that they can be mostly ignored relative to population dynamics. Consequently, this section addresses reproduction, mortality, and population regulation through density-dependent feedback loops.

While variation in adult survivorship has a notably greater effect on population dynamics than equivalent variation in recruitment rate (Gaillard et al 2000, Rubin et al. 2002), as a general rule variation in recruitment rate largely drives the dynamics of wild ungulate populations due to relatively low variation in adult survivorship (Gaillard et al. 1998, 2000). Bighorn sheep may be something of an exception in some situations because of the higher rates of adult mortality that sometimes occur (Johnson et al. 2010) due to factors like mountain lion predation and respiratory disease epizootics.

Recruitment

In years of very poor nutrient availability due to insufficient winter rains, it is likely that most females do not attempt to rear lambs after they are born; few lambs are actually seen in such years. In years of higher nutrient availability most lamb mortality occurs in May and June as diet quality drops and temperatures rise. For the Old Dad population in the eastern Mojave Desert of California there was no evident loss of lambs over summer except when a water source dried up (see Surface Water Use above).

Spring lamb survival has been linked to diet quality in late winter and spring, thus to cool season rainfall (Wehausen 2005). However, that relationship was complex, with a linear increase to a peak lamb:ewe ratio of 0.61, but a strongly declining trend at yet higher rainfall and diet quality levels (Wehausen 2005). It is not known whether this is a general pattern for desert bighorn, but has important implications relative to climate change (see Appendix II) and population dynamics in general if it is.

The important message is that cool season rainfall is the primary driver of recruitment variation, and where variation in adult mortality is low, recruitment variation drives the dynamics of populations. The exceptions where variation in adult mortality dominates instead will be discussed below. Cool season rainfall has high year-to-year variation in desert ecosystems. For 110 years of data for Parker, Arizona, average October-April rainfall was 3.2 inches (range 0-12.4) with a coefficient of variation (standard deviation as a percent of the mean) of 70.7. This amounts to a high amount of unpredictable (stochastic) temporal environment variation that drives population dynamics. Each different cool season rainfall level would result in a different carrying capacity for the population if that rainfall level were to remain constant; thus the bighorn sheep population

DRAFT

dynamics in these desert ecosystems can be viewed as a system of constantly changing carrying capacity. There is also considerable geographic variation in rainfall discussed below, which adds a second dimension to population carrying capacity variation.

Mortality Factors

Diseases and Parasitism

Numerous diseases of bighorn sheep have been identified (Jessup 1985, Bunch et al. 1999), of which pneumonia and psoroptic scabies have had the greatest apparent population-level effects. Bighorn sheep show a high susceptibility to pneumonia (Post 1971), usually caused by bacteria of the genus *Pasteurella* and it recent taxonomic derivatives. Bunch et al. (1999) considered pneumonia caused by such bacteria alone, or in combination with other pathogens, as the most significant disease threat for bighorn sheep.

Many early die-offs of bighorn sheep were attributed to scabies thought to have been contracted from domestic sheep (Jones 1950, Buechner 1960). Over the past 20 years, this disease has been a significant mortality factor among desert bighorn sheep in the San Andres Mountains of New Mexico (Lange et al. 1980, Hoban 1990, Rominger and Weisenberger 2000). Scabies also has been found recently in desert bighorn sheep in California (Clark et al. 1988), but it is not known to be a significant mortality factor, despite serological evidence of widespread distribution (Mazet et al. 1992).

Like scabies, temporal and spatial correlations between domestic sheep grazing on bighorn sheep ranges and the appearance of disease in the bighorn sheep led to the hypothesis that domestic sheep were probably a major source of pneumonia in bighorn sheep (Goodson 1982). Considerable research has found that contact between healthy domestic sheep and healthy bighorn sheep in captivity consistently leads to fatal pneumonia in the bighorn sheep (Wehausen et al. 2011), and Lawrence et al. (2010) documented the interspecies transfer of key respiratory tract bacteria from domestic sheep to bighorn sheep. This respiratory disease relationship between these sheep species helps explain the historical pattern of widespread extirpation of bighorn sheep populations in the geographic range where domestic sheep have been grazed, but the lack of a change in the distribution of North American wild sheep north of the geographic distribution of past domestic sheep grazing (Wehausen et al. 2011). It has also lead to recommendations of sufficient buffer distances between these two species to minimize the risk of interspecies contact (Wehausen et al. 2011).

While one strain of respiratory tract bacterium (*Mannheimia hemolytica* type A2) has been repeatedly identified as fatal to bighorn sheep, searches for all such bacteria that are fatal to bighorn sheep has been less than successful because of limitations of the research methods available (Wehausen et al. 2011). One research finding suggested the implication of *Mycplasma ovipneumoniae* as a co-factor (Besser et al. 2008). Other research has identified a second bacterium potentially present in domestic ungulates other than sheep that is fatal to bighorn sheep (Dassanayake et al. 2009). And, research on a recent pneumonia die-off of bighorn sheep in Colorado has implicated cattle as a potential source of the fatal pneumonia (Wolfe et al. 2010). Domestic goats have been similarly implicated (Rudolph et al. 2003, Foreyt et al. 2009). Domestic sheep and goats pose the greatest threats to the health of bighorn sheep because bighorn sheep will socialize with them, providing considerable opportunity for transmission of respiratory tract

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microbes. In contrast, bighorn sheep do not readily mingle with domestic cattle, making transmission of microbes much less probable. However, because probabilities are additive over time, the overall probability of disease transmission from cattle is considerably higher where their ranges overlap bighorn sheep year after year. This may be yet higher where both species share a water source.

Lungworms of the genus *Protostrongylus* can become an important predisposing factor for pneumonia and mortality in bighorn sheep in the Rocky Mountains when infection levels are high (Forrester 1971, Woodard et al. 1974). Methods have been developed to control these nematode parasites in wild populations (Schmidt et al. 1979). Protostrongylid lungworms of bighorn require a snail intermediate host, which Boag and Wishart (1982) found to inhabit coniferous forest duff in the Canadian Rockies. Most habitats utilized by desert bighorn sheep are too arid to support snails and lungworm infections. For Nevada McQuivey (1978) reported that the only bighorn sheep populations showing lungworm infection were in mountain ranges in which the sheep used pinyon pine forests. For desert bighorn in California, only the populations in the White and Inyo Mountains have been found to harbor protostrongylid lungworms (Wehausen 1983, 1984b, Clark et al. 1985). Both are high mountain ranges that include a large elevational band of pinyon juniper woodland and apparently provide adequate habitat for the snail intermediate host.

Lungworm infection levels in bighorn sheep are known to vary seasonally and between years (Uhazy et al. 1973), and in the Rocky Mountains autumn infection levels were found to correlate with April-June rainfall (Forrester and Littell 1976). Such variation is apparent in the White Mountains in California, where following one particularly wet spring bighorn sheep exhibited widespread barely audible coughs while feeding, and notably elevated fecal lungworm levels as high as 3000 larvae per dry gram of feces (J. D. Wehausen, unpubl. data).

Other infectious diseases may be of concern for bighorn sheep in selected instances. Bluetongue virus was responsible for die-offs of bighorn sheep in the Lava Beds enclosure in California (Blaisdell 1975) and at the Red Rock facility in New Mexico (Singer et al. 1998). For the Red Rock facility, a comparative study of bluetongue exposure in adjacent cattle indicated that those bovids likely were not the source of infection (Singer et al. 1998). Similarly, Singer et al. (1997) found that neither deer nor cattle were implicated in the Lava Beds die-off. A serologic survey of bighorn sheep in California found evidence of widespread exposure to bluetongue and its close relative, epizootic hemorrhagic disease, both of which are transmitted by gnats (Clark et al. 1985, 1993). One or both of these diseases may have played a key role in episodes of high spring losses of bighorn lambs to pneumonia in multiple desert bighorn sheep populations in California (DeForge et al. 1995, Wehausen 1992b).

Predation and Other Mortality Factors

Bighorn sheep die from a variety of causes other than disease, including predation, and accidents. Of particular interest relative to population dynamics are factors that remove females at younger ages when considerable reproductive potential remains.

Various predators kill wild sheep in North America, including wolves, mountain lions, coyotes, bears, bobcats, wolverines, and eagles (Ober 1931, Kelly 1980, Berger 1991, Nichols and Bunnell 1999, Bleich 1999), of which wolves and wolverines can be removed as predators in desert

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bighorn sheep habitat in California, except for the possible rare wolverine in the White Mountains (Carey and Wehausen 1991).

Cervids are usually the primary prey of mountain lions in North America (Ross et al. 1997); consequently, it is usually only bighorn sheep populations that are in close proximity to deer and elk ranges that suffer sustained losses to this predator. In some situations use of domestic calves as prey can artificially elevate mountain lion populations and increase predation on nearby desert bighorn sheep (Rominger et al. 2004). Where bighorn range overlaps or is immediately adjacent to higher density mule deer populations, mountain lions are usually the primary predator of bighorn sheep, as well as the single largest source of mortality (Wehausen 1996, Hayes et al. 2000, Rominger et al. 2004). Where this predation has been studied in adequate detail, significant losses of bighorn sheep have been attributable to relatively few mountain lions that may have shifted their prey selection to focus more on bighorn sheep (Ross et al. 1997, Ernest et al. 2002, Festa-Bianchet et al. 2006). Populations of desert bighorn sheep are small in general (Epps et al. 2004) because of the nature of the habitat they occupy, and this allows one or a few mountain lions to have a potentially large influence on population dynamics (Ernest et al. 2002), even if bighorn sheep are a relatively small proportion of the prey that they kill. Such predation also tends to be episodic (Wehausen 1996), thus can be viewed as a stochastic influence (Festa-Bianchet et al. 2006), but on a longer time frame compared with rainfall. Because it can greatly depress annual adult survivorship (Wehausen 1996, Hayes et al. 2000, Rominger et al. 2004), mountain lion predation can overpower influences of other factors on desert bighorn sheep population dynamics and cause rapid population declines (Wehausen 1996), even potentially serve as an inverse density-dependent, population destabilizing factor (Rominger et al. 2004).

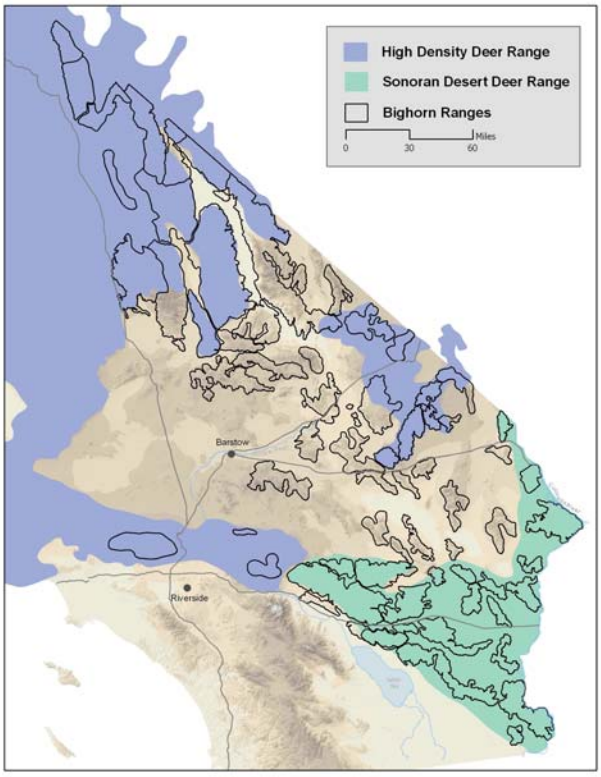

Figure 1. Distribution of deer relative to desert bighorn sheep in California. Distribution of resident mountain lions matches the northern higher density deer range.

Desert mule deer that largely inhabit ironwood washes in the Sonoran Desert of southern California apparently occur at insufficient density to support sustaining mountain lion populations. Consequently, desert bighorn sheep populations in proximity of deer can be classified into two categories relative to potential influences of mountain lions: Sonoran Desert vs Mojave and Great Basin Deserts (Figure 1). Higher average rainfall has resulted in a finger of Great Basin habitat that protrudes into the eastern Mojave Desert of California from the east, terminating in the Providence and Granite Mountains (Figure 2). Deer were introduced to that habitat in 1948 (Cronin and Bleich 1995). Mountain lions apparently followed decades later and were found to be the driver of bighorn sheep population dynamics in one mountain range (Wehausen 1996). Mountain lion predation on desert bighorn sheep has been documented in numerous other mountain ranges in California, and found to be a significant mortality factor in some (Jaeger 1994, Hayes et al. 2000, Schaefer et al. 2000, Holl et al. 2004).

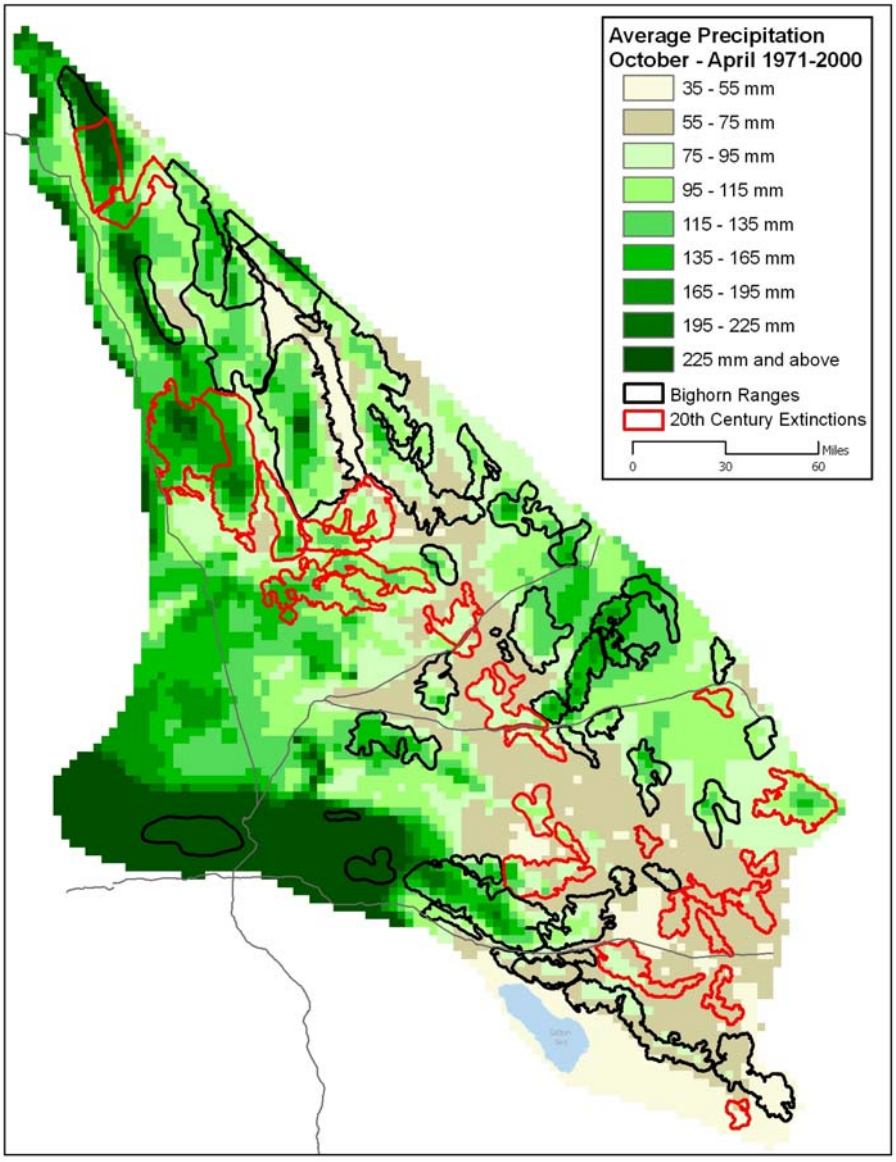

Figure 2. Cool season (October-April) precipitation variation across desert bighorn sheep habitat in southeastern California.

Population Regulation

An early simple concept of wildlife population ecology pitted the positive reproductive force of a population against a negative force termed environmental resistance, with the interaction of those forces underlying population dynamics (Leopold 1933). In the absence of environmental resistance, populations will grow exponentially. The various factors that make up the environmental resistance can be classified as density independent or density dependent. Factors (expressed as rates per individual) that have trends that correlate with increasing population density fit the latter category; factors that are density independent lack such a relationship.

No population increases exponentially indefinitely. While in theory a population might increase exponentially and suddenly cease growing and stabilize at some carrying capacity (ceiling model), ungulates typically show some form of S-shaped population growth trajectory. It is density dependent factors that determine that S shape through negative feedback loops. In ungulates, those feedback loops mostly involve recruitment rate (Galliard et al. 1998). In addition to limiting how large a population can grow, at the other end of the population size spectrum, density dependent factors serve importantly as forces resisting extinction (Morris and Doak 2002). Traditional density dependent factors result in high rates of population growth at lower densities, low rates of growth as population density approaches carrying capacity, and negative rates of population growth for population densities above carrying capacity; hence the term regulation. However, at very low density an antiregulatory phenomenon known as the Allee effect can accelerate extinction in some species (Morris and Doak 2002).

How tightly a population is regulated will be determined by the relative mix of density dependent and density independent factors that affect population change, and lag times associated with the density dependent factors. Population regulation weakens as this mix shifts toward density independent factors. Caughley (1987) coined the term centripitality to characterize the dynamics of kangaroo populations in desert ecosystems of Australia, where the influences of highly variable rainfall on forage growth largely drove the population dynamics in a density independent pattern. He concluded that despite the large influence of density independent (stochastic) variation, the underlying density dependent mechanisms continue to have an important stabilizing influence in such systems by dampening fluctuations.

The centripitality concept of population regulation fits desert bighorn sheep in California well, as would be expected in these water limited ecosystems with highly variable rainfall. Using analyses of long term data from bighorn sheep populations in the eastern Mojave Desert of California, Wehausen (2005) elucidated a causal network that connects cool season rainfall to late winter and spring diet quality, and that diet quality to lamb recruitment. There is also evidence of covariation between lamb recruitment and adult survivorship (Wehausen 1997); in years of low rainfall, poor diet quality, and low lamb survival, adult survivorship also declines considerably.

For desert bighorn sheep, two factors can be expected to help populations resist local extinctions. One is an underlying density-dependence in recruitment rate despite high stochastic variation from cold season rainfall. Second is the relatively high longevity of females and their continued reproductive output at older ages. This second factor will help a population survive numerous years of low recruitment, in part by making considerable gains in occasional more favorable years despite an age structure dominated by older animals (Wehausen 1992b).

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Competition with Other Ungulates

There are historical records of pronghorn antelope (*Antilocapra americana*) in some areas of the California desert, but the mule deer (*Odocoileus hemionus*) is the only other native ungulate that currently overlaps the range of desert bighorn sheep in California. In Sonoran Desert habitat at the southern end of desert bighorn sheep habitat considered in this plan, desert mule deer (*O. h. eremicus*) inhabit ironwood wash habitats. Mostly they occupy intermountain areas utilized minimally by bighorn sheep for feeding, but where they overlap bighorn sheep habitat deer densities are very low (Andrew et al. 1997a); therefore this species is unlikely to be an important competitor for forage. Further north, mule deer inhabit the higher mountain ranges that include desert bighorn sheep habitat. Because of sufficiently different habitat selection by these deer compared with bighorn sheep, resource competition for forage species consumed by both species is unlikely. However, apparent competition can occur through a shared predator, the mountain lion, as discussed above.

Significant issues of competition with desert bighorn sheep involve a variety of introduced ungulates. In the past, domestic sheep would have been a significant competitor in a few locations in California, but disease transmission from domestic sheep discussed above was the more serious issue. In recent decades, cattle and feral burros have been the potential competitors of concern relative to desert bighorn sheep.

Cattle

The question of the effects of cattle grazing on bighorn sheep has a parallel with domestic sheep. For domestic sheep a large body of growing circumstantial evidence first compiled by Goodson (1982) suggested that many major pneumonia die-offs of bighorn sheep could be traced to contact with domestic sheep. Subsequent strong evidence reviewed above corroborated that causal relationship. For cattle a similar large and growing body of circumstantial evidence indicates that bighorn sheep populations do poorly or disappear in the face of sympatric cattle grazing (Gallizioli 1977).

Cattle cannot utilize the steeper habitat used by bighorn sheep; however, interpretation of minimal range overlap between these species as entirely due to different and natural habitat selection by these two species is potentially a misinterpretation of the effects of interference competition, where bighorn sheep mostly avoid areas utilized by cattle (Albrechtsen and Reese 1970, King and Workman 1984). This interference competition explanation is supported by observations of changes in habitat use by bighorn sheep following introduction of cattle, and following the removal of cattle, that are consistent with interference competition (Irvine 1969, Wilson 1975a). Similarly, the conclusion from circumstantial evidence that desert bighorn sheep populations do poorly where cattle overlap their range is supported by parallel natural experiments in which bighorn sheep populations have declined following introduction of cattle, or increased significantly following the removal of cattle (Webb 1972, Gallizioli 1977, Bates 1982). In California, a depressed population of desert bighorn sheep in the Cady Mountains (Wehausen 1992b) has flourished following the removal of cattle.

Specific observations of habitat degradation from cattle grazing in desert bighorn sheep habitat include frequent localized overgrazing (Gallizioli 1977) and fouling of water holes

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(Albrechtsen and Reese 1970). Recommendations have been to remove cattle from desert bighorn sheep ranges (Wilson 1975b, Gallizioli 1977).

Burros

Burros are an introduced large herbivore that, because of the habitat of its wild ancestor in northeastern Africa (McKnight 1958), is preadapted to living in desert ecosystems. In the desert region occupied by desert bighorn sheep, feral burro populations developed in the late 19th and early 20th centuries probably mostly from released and escaped pack stock (McKnight 1958). Concerns about the negative effects of this introduced herbivore have a long history based on observed negative influences of burros on habitat condition, and correlations between burro population increases and coincident decreases in desert bighorn sheep populations and bighorn sheep use of habitat occupied by burros (Jaeger 1950, McKnight 1958, Sumner 1959). While not as agile on steep rocky slopes as desert bighorn sheep, burros do utilize steep, rough topography, and therefore can overlap bighorn sheep and compete for forage in a significant proportion of bighorn sheep ranges.

Burros are not ruminants, and their caecal fermentation digestive system allows them to extract nutrients from low quality forages that desert bighorn sheep cannot digest (Janis 1976, Seegmiller and Ohmart 1981), giving burro populations a larger food resource base compared with bighorn sheep, especially in seasons and years when forage quality is low. That and their higher potential rate of population growth compared with desert bighorn sheep (Seegmiller and Ohmart 1976) predict that burros will outcompete desert bighorn sheep (Seegmiller and Ohmart 1981, Ginnet and Douglas 1982). Considerable circumstantial evidence is consistent with that prediction (McKnight 1958, Sumner 1959, Seegmiller and Ohmart 1981). Indeed, unchecked burro populations have greatly exceeded sympatric bighorn sheep populations in numbers and biomass (Seegmiller and Ohmart 1981).

Several specific negative ecosystem level influences of feral burros have been identified and studied. Burros can reach high population densities that lead to obvious overgrazing of forage species, especially in the vicinity of water sources (Sumner 1959, St. John 1965, Seegmiller and Ohmart 1976, Douglas and Norment 1977, Hanley and Brady 1977). Their diet selection can substantially overlap that of sympatric bighorn sheep, which in combination with burro overgrazing suggests a high potential for resource competition (McMichael 1964; St. John 1965; Seegmiller and Ohmart 1975, 1976, 1981; Walters and Hansen 1978; Ginnet and Douglas 1982). Burros are well known to foul previously pristine water sources by walking, urinating and defecating in the water (Weaver 1959, Dunn and Douglas 1982). They also monopolize water sources in the hot season making it difficult for bighorn sheep to find a time to drink undisturbed (Weaver 1959, St. John 1965). Dunn and Douglas (1982) found that bighorn sheep females and associated sheep would not visit water sources used by burros, indicating a strong interference competition. The large hooves and high population densities of burros have resulted in considerable physical habitat damage in the form of dense trailing and soil erosion (Sumner 1959, Weaver 1959, Walters and Hansen 1978).

Recognition of these burro effects have long prompted knowledgeable biologists to call for the control and elimination of burro populations where they overlap bighorn sheep habitat (Weaver 1959, 1972; Sumner 1959; Wilson 1975) One strategy for managing feral burros in bighorn sheep habitat has been to fence water sources with a pipe fence design that excludes burros but allows access to bighorn sheep (Cleary 1973, Andrew et al. 1997b).

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Metapopulation Dynamics

A metapopulation is a network of geographically distinct populations that are connected through migration events in which sheep move between populations. Two types of migration processes occur in metapopulations. One is the migration of genes between populations, which plays an important role in maintenance of genetic diversity. While migration by both sexes contributes to this gene flow, male migration can be the dominant source of gene flow. The other migration process involves the colonization of habitat vacated by the extinction of populations. This requires migration by both sexes, and the colonization rate must exceed the extinction rate for a metapopulation to persist (Hanski 1991). The metapopulation approach to population ecology recognizes the critical nature of gene flow and colonization, and that important dynamics occur at a metapopulation level in addition to individual populations. From a conservation standpoint, an important consideration is long-term viability of the entire metapopulation, rather than just individual populations. The geographic distribution and migration behavior of desert bighorn sheep fit the metapopulation concept particularly well; their preferred habitat is naturally discontinuous and sheep of both sexes move between those habitat patches (Schwartz et al. 1986, Bleich et al. 1990a, 1996).

Gene Flow, Small Populations, and Inbreeding

Genetic diversity within populations results from the combined influences of three factors: gains from immigration and mutation, and losses from genetic drift. The rate of loss of genetic diversity from genetic drift is inversely related to population size. One of the basic equations of population genetic theory is the drift mutation model, an equation that simultaneously incorporates the effects of genetic drift and mutation rate. A fundamental conclusion from that model is that at high population sizes genetic drift is inconsequential, leaving mutation rate as the variable determining genetic diversity. At the other end of the population size spectrum the opposite occurs: genetic drift is the dominant force continually eroding genetic diversity (Hartl and Clark 1997, Gillespie 1998). Bighorn sheep are the epitome of this latter situation, occurring in small populations, often with fewer than 100 sheep (Epps et al. 2003, Dolan 2006). Genetic diversity (heterozygosity) in isolated populations declines due to genetic drift by a factor of $1/2N_e$ per generation, where N_e is genetically effective population size, which may be as low as 10% of actual population size (Frankham 1995). In the absence of gene flow between populations, genetic diversity in desert bighorn sheep would erode rapidly.

In time, declining genetic diversity will lead to increasing coefficients of inbreeding (equivalent of mating among relatives) that at some level will have negative demographic effects through some form of inbreeding depression (reduction in fitness; Soulé 1980) and loss of adaptability. At what point that will occur is not known and will be influenced by the general history of inbreeding and other factors that challenge bighorn sheep herds. It has been suggested that lamb survival and horn growth in bighorn sheep are influenced by inbreeding (Sausman 1982, Stewart and Butts 1982, Fitzsimmons et al. 1995). There is also growing evidence that disease resistance is significantly affected by levels of heterozygosity (Carrington et al. 1999, Coltman et al. 1999). Hogg et al. (2006) presented evidence that numerous fitness traits of a small isolated bighorn sheep population on the National Bison Range were negatively affected by inbreeding following numerous decades of declining genetic diversity due to genetic drift.

DRAFT

A small amount of gene exchange among herds via movements by males and occasional females can counteract reductions in heterozygosity that might otherwise develop in small, isolated populations (Schwartz et al. 1986). Geist (1971) noted that bighorn sheep rams in the northern Rocky Mountains showed a strong tendency to rut in other than their natal home ranges, a behavior that would avoid inbreeding and help counter heterozygosity losses due to genetic drift. Desert bighorn sheep males regularly move between mountain ranges, apparently in search of females with which to breed (Bleich et al. 1996), and where geographic distances between groups of females within metapopulations are not great, gene migration occurs readily (Epps et al. 2005).

Population Substructuring

Substructuring is also well documented to occur within what are often designated as single herds of bighorn sheep (Geist 1971, Holl and Bleich 1983, Festa-Bianchet 1986, Wehausen 1992a, Jaeger 1994, Andrew et al. 1997a, Rubin et al. 1998). Such substructuring is defined by separate home range patterns. Although more evident in females, it can occur in both sexes. Because separate female groups often represent different maternal lineages (Festa-Bianchet 1986), differences in (maternally inherited) mitochondrial DNA profiles between them are often detectable (Bleich et al. 1996, Boyce et al. 1999). Bleich et al. (1996) suggested that separate female groups are the fundamental building blocks of bighorn sheep metapopulations.

Source-Sink Metapopulation Dynamics

Habitat patches within a metapopulation can differ considerably in importance relative to metapopulation processes. First, better habitat patches will support larger, more stable populations that are less vulnerable to extinction. On the long term those patches will be net exporters of genes and colonists. At the other end of that spectrum, poorer habitat patches will be net importers of genes because they support relatively small unstable populations that undergo relatively frequent extinction. On another dimension, degree of isolation by distance and/or geographic location of each habitat patch in a metapopulation relative to other patches will determine its role relative to metapopulations processes. For instance, those patches in central locations networked with multiple adjacent patches will play important metapopulation roles compared with marginal patches that interact in a limited number of directions with few other patches. From a conservation standpoint it is important to recognize these differences among habitat patches relative to roles in metapopulation processes to focus efforts where the highest return for metapopulation persistence will result.

DESERT BIGHORN SHEEP IN CALIFORNIA

Taxonomy and Uniqueness

Cowan's (1940) seven proposed subspecies of bighorn sheep have not stood up to statistical morphometric scrutiny nor genetic analyses in the context of a subspecies definition (Ramey 1993, 1995; Wehausen and Ramey 1993, 2000). Appropriate statistical analyses of the data that Cowan used to propose those subspecies could not find support for more separation than desert bighorn from Rocky Mountain bighorn (Ramey 1993). Concordant results of new analyses of cranial morphometric variation and mtDNA variation in California relative to larger regions (Wehausen and Ramey 1993, 2000) have found support for only two subspecies: desert bighorn (*Ovis canadensis nelsoni*) and Sierra Nevada bighorn (*O. c. sierrae*; Wehausen et al. 2005), of which this plan addresses only the former. There is similar lack of support for additional desert subspecies

DRAFT

outside of California (Wehausen and Ramey, unpubl.), and recent mtDNA sequence variation indicates that variation among desert bighorn represents a radiation too recent to produce deep divergences (Wehausen, Epps, and Ramey, unpubl.). This supports Ramey's (1993, 1995) proposal that desert bighorn be viewed as one polytypic subspecies.

The lack of defensible subspecies of desert bighorn sheep does not mean that there is no important variation within that subspecies that should be recognized in conservation decisions. Desert bighorn sheep occupy a great variety of habitats ranging from southern Sonoran and Chihuahuan hot deserts to cold northern deserts, including even alpine desert environments in California and Nevada. These different habitats present great variation in selective forces on the bighorn sheep inhabiting them. One apparent adaptation is the timing of lambing seasons, of which the month of initiation and total length vary greatly, as discussed above. There are likely other climate related adaptations, such as horn size (Wehausen 1991).

California encompasses much of this habitat variation for desert bighorn sheep, ranging from hot Sonoran low desert in the south to the cold alpine desert in the White Mountains. Correlated with this spectrum is considerable variation in life history traits (Wehausen 2005). At the cold end of the spectrum, the population in the White Mountains has a short lambing season beginning in late April, whereas this can begin as early as December and occasionally November at the southern end of the state (Wehausen 1983, 2005).

Cranial morphometric analyses indicate that the range of desert bighorn once extended north through Oregon (Wehausen and Ramey 2000), where life history patterns undoubtedly would have been similar to bighorn sheep further north. All native populations of desert bighorn sheep at the northern extreme of their range in Oregon, and adjacent areas of southwestern Idaho, northeastern California, and northern Nevada went extinct (Buechner 1960), leaving surviving representatives of northern desert bighorn only in the White Mountains of California and a few mountain ranges further east in Nevada. These include the Toiyabe and Toquima Ranges, both of which contain alpine habitat. In recent years the Nevada Department of Wildlife has translocated bighorn sheep with much earlier lambing initiation from the southern end of the state both to re-establish herds in this region and to augment most of the native populations of northern desert bighorn. This places the population in the White Mountains in a particularly unique position of being apparently one of only two remaining populations of northern desert bighorn that are genetically "pure"; the other population is Lone Mountain in Nevada a short distance east of the White Mountains. Consequently, this plan recognizes bighorn sheep in the White Mountains as a particularly unique resource. This has important conservation implication relative to potential sources of stock for future reintroductions to northeastern California. Because of apparent adaptations to a colder climatic pattern, bighorn sheep in the White Mountains are the only appropriate source of translocation stock in California for reintroduction to vacant habitat in northeastern California.

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Habitat Variation and Metapopulation Processes

The deserts of California result from tectonic activity that produced particularly high western mountain ranges that create rain shadows in the southeastern corner of the state. However, seasonally different storm patterns and elevations of mountain ranges across the desert region of California result in a particularly wide array of desert habitats occupied by desert bighorn sheep, varying from hot, Sonoran low elevation desert in the south to the extensive cold alpine desert in the White Mountains. There is a general correlation between maximum elevation of mountain ranges

and latitude, with higher ranges further north. In addition to altitudinal differences, there is notable variation in cool season rainfall. Of particular note is the high rainfall along the western extreme and low rainfall in a south central part of the desert (Figure 2). Because the amount of cool season rainfall largely determines nutrient availability to these sheep in most of these ecosystems (Wehausen 2005), the pattern of average cool season rainfall (Figure 2) also will reflect variation in population density that these ranges can potentially support. When coupled with other factors such as sizes of mountain ranges, this habitat quality variation results in considerable variation in the sizes of populations of desert bighorn sheep in California. However, overall those sizes are small, with only about 15% of extant populations exceeding 100 sheep in a recent compilation (Table 1). At these sizes genetic drift would rapidly erode genetic diversity in the absence of gene flow (Table 1).

Table 1. Population size distribution for desert bighorn sheep in California excluding the Peninsular Ranges (modified from the compilation of Epps et al. 2003). Rodman Mountains were not included as extinct because they are now combined with Newberry/Ord as done by Weaver (1975). Heterozygosity loss rates are per generation for the largest population size in each category and are for a N_e/N range of 0.5 – 0.1 calculated from the standard drift equation.

Size Category	Populations	Percent	Heterozygosity Loss Rate
Extinct	8		
<25	7	14.6	4 - 20%
25-50	15	31.2	2 - 10%
51-100	19	39.6	1 – 5%
>100	7	14.6	

Relative measures of genetic diversity have been developed for most desert bighorn sheep populations in California (Figure 3). Analyses of resulting gene flow estimates found three variables that affected rate of gene flow. First is slope; sheep move much more readily across terrain with a slope of at least 15%, compared with valley bottoms of lower slope (Epps et al. 2007). Second is distance; the further the distance between mountain ranges the lower the gene flow, which reached a low asymptote at 16.4 km of valley bottom (low slope) habitat (Epps et al 2005, 2007). Third were anthropogenic barriers that have effectively terminated gene flow (Epps et al. 2005).

All desert bighorn sheep in California were once one large metapopulation. Three major interstate highways (15, 40, and 10) have split this metapopulation into six metapopulation fragments due to a lack of adequate migration across those barriers (Epps et al. 2005, 2007). One of those fragments in the Peninsular Ranges was naturally isolated by the wide Coachella Valley and connected to other populations in the state perhaps exclusively at its north end across San Gorgonio Pass. The metapopulation fragment in the Transverse Range west of the Interstate Highway 15 also would have originally been substantially isolated by distance and tall vegetation in this zone of higher rainfall (Figure 2). The remaining four metapopulation fragments are the focus of this plan and vary considerably in size (Figure 4).

DRAFT

Because desert bighorn sheep move across sloped habitat much more readily than across valley bottom habitat of < 15% slope (Epps et al. 2007), their habitat considered in this plan was partitioned into those two classes, labeled mountain and intermountain habitat (Figure 4). In addition to the 15% slope criterion used to separate these two habitat classes, intermountain habitat also was limited to a maximum effective geographic distance (EGD) of 16.4 km, where stepping stones of mountain habitat had distance weightings 1/10th that of intermountain habitat of <15% slope, based on the least cost path analysis of gene flow estimates by Epps et al. (2007). This EGD limitation identified wider valleys that sheep are unlikely to cross, which consequently are not considered bighorn sheep habitat (Figure 4). The mountain and intermountain habitat in Figure 4 represents historic habitat of desert bighorn sheep in California. Because intermountain migration by both sexes is essential for the persistence of desert bighorn sheep, mountain and intermountain habitat are equally important habitat components.

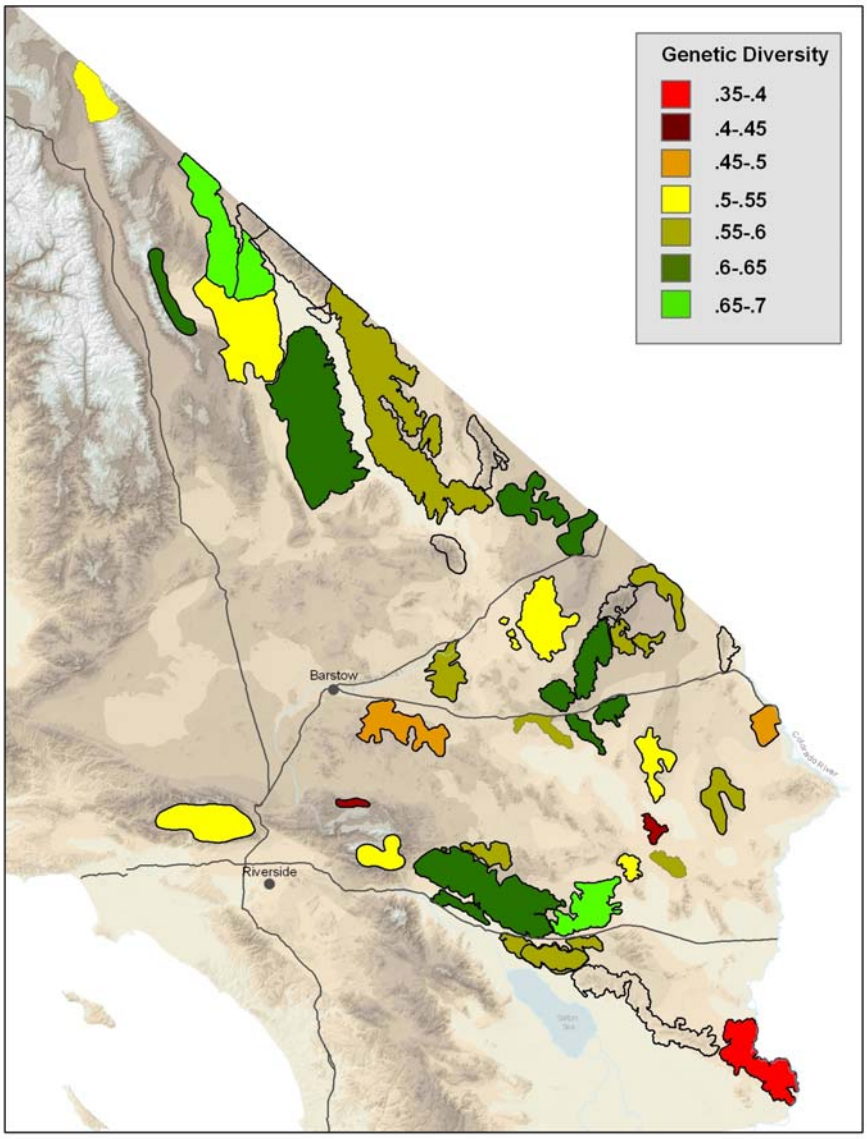

Figure 3. Genetic diversity (expected heterozygosity) for desert bighorn sheep populations sampled in California.

Herd Units

Based on known current and historic distribution of desert bighorn sheep in California, herd units were defined and have been given an identification number in Figure 4. Table 2 provides basic information on each of these herd units. Because (1) migration by both sexes between areas of more concentrated use is essential to these sheep, and (2) areas of more concentrated use by sheep have varied over time and can be expected to vary in the future depending on availability of various important resources, herd units were identified only regionally by mountain ranges included (Table 2, Figure 4). Some of these herd units are currently vacant (Table 2), and occupied herd units vary in the number of reproductive units (geographically distinguishable female concentrations) they encompass.

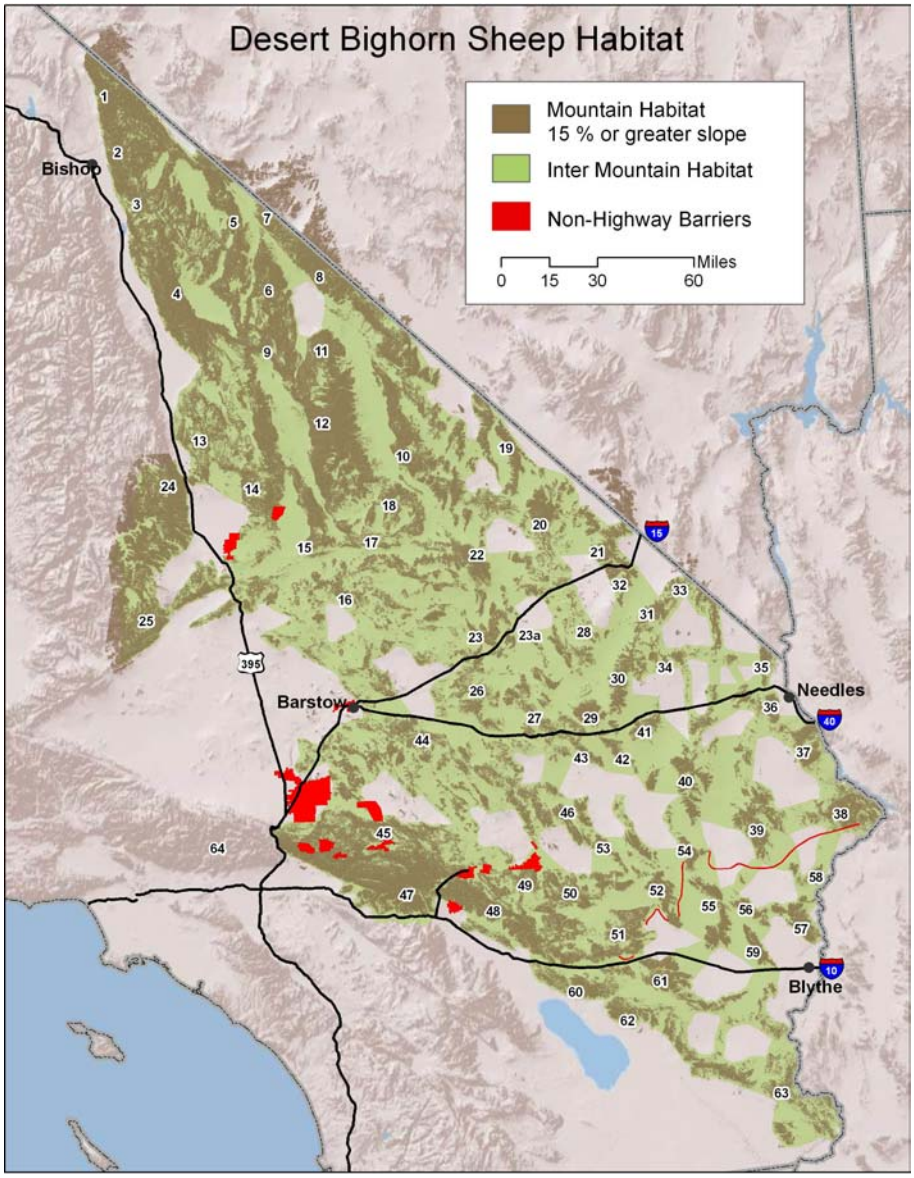

Figure 4. Historic desert bighorn sheep habitat in California segregated into mountain and intermountain habitat. Numbers identify herd units in Table 2. Interstate Highways 15, 40, and 10 are barriers to migration and gene flow and have fragmented what was once a single metapopulation. Other partial barriers are plotted as well.

Table 2. Herd units plotted on Figure 1 with agency jurisdiction and status

ID #	Herd Unit	Jurisdiction	Status
1	Northern White Mountains	USFS	N
2	Southern White Mountains	USFS	T
3	Deep Springs	USFS/BLM	C
4	Inyo Mountains	USFS/BLM	N
5	Last Chance and Dry Mountain	NPS	N
6	Tin Mountain	NPS	N
7	Grapevine Mountains	NPS	N
8	Funeral Mountains	NPS	N
9	Hunter Mountain & Panamint Buttes	NPS	N
10	Black Mountains & Greenwater Range	NPS	N
11	Tucki Mountain	NPS	N
12	Panamint Mountains	NPS/BLM	N
13	Coso Mountains	DOD/BLM	C
14	Argus Mountains	DOD/BLM	T
15	Slate Range	DOD/BLM	V
16	Eagle Crags	DOD	T
17	Brown, Quail, and Granite Mountains	DOD	V
18	Owlshead Mountains	NPS	V
19	Nopah Mountains & Resting Spring Range	BLM	N
20	Kingston, Mesquite, and Shadow Mountains	BLM	N
21	Clark Mountain & Spring Range	NPS	N
22	Avawatz Mountains	DOD/BLM	N
23	Soda Mountains	BLM	V
23a	South Soda Mountains	BLM/NPS	C
24	Chimney Peak	BLM	V
25	Cache Peak, El Paso Mountains	BLM	V
26	Cady Mountains	BLM	N
27	North Bristol & Old Dad Mountains	BLM	T
28	Old Dad Pk., Kelso Pks., Marl Mts., & Club Peak	NPS	N
29	Granite Mountains	NPS	N
30	Providence Mountains	NPS	N
31	New York Mountains	NPS	N
32	Mescal & Ivanpah Mountains	NPS	V
33	Castle Peaks, Castle Mountains, & Piute Range	NPS/BLM	N
34	Woods & Hackberry Mountains	NPS	N
35	Dead Mountains	BLM	N
36	Sacramento Mountains	BLM	V
37	Chemehuevi Mountains	BLM	N
38	Whipple Mountains	BLM	T
39	Turtle Mountains	BLM	N
40	Old Woman & Piute Mountains	BLM	N
41	Clipper Mountains	BLM	N
42	Marble Mountains	BLM	N

DRAFT

43	South Bristol Mountains	BLM	C
44	Newberry, Ord, and Rodman Mountains	BLM/DOD	N
45	North San Bernardino Mountains	USFS/BLM	C
46	Bullion Mountains	DOD	T
47	Mount San Gorgonio	USFS/BLM	N
48	Little San Bernardino Mountains	NPS/BLM	N
49	Queen Mountain	NPS	N
50	Pinto Mountains	NPS	V
51	Eagle Mountains	NPS	N
52	Coxcomb Mountains	NPS	N
53	Sheephole & Calumet Mountains	BLM	T
54	Iron Mountains	BLM	C
55	Granite & Palen Mountains	BLM	N
56	Little Maria Mountains	BLM	C
57	Big Maria Mountains	BLM	V
58	Riverside Mountains	BLM	V
59	McCoy Mountains	BLM	V
60	Orocopia Mountains	BLM	N
61	Chuckwalla Mountains	BLM	T
62	West Chocolate Mountains	DOD	N
63	East Chocolate & Cargo Muchacho Mountains	BLM	N
64	San Gabriel Mountains	USFS	N

N = native; C = natural colonization; T = translocated; V = vacant
BLM = Bureau of Land Management; DOD = Department of Defense; NPS = National Park Service; USFS = U. S. Forest Service

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Population Extinction Patterns and Correlates

Desert bighorn sheep in California suffered considerable loss of populations in the twentieth century (Wehausen et al. 1987b, Wehausen 1999). This was a widespread phenomenon for bighorn sheep south of Canada, and is particularly pronounced in areas with a history of extensive domestic sheep grazing (Wehausen et al. 2011). The extensive loss of bighorn sheep populations beginning in the second half of the 19th century traditionally has been attributed to diseases introduced from domestic sheep, competition with domestic sheep, and early unregulated hunting (Beuchner 1960). Desert bighorn sheep in California appear to differ from most states in the temporal pattern of population losses; in California most such losses occurred well into the twentieth century (Wehausen et al. 1987b, Wehausen 1999). Epps et al. (2004a) analyzed those losses relative to surviving populations and found four variables that statistically were associated with higher probabilities of extinction: lower maximum elevation, lower average rainfall, lack of reliable surface water, and a history of domestic sheep grazing. Except for domestic sheep grazing, which statistically accounted for the disappearance of desert bighorn sheep populations in the Transverse Range, the very southern Sierra Nevada, and the northwestern Mojave Desert, a conclusion from that study is that most desert bighorn populations lost in California in the twentieth century were in more marginal habitat.

One test of this model examined 18 extant populations and found that those classified by the model to have higher extinction risk due to lower rainfall and elevation were associated with lower

growing season diet quality as measured by percent fecal nitrogen (Epps 2004b). A second test of this extinction model involves classification of populations lost in the twentieth century relative to the maximum number of sheep seen prior to extinction, which yields a strongly bimodal distribution (Figure 5). This distribution suggests the possibility that about half of those extinctions involved populations that may have lacked viability prior to disappearing, which would be consistent with populations inhabiting marginal habitat. Examination of the geographic distribution of extinct populations relative to cool season rainfall finds a concentration of such populations in the south central drier part of the California desert (Figure 2).

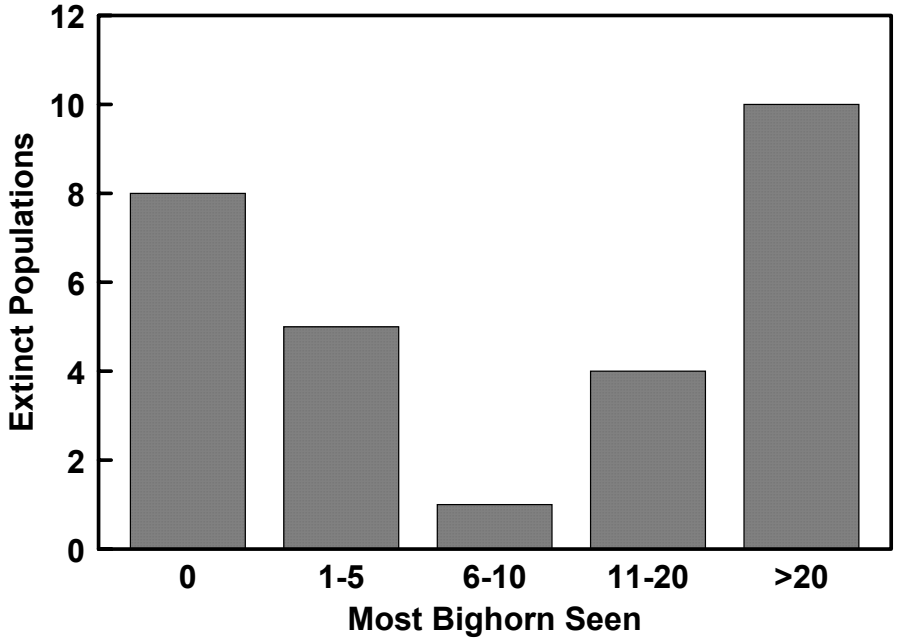

Figure 5. Highest number of bighorn sheep recorded prior to extinction for all populations in California known to go extinct in the twentieth century.

The loss of many of those populations in the twentieth century also coincided with a long drought period (Figure 6). For Parker Arizona at the southeastern edge of the California desert, October-April rainfall averaged 2.25 inches during the 1942-72 drought period and only 1.84 inches during the 1946-61 peak drought period. Compared with an average of 3.68 inches during 1895-1941 these drought levels are respectively 61 and 50%. This mid twentieth century drought period is evident in long term rainfall data throughout the California desert region (Appendix II). Other factors (e.g. localized poaching, human usurpation of springs) may have contributed to the extirpation of some herds. However, it appears that many of the herds that went extinct may reflect the influence of a protracted drought period on small populations inhabiting more marginal habitat. It is likely that many of those populations in more marginal habitat have experienced repeated extinction and re-colonization events over longer time periods. Of particular note is a southern region from the Iron Mountains south to the East Chocolate Mountains of low average rainfall (Figure 2) that would be particularly hard hit during a prolonged drought. Some of the extant

populations in this zone may persist only because of natural re-colonizations and a rescue effect from continuing migration (e.g. Coxcomb, Granite/Palen, East Chocolate herd units).

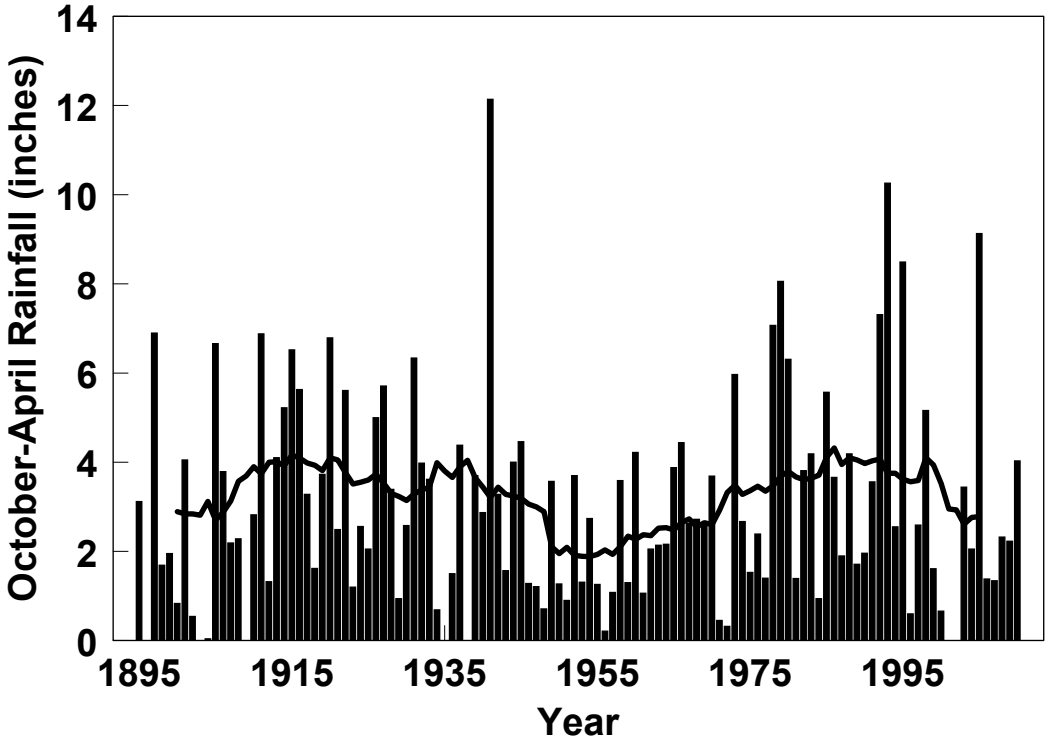

Figure 6. October-April rainfall for Parker Arizona with 15-year running means.

The mid twentieth century drought period ended in 1973. Since then, the prior pattern of an increasing net loss of populations has shifted to one in which natural colonizations exceed extinctions (Table 3). Thus, the metapopulation dynamics of desert bighorn sheep in California appears to be episodic in nature, as opposed to a continuous balance between extinction and colonization. The current period of greater colonization than extinction suggests that natural metapopulation dynamics may be viable on the long term, particularly with the elimination of earlier additional causes of extinction such as respiratory disease from domestic sheep, competition from non-native ungulates, losses of water sources to human activities, and localized uncontrolled hunting.

Table 3. Metapopulation dynamics by time periods.

Time Period	Extinctions	Colonizations
Before 1972	13	0
1972-1985	4	0
After 1985	2	6
Translocated 1983-1992??		9

Metapopulation Roles and Source-Sink Dynamics

The extinction analysis of Epps et al. (2004) elucidated and quantified great variation among occupied and vacant habitat patches in their ability to support bighorn sheep populations over long time periods. Those habitat differences form an important basis for evaluating the relative metapopulation roles of different habitat patches and for prioritizing conservation actions. Given this important role of the extinction model that Epps et al. (2004) produced, its robustness was first evaluated and found to be high (Appendix I). As part of that process a new analysis was produced using a reduced data base to produce a model most appropriate to the desert bighorn sheep habitat considered in this plan (Appendix I). Of the four variables in that model, two (domestic sheep grazing and reliable water) are amenable to management actions. Risk of contact with domestic sheep can be eliminated and reliable water can be created where it has been absent. Consequently, the new extinction model was also modified to represent the management situation where both of those variables are universally optimal (not limiting) and that model was applied to all habitat patches to yield habitat potential (Appendix I, Figure A3). The resulting variation in habitat potential is important relative to prioritizing conservation actions called for in this plan.

Management and Legislative History

Native Americans

Native Americans hunted desert bighorn sheep extensively in California, especially in mountain ranges that provided other resources, as evidenced by projectile points, rock art, and bighorn sheep remains at midden sites. For instance, one group of Native American in the Death Valley area was known as the Sheep Eaters because of that specialization. Native American hunting methods included chasing bighorn sheep to hunters hidden in rock blinds along predictable escape routes (Muir 1894). Extensive petroglyphs in the Coso Mountains even include depiction of the use of dogs in such hunts. In that range there are also stacks of rocks on bluffs clearly intended to mimic humans to further steer running bighorn sheep to the hunting blinds There is speculation that hunting by Native Americans may have driven the bighorn sheep population in the Coso Range to extinction (Garfinkel et al. 2010).

Early Legislative Protection and the Period of Passive Conservation

Uncontrolled hunting of wildlife by Europeans occurred following their colonization of California, including market hunting. The obvious rapid decimation of multiple wildlife species led to initiation of legislative protection beginning in the 1870s. For bighorn sheep this first occurred in 1876 with an amendment to add mountain (bighorn) sheep to an earlier Act of 1872 that protected elk, deer, and pronghorn for 8 months of the year. That Act was further amended 2 years later to establish a 4 year moratorium on the taking of any pronghorn or mountain sheep. For mountain sheep that Act was extended indefinitely in 1883 – a protection that continues today (Wehausen et al. 1987b).

While enacted in good faith, full protection in the 19th century largely lacked enforcement until the 20th century, when the California Department of Fish and Game (CDFG) was created, first as a law enforcement agency. When CDFG later added biologists to their staff, full protection for bighorn sheep became an impediment because funding from hunting and fishing license fees could not be utilized for non-game species (Wehausen et al 1987b). Consequently, few data were

DRAFT

collected on desert bighorn sheep for much of the 20th century, consisting initially of relatively crude population inventories about once a decade beginning in the late 1930s (Wehausen 1999). This began to change in the late 1960s with a considerably more thorough survey of desert bighorn sheep ranges (Weaver 1972) funded by Senate Resolution 43 (Weaver 1969). That survey concluded that the overall population trend of desert bighorn in California was negative, and that numerous populations had gone extinct in the previous 3 decades. It also identified factors likely limiting populations, and included detailed recommendations of how populations might be enhanced by developing water. This resulted in a cooperative program involving CDFG, BLM, and the Society for the Conservation of Bighorn Sheep to build water developments for desert bighorn sheep (Bleich et al. 1982b). This was the beginning of a shift in the conservation of desert bighorn sheep in California from a passive to an active approach.

Legislative attempts to return mountain sheep to game animal status began in the 1920s. Senate Bill SB527 in 1922 proposed an open season with a $100 license fee and tag system, but was opposed and defeated because its steep fee catered to the wealthy (Scofield 1923). Senate Bill SB833 in 1979 proposed making the Nelson subspecies (versus Peninsular and Sierra Nevada bighorn) a game animal, but was defeated. Assembly Bill AB1548 in 1983 was the same proposal as SB833, but also called for extensive data collection. It passed the House but died in a Senate Committee in 1984. Instead, funding was allocated from the Environmental License Plate Fund for the data collection aspect of the bill, and this initiated another episode of increased data collection on desert bighorn sheep.

Transition to More Active Conservation

DFG first compiled a list of rare and endangered species in California in the early 1970s, which included Sierra Nevada and Peninsular bighorn sheep (Leach et al. 1974). This was the first state document to call for bighorn sheep restoration (Wehausen et al. 1987b). In 1979 the first bighorn sheep caught and translocated within California established the first reintroduced herd in the Sierra Nevada (Bleich et al. 1990). Subsequent captures and translocations in the Sierra Nevada enabled the development of appropriate techniques for capturing and handling bighorn sheep within CDFG (Jessup et al. 1984, Kock et al 1987a, 1987b, 1987c). The discovery of some large populations of desert bighorn sheep capable of serving as sources of translocation stock enabled the expansion of that translocation program in 1983 to include desert bighorn sheep (Wehausen et al. 1987b, Bleich 1990). During 1983-2007**???** bighorn sheep were moved to the Whipple Mountains, Sheephole Mountains, Eagle Crags, Argus Range, Chuckwalla Mountains, Silver Canyon (White Mountains), and North Bristol Mountains in the Mojave Desert, and in the Transverse Range to Prairie Fork in the San Gabriel Mountains and San Rafael Peak (Bleich et al. 1990).

In 1986, Assembly Bill 3117 was passed into law, which made bighorn sheep a game animal for a 7 year experimental period in 2 Mojave Desert ranges: Old Dad Peak and the Marble Mountains, both of which had served as sources of translocation stock. That legislation set up a conservative hunting program in which hunting tags could not exceed 15% of mature rams counted annually. It also provided financial support for conservation activities for bighorn sheep in California by (1) allowing one hunting tag to be auctioned to the highest bidder each year, and (2) establishing a dedicated bighorn sheep conservation fund for revenues from this hunting program. In 1990 the legislature removed the 7 year expiration date of AB3117. Building on the success of this hunting program, Assembly Bill 977 amended sections 4902 and 4903 of the Fish and Game Code to (1) permit hunting in additional populations having completed management plans, (2)

DRAFT

maintain the tag limitation at 15% of mature rams (3) increase the number of allowable auction tags to 3, but not to exceed 15% of all tags allocated, and (4) limit the expenditure of funds raised by this program on administrative overhead to reasonable costs associated with direct administration of the bighorn sheep hunting program; otherwise, those funds were to be used to augment existing programs. By 2003 this program had raised nearly 2.2 million dollars (Epps et al. 2003), a figure that grew to about 3.5 million dollars by 2010.

Management of Non-native Ungulates

Various actions have had potential indirect effects on desert bighorn sheep in California, including grazing by other ungulate species. In the mid 20th century the desert region of California supported the highest number of burros in the Southwest (McKnight 1958). Those uncontrolled feral burro populations overlapped many desert bighorn sheep ranges and were a great concern relative to potential negative demographic influences on bighorn sheep (Weaver 1972). Since then various agencies with jurisdiction over lands inhabited by bighorn sheep have established burro control programs and brought this competing influence into control in many locations. The National Park Service has done so most completely, having management goals of zero feral burros on their lands and largely attained that goal through the removal of thousands of burros. There remain some burro management zones that overlap occupied and vacant bighorn sheep ranges, especially on military lands (Figure 7), and in some of those areas burros appear to be increasing in numbers and distribution.

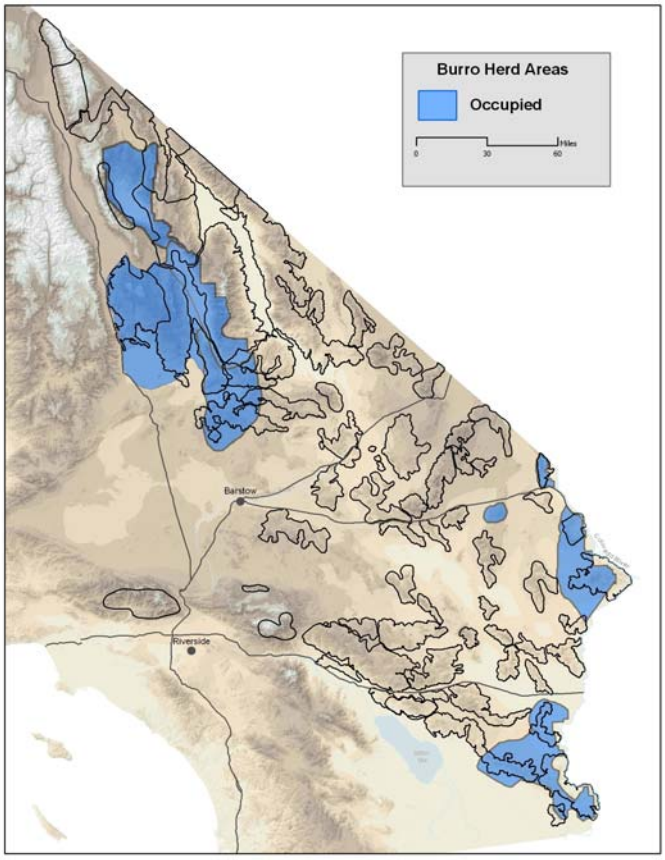

Figure 7. Current distribution of feral burros in the plan area.

Cattle also have overlapped some bighorn sheep ranges in California, and that grazing has the potential to influence bighorn sheep demography through forage and water competition, as well as disease transmission (see above). The bighorn sheep population in the Cady Mountains had a very depressed population with a reproductive base of only about 25 females under cattle grazing that overlapped much of their range. Cattle grazing in that range ended in **????** and the bighorn sheep population has increased at least 5 fold. The BLM California Desert Conservation Area Plan was completed in 1980, and the final decision on livestock grazing stated "Eliminate livestock on bighorn sheep ranges south of I-40". Instead, one of the first actions was a plan amendment that permitted cattle grazing into the Old Woman Mountains, where the bighorn sheep population has since suffered multiple disease episodes. There was also no attempt to follow that plan and eliminate other cattle grazing south of I-40. It was through pressure from CDFG that such grazing in the Clipper Mountains was terminated. Although greatly reduced, grazing still continues in the Newberry and Ord Mountains.

Mountain Lions

In 1990 the people of California approved an initiative, The Wildlife Protection Act (Proposition 117), which classified mountain lions in as a specially protected mammal. Three independent legal opinions in 1998 relative to Sierra Nevada bighorn sheep determined that this law had superceded any authority of CDFG to engage in mountain lion control for Sierra Nevada bighorn sheep, then listed as threatened in California. It was that finding that prompted the listing of Sierra Nevada bighorn sheep as a federally endangered species, in part to allow federal law to supersede state law relative to mountain lion control. That federal endangered listing prompted the California state legislature to pass a law (AB560) that altered Proposition 117 to provide CDFG with authority to engage in mountain lion control for any bighorn sheep population in California.

DRAFT

SUMMARY OF KEY ELEMENTS OF BACKGROUND INFORMATION RELATIVE TO CONSERVATION PLANNING

Taxonomy and Uniqueness

1. Desert bighorn sheep in California are one polytypic subspecies (*Ovis canadensis nelsoni*). Because of variation within that subspecies, the bighorn sheep in the White Mountains are treated as representing potentially important adaptations to cold deserts at one end of the temperature spectrum. This population is important to potential future reintroductions in northeastern California.

Habitat and Climatic Variation

2. ***Habitat Selection***. Bighorn sheep use keen eyesight as their primary sense for detecting predators and great agility on steep rocky slopes as their means of escaping predators. Their preferred habitat is consequently visually open (low stature vegetation) with an abundance steep rocky slopes. In much of the California desert region preferred bighorn sheep habitat can be thought of as islands in a sea of desert.

3. ***Climate Factors, Nutrient Availability, and Reproductive Success***. For most desert bighorn ranges in California, the primary period of forage growth and increased nutrient availability is in winter and spring when nutrient intake is dependent on rainfall in the cool season (October-April).

This is also the season when lambs are born and reared, and reproductive success varies greatly among years with the amount and timing of cool season rainfall.

4. ***Habitat Variation.*** While cool season rainfall limits nutrient availability for most desert bighorn sheep in California, along the western extreme of their distribution in the Transverse Range higher rainfall in combination with cooler temperatures result in conditions that are too favorable for plant growth. The result is climax chaparral vegetation that is too tall and thick to support bighorn sheep populations. In this region persistence of bighorn sheep depends on regular fires. This plan does not cover those ranges that are fire dependent. It also does not cover the Peninsular Ranges, where a recovery plan for bighorn sheep already exists.

Within the region covered by this plan there remains considerable variation in temperature and precipitation patterns that translates to great variation in habitats available to desert bighorn sheep, from low elevation Sonoran desert at the southern end of the state to alpine desert in the White Mountains. In the southern part of the desert is a region with particularly low average cool season rainfall, where bighorn sheep have a long history of low population densities.

Mortality Factors

5. A variety of introduced diseases have potential adverse effects on bighorn sheep. Particularly devastating are respiratory diseases, which can cause widespread mortality and potentially localized extirpation. Because of the likelihood of direct contact with bighorn sheep, domestic sheep and goats represent the greatest threats as potential sources of introduced respiratory tract microbes that cause pneumonia in bighorn sheep that is frequently fatal. Cattle apparently can also serve as a source of fatal respiratory disease in bighorn sheep, but transmission is considerably less likely because bighorn sheep mostly avoid cattle. Cattle also can be an important factor in other detrimental infectious diseases that cause mortalities in bighorn sheep.

6. Outside of the Sonoran Desert, resident mountain lions occupy mountain ranges that have deer populations. In those ranges lions prey on bighorn sheep opportunistically to varying degrees. Because desert bighorn sheep populations are mostly small in size, mountain lion predation by one or a few lions can cause major population declines and limit population recovery. Knowledge about a bighorn sheep herd as a source of prey is passed on from mountain lion mothers to offspring. Removal of a small number of lions that prey on a bighorn population often can break that cycle and help stabilize dynamics of a bighorn sheep herd. But, mountain lion predation on bighorn sheep can be episodic and on its own abate and even disappear for periods of time.

Sources of Competition

7. Cattle and feral burros can be significant competitors with bighorn sheep. They can compete for forage resources where their ranges overlap and they can compete for water. Cattle and burros both foul water sources and bighorn sheep ewes are known to avoid water sources with high burro use. Both can also be destructive to habitat in general through overgrazing as well as physical damage due to their size, including the creation of extensive trailing on slopes.

DRAFT

Population Structure and Metapopulation Dynamics

8. A metapopulation is a network of geographically distinct populations connected through migration. The population structure of desert bighorn sheep has three levels: metapopulation, mountain ranges, and subpopulations (reproductive units) within some larger mountain ranges. Recognition of these levels of substructuring is important for conservation planning.

9. Due to the nature of the habitats in which desert bighorn live, their populations are relatively small in general. This makes them quite vulnerable to local extinctions and to the loss of genetic diversity through genetic drift if isolated.

10. For desert bighorn sheep there are two key dynamics that occur within metapopulations: gene flow between mountain ranges that is critical to the maintenance of genetic diversity; and a balance between extinction and natural re-colonization rates that together determine whether the metapopulation persists. Metapopulation persistence requires the natural colonization rate to exceed the extinction rate. Both types of metapopulation dynamics require regular movements of bighorn sheep between mountain ranges. Maintenance of genetic diversity is driven substantially by intermountain movement of rams, while the extinction/re-colonization dynamics are limited by intermountain movements of ewes, which is less frequent than that of rams. Because metapopulation processes are critical for the persistence of desert bighorn sheep, habitat used for intermountain movements is as important as the habitat within mountain ranges.

11. What was once a single large metapopulation of desert bighorn sheep in California has been fragmented by major highways into multiple smaller metapopulation fragments, of which four are covered by this plan. There is currently essentially no gene flow across those anthropogenic barriers, thus also no opportunity for re-colonization.

12. Desert bighorn sheep in California experienced a high level of population extinction during the mid twentieth century that greatly exceeded natural re-colonization in that period. Those extinctions were likely due to multiple causes. They correlate temporally with a long mid century drought period, but also with the great depression years when some people attempted to make a living at mining in the desert. The southern area of low average cool season rainfall saw the disappearance of many bighorn sheep populations. It is likely that populations in that region have experienced repeated episodes of extinction and re-colonization as a function of climatic variation. The past quarter century has seen considerable natural re-colonization in desert bighorn sheep in California, with natural re-colonization exceeding extinction. This suggests that basic metapopulation processes are functional for desert bighorn sheep in California, but operate in an episodic fashion driven by long term rainfall patterns.

13. Habitat patches available to desert bighorn sheep in California vary greatly in habitat quality and connectivity with other neighboring patches. For bighorn sheep populations inhabiting such patches this variation translates into considerable variation in genetic diversity and vulnerability to extinction. Extinction vulnerability is driven substantially by average rainfall, maximum elevation, and the existence of reliable surface water, all three of which affect the size and stability of populations. Genetic diversity differences reflect (1) elevation of the mountain range, which correlates with habitat quality, and (2) geographic position of mountain ranges relative to potential sources of gene migration and. Higher mountain ranges tend to support larger more stable populations that are less likely to experience periodic extinction, and will lose genetic diversity to

DRAFT

drift more slowly. From a long term metapopulation conservation perspective, it is important to recognize differences among populations in their potentials to persist over time, their potentials to export colonists and genes, as well as their geographic position in the metapopulation as "stepping stones" for gene flow, and to prioritize management efforts accordingly.

Surface Water

14. In California surface water is abundant in a few higher mountain ranges that also receive higher levels of rainfall (e.g. White, Inyo, San Gabriel, San Gorgonio). However, for most of the mountain ranges considered in this plan, natural reliable sources of surface water are relatively rare to non-existent. Desert bighorn sheep regularly visit available water sources to drink during the hot season. This plan treats surface water as an important resource for desert bighorn sheep considered to affect population carrying capacity in multiple ways, as well as population stability. As such, the strategic development of water sources is considered an important management tool that can help minimize loss of genetic diversity in current metapopulation fragments through greater stability and sizes of some populations and increased gene flow.

Human Uses of Desert Bighorn Sheep

15. Desert bighorn sheep of California have provided both consumptive and non-consumptive uses for resident and non-resident people. Consumptive use as a hunted species resumed in 1987 following 108 years of full protection. Hunting of desert bighorn sheep in California has been limited to a small number of larger populations and a small number (**insert range**) of hunting permits issued annually through lottery and auction. Legislation that initiated this hunting program specified that funds developed from the program be allocated to conservation activities for this species. As of 2010 this program had raised about 3.5 million dollars.

Non-consumptive uses of desert bighorn sheep include viewing and photography, as well as scientific research. The paucity of management actions for this species that occurred during 108 years of full protection has proven to be beneficial to desert bighorn sheep in general because of scientific research this made possible. In particular, there have been relatively few translocations of desert bighorn sheep in California. This has allowed important studies of metapopulation dynamics that have considerable conservation implications for all desert bighorn sheep, and possibly all wild sheep in North America. Genetic aspects of that research could not have taken place in other states with desert bighorn sheep because of the confounding influence of many translocations in those states. The emerging pattern of natural extinction/re-colonization dynamics elucidated in this plan also would not have been detectable in other states because of the high level of population manipulation. There remains considerably more to learn about metapopulation dynamics of desert bighorn sheep, and California remains the only state where research on this phenomenon can take place on an adequate scale.

THE CONSERVATION CHALLENGE

Metapopulation Level Challenges

1. *Genetic Challenges.* Long term metapopulation health is closely tied to maintenance of genetic diversity. Because desert bighorn populations are frequently small (Table 3), gene flow and the intermountain habitat used by bighorn sheep to move between mountain ranges is of critical

DRAFT

importance to their long term conservation. Past and potential future metapopulation fragmentation from human uses of that intermountain habitat poses a critical conservation challenge for this animal. This includes the question of potential strategies to counteract the genetic effects of current migration barriers.

2. *Demographic Challenges.* The current distribution of desert bighorn sheep in California reflects a period in the mid twentieth century when extinctions substantially exceeded colonizations. Those dynamics have since shifted in favor of natural re-colonizations, a balance essential for metapopulation persistence and the future of desert bighorn sheep in California. Similar to genetic challenges, the maintenance of adequate rates of natural re-colonization depend on the conservation of intermountain movement corridors. Long term maintenance of a ratio of natural colonizations to extinctions that is >1 is a fundamental conservation challenge for desert bighorn sheep in California.

Population Level Challenges

Population level challenges concern these demographic parameters: geographic distribution of sheep within herd units, carrying capacity (the population size that a mountain range can support) and population dynamics (variation or stability of each population over time). Population dynamics of desert bighorn sheep are driven primarily by variation in rates of adult survivorship, and lamb recruitment. Population level parameters greatly affect both genetic and demographic metapopulation dynamics. Larger and more stable populations will lose genetic diversity through genetic drift more slowly. Larger populations also will produce more dispersing sheep that will enhance gene flow and thereby counter genetic diversity erosion in adjacent populations, while also increasing re-colonization of vacant habitat. Currently there is considerable variation among desert bighorn sheep populations in California in genetic diversity levels that in part reflect variation in population sizes and stability over time. Retention of genetic diversity within current metapopulation fragments is a challenge that in part involves size and stability of constituent populations.

The following factors are challenges that currently or potentially affect population parameters that currently need conservation action, or may need conservation action:

1. *Direct Habitat Loss from Human Activities*. Human actions can displace bighorn sheep from habitat in which they would otherwise obtain nutrients or other resources (e.g. water). The result of this will be a reduction in carrying capacity. The degree of reduction in carrying capacity will depend on the amount of habitat lost and the resources in that habitat.

2. *Habitat Change.* Various changes in habitat can be equivalent to habitat loss. One of those is vegetational succession. This is not a factor in the vegetation communities of much of the range of desert bighorn sheep. However, along the western margin of distribution of this species, occupied and vacant historic habitat in the Transverse Range and San Bernardino Mountains receive notably higher rainfall (Figure 2). That higher rainfall results in a vegetation climax community of thick chaparral whose stature is too tall and dense to support viable bighorn sheep populations. The persistence of bighorn sheep in that region is dependent on periodic fires that create habitat patches with adequate visibility.

Introduced plant species represent a different potential threat of habitat change. Currently there are a number of introduced species that benefit desert bighorn by providing highly nutritious

DRAFT

forage in early phenological stages (e.g. *Bromus tectorum*, *Bromus rubens*, *Erodium circutarium*). However, introduced plant species may be detrimental where they displace desirable forage species. Introduced grasses in the Mojave Desert may now be sufficiently dense to carry fires from lightning strikes to burn large areas where previously little would burn. In that habitat such fires may be detrimental to habitat quality for bighorn sheep and decrease carrying capacity for some years. Long term directional climate change also has the potential to alter habitat through changes in vegetation structure.

Loss of reliable water sources can have particularly significant effects on bighorn sheep demographic parameters. Numerous factors may be involved in the disappearance of water sources, including natural climate cycles, geological changes (e.g. via earth quakes), draw down of aquifers from ground water pumping, long term directional climate change, or human diversions of surface water.

3. *Amount and distribution of surface water.* Amount and distribution of reliable surface water influences carrying capacity and stability of desert bighorn populations. Greater geographical distribution of water will allow a wider distribution of bighorn sheep during the hot season and thereby increase the availability of forage in that season. The long term stability of desert bighorn sheep populations will similarly be affected by the distribution of water. If one of multiple water sources goes dry during summer, only a fraction of the population will be affected and the existence of other water sources will give individual sheep an alternative place to drink.

4. *Competition*. Feral burros and cattle are competitors with bighorn sheep for forage and water where their ranges overlap, and that competition can depress bighorn sheep populations significantly. There is also the possibility of apparent competition, where cattle can indirectly influence mountain lion predation on bighorn sheep by serving as an important prey base that elevates mountain lion populations near bighorn sheep. Feral burros and cattle can significantly foul water sources and displace bighorn sheep from water. They can also result in a behavioral displacement from other habitat.

5. *Risk of introduced diseases*. Bighorn sheep are very susceptible to a number of introduced diseases, which can have large and prolonged demographic effects, including population extinction. Non-native ruminants are the source of the diseases of greatest concern, especially domestic sheep and goats; but cattle can also be a source.

6. *Mountain Lion Predation*. Mountain lion predation on bighorn sheep has been widely documented to be locally excessive at times, when it can greatly depress bighorn sheep populations and prevent population recovery. Because of the relatively small size of many desert bighorn sheep populations, one or a small number of mountain lions can have a large demographic effect. As a population depressing and destabilizing influence, mountain lion predation has the potential to result in more rapid loss of genetic diversity through genetic drift.

CONSERVATION GOAL

Desired Future Condition. In 50 years the focal four metapopulation fragments of desert bighorn sheep have incurred no net loss of genetic diversity and have become one reconnected functional metapopulation with optimal gene flow, no competition from non-native ungulates, and a near zero risk of introduced diseases.

DRAFT

STRATEGIES FOR ACHIEVING CONSERVATION GOAL

Metapopulation Level Actions

1. Prevent further metapopulation fragmentation. Do not allow developments in intermountain movement habitat identified in Figure 4 that will curtail essential gene flow.

2. Explore ways to provide bighorn sheep the ability to cross current metapopulation barriers and work with appropriate agencies to reconnect metapopulation fragments.

3. Within metapopulation fragments, minimize loss of genetic diversity by maximizing the connectivity between populations and maximizing the stability and size of constituent populations. Population stability is more important than size, i.e. a moderate population density with high stability will better conserve genetic diversity than a high density population that is prone to periodic population crashes to low densities.

4. Recognize differences among occupied and vacant habitat patches in their importance to long term genetic diversity within metapopulation fragments. Identify core populations that because of more favorable habitat characteristics and resulting low extinction probabilities have regionally carried the metapopulation through periods of higher extinction. These populations will be net exporters of colonists and genes over long time periods. At the other end of the spectrum, identify populations that, because of marginal geographic location and relatively poor habitat characteristics, have been net importers of colonists and genes over long time periods because of high frequency of extinction and re-colonization. Populations at this low end of the spectrum will contribute the least to long term processes critical to metapopulation persistence. For populations that do not fit either of these categories, identify those that play an important role in conservation of genetic diversity because of their location in metapopulation fragments. Use the above analysis to set priorities for conservation actions whereby actions that contribute most to the conservation of genetic diversity and metapopulation persistence have highest priority.

5. Carefully monitor vacant habitat patches to continue the documentation of natural re-colonizations of vacant habitat. To preserve the natural metapopulation structure give natural colonization the top priority for filling vacant habitat patches. Use translocation as the second priority method of filling vacant habitat patches and engage this tool only in higher priority habitat if natural colonization appears to be too slow. Where translocation is deemed necessary, attempt to mimic natural metapopulation processes by using a small number of females from a neighboring population if available. Natural colonization events in a functional metapopulation probably mostly involve small numbers of females in habitat already utilized by males.

This approach will preserve the ability of desert bighorn sheep in California to be researched further to better understand both genetic and demographic metapopulation processes. While natural re-colonization is a relatively slow process compared with year-to-year population dynamics, so is the process of genetic drift, which is measured in time units of generations (6-7 years per generation). A number of current vacant herd units are in habitat that is low priority for conservation actions; thus their occupation by sheep is not critical to metapopulation persistence. Other vacant herd units that are in more favorable habitat and higher priority categories will likely be naturally re-colonized relatively quickly once habitat deficiencies are corrected.

DRAFT

Population Level Actions for Metapopulation Conservation

1. Analyze limiting factors for each herd unit and propose remedial management actions for factors amenable to correction that will help maintain and enhance genetic diversity.

2. Compile a list of all needed actions and prioritize those relative to importance to metapopulation processes as discussed above.

Other Population Level Actions

1. Where possible, replace high maintenance water developments with more reliable low maintenance systems of higher storage capacity. Prioritize this conversion using the metapopulation priority categories. More reliable water systems will enhance stability of bighorn sheep populations.

2. Continue the bighorn sheep hunting program and consider adding to it new hunt zones in herd units found to meet minimum criteria. Those criteria are: (1) the ability of CDFG to administer an additional hunt zone in the region in question, including monitoring the size and composition of the bighorn sheep population in question on a regular basis; and (2) population parameter data of adequate quality (resolution) from a period of at least 5 years that indicate a population of sufficient size and stability in which the number of females never drops below 40.

Research and Monitoring

Some of the conservation strategies called for here are adaptive management in that they depend on feedback from the collection of reliable information of a variety of types. Additionally, the success over time of the application of these strategies relative to the desired future conditions outlined above under Goals cannot be evaluated without adequate monitoring of appropriate metapopulation parameters. Regular monitoring of all herd units identified in Figure 4 and Table 2 is essential. That monitoring will serve two needs: (1) a metapopulation level assessment of extinction/colonization dynamics; and (2) overall population trends. That monitoring needs to carefully analyze the question of needed data resolution relative to population sizes, recognizing a potentially important cost tradeoff between data resolution and numbers of herd units that can be monitored. Monitoring of herd units in the recent past has had a bimodal distribution due to a bias for some herd units at the expense of the rest. A new strategy is needed that distributes the monitoring effort according to a plan based on a problem analysis.

Second, this plan is built on the best available science, but there is always uncertainty in science, and there may be unknown or unrecognized factors of importance that need to be considered relative to conservation. It is important to engage in appropriate research concerning the scientific foundation of this plan. It is also important to engage in research on possible new conservation approaches and monitoring approaches. One example concerns the possibility of using water next to some highway bridges to encourage sheep to use those bridges as underpasses. This is a high priority research project.

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Plan Review

This plan sets 50 year goals. Progress in achieving actions called for in this plan should be reviewed in 15 years along with a re-assessment of the plan direction and its scientific basis. If the plan direction is considered still viable a second such review should occur in 30 years. This plan should be revised when it is considered outdated because of new information and/or concepts.

IMPLEMENTATION OF CONSERVATION STRATEGIES

This section is organized by five metapopulation fragments that are defined substantially by major highways that are major barriers to intermountain migration by bighorn sheep. Within each metapopulation fragment are herd units defined regionally (Figure 4). Some herd units encompass multiple groups of females that have geographically separate home ranges and are referred to here as reproductive units.

Northern Metapopulation Fragment

This metapopulation fragment lies north of Interstate Highway 15. Geographically it is the largest of the metapopulation fragments (Figure 4) and includes at least 24 extant demographically distinct reproductive units and 25 defined herd units, of which 6 are currently vacant (Table 2). Land ownership includes The U.S. Forest Service, National Park Service, Bureau of Land Management, and a couple of large tracts of military land at the southern end under two different agencies. Compared with desert bighorn sheep habitat further south, this metapopulation fragment has generally higher precipitation (Figure 2) and higher mountain ranges, including three ranges that reach or exceed 11,000 ft elevation (Panamint, Inyo, and White Mountains), resulting in generally low extinction probabilities when only habitat potential (elevation and precipitation) is considered (Figure A3). This metapopulation fragment is also characterized by high connectivity compared with the more island-like metapopulation structure further south (Figure 4). High gene flow and low extinction rates result in generally high genetic diversity levels for the populations that persist and have been sampled, (Figure 3).

The higher and somewhat wetter characteristics of the western part of this metapopulation fragment resulted in considerable domestic sheep grazing that undoubtedly was the cause of the disappearance of many populations. In the late 19th and early 20th centuries there was a domestic sheep grazing circuit that began in the central valley in winter, crossed Tehachapi and Walker Passes in early spring for spring grazing in the western Mojave Desert, eventually working north through the Owens Valley to summer grazing pastures in the high Sierra Nevada and White Mountains and back in the fall (Austin 1906). In the White Mountains alone an estimated 40-50 thousand domestic sheep were grazed every summer (Wehausen 1986, 1988a). This suggests a high intensity of spring grazing in the western Mojave Desert and the likelihood that shepherds would have pushed bands of domestic sheep into every corner of the desert that they could reach, including adjacent mountain slopes. This readily explains the loss of almost all bighorn sheep populations on the Sierra Nevada and desert sides along the routes traveled by the bands of domestic sheep. Bighorn sheep survived in only two areas in the Sierra Nevada (Mount Williamson and Mount Baxter/Sawmill Canyon herds) and the northern White Mountains. These surviving herds migrate seasonally between extensive alpine summer ranges and low elevation winter ranges and included a great deal of habitat that would have been inaccessible to domestic sheep. Nevertheless, genetic population structure of the surviving bighorn sheep suggest that they suffered

DRAFT

past severe pneumonia die offs following contact with domestic sheep. In both the Sierra Nevada and White Mountains the populations currently each have only a single mitochondrial DNA haplotype, which contrasts with all desert bighorn sheep populations sampled in this region (Wehausen and Ramey unpubl. data). The few populations that survived in the Sierra Nevada show strong evidence of a genetic bottleneck and resulting low genetic diversity (U. S. Fish and Wildlife Service 2007), while those surviving in the White Mountains exhibit relatively low genetic diversity for this region (Figure 3). On the desert side of the domestic sheep driveway, bighorn sheep populations disappeared from the southern White Mountains, the west side of the Inyo Mountains, and the Coso, Argus, Slate, Brown, Quail, Granite, and the Eagle Crags ranges. It is possible that domestic sheep also were involved in the loss of bighorn sheep from the Owlshead Mountains, which are connected to the Quail Mountains. Bighorn sheep also disappeared from two areas in the very southern Sierra Nevada (Chimney Peak and the Cache Peak, Jawbone Canyon and El Paso Mountains), where historic populations were most likely desert bighorn sheep (see below).

Fort Irwin and China Lake Naval Weapons Centers came into existence in the early 1940s, which would have resulted in a major reduction in area available for spring grazing of domestic sheep. A small fraction (6,000 domestic sheep) of the original grazing continued through the 20th century along this driveway up through the Owens Valley during springs of good forage growth until terminated at the beginning of the 21st century following the listing of Sierra Nevada bighorn sheep as a federally endangered species. Nevertheless, the threat of disease transmission from domestic sheep and goats has not entirely vanished from this region.

This metapopulation fragment includes 25 defined herd units, of which 19 are occupied and include at least 28 geographically distinct reproductive units. Two of the herd units are occupied because of natural re-colonizations, while translocations have restored sheep to 3 others. This metapopulation fragment currently contains two hunt zones: one in the White Mountains; and one in the Clark and Kingston Mountains.

White Mountains. The White Mountains currently support the largest population of bighorn sheep in California. These sheep appear to be a unique population among desert bighorn sheep in California because of extensive use of alpine habitat, altitudinal migration, and a unique life history pattern appropriate to cold desert ecosystems (see above). Because of its life history pattern and other likely adaptations to living in a cold desert ecosystem, this population would be the most appropriate stock to use for translocations to northeastern California. However, it suffers from close proximity to domestic sheep and currently has an active respiratory disease process that probably is derived from contact with domestic livestock. This is likely one of many such disease episodes for bighorn sheep in this range; a prior respiratory disease epizootic is the most probable explanation for a low population of only about 50 bighorn sheep in the White Mountains in the late 1970s (Wehausen 1983). Domestic sheep were still grazed in the alpine along the top of the northern White Mountains in the 1950s (Wehausen 1983). The uniqueness of this population needs to be recognized and threats of contact with domestic sheep and goats eliminated.

Deep Springs. Immediately south of the two White Mountains herd units is the Deep Spring herd unit, which includes habitat in the southeastern part of the White Mountains and the mountain range on the south side of Deep Springs Valley, sometimes referred to as Soldier Pass. There are many historic accounts of bighorn sheep on both sides of Deep Spring Valley (Wehausen et al. 1987b, Wehausen 1999). This population vanished in the 1970s coincident with the development of a sympatric feral goat population that apparently originated from Deep Springs College. Those goats

DRAFT

did not persist, and bighorn sheep re-colonized this area near the end of the 20th century, probably from the Last Chance Range. Evidence of that colonization began with reported sightings along the Death Valley road on the west side of Eureka Valley, and eventually sightings in the habitat around Deep Springs Valley, including Wyman Canyon. This population is now well established. They utilize only one of the springs south of Deep Springs Lake, which is the closest spring to steep escape terrain, despite numerous other suitable springs. There is an abundance of cattle use around all of these springs. It is likely that cattle are having a significant effect on habitat use by these sheep in this area.

The 1987 BLM California Desert Conservation Area Amendment Decision called for a Habitat Management Area in the Soldier Pass – Piper Mountain area for bighorn sheep reintroduction and other wildlife. Cattle were a specific issue raised, including their drift outside of allotment boundaries there. Given (1) the close proximity of bighorn sheep and cattle south of Deep Springs Lake and the potential for cattle to serve as a source of respiratory disease for bighorn sheep (Wolfe et al. 2010), (2) likely cattle displacement of bighorn sheep from multiple water sources south of Deep Spring Lake, and (3) likely cattle displacement of bighorn sheep from nutritious forage near multiple water sources south of Deep Springs Lake, there is an immediate need for BLM to prepare the analysis called for nearly a quarter century ago. Appropriate actions would include fencing cattle away from suitable bighorn sheep habitat. There is also a need to consider water sources on the north side of Deep Springs Valley that bighorn sheep might use.

Inyo Mountains. Historical records from the early twentieth century indicate that bighorn sheep once occurred all along the west side of the Inyo Mountains and in the Waucoba Mountain area in addition to the east side of the range. Early population estimates for the whole range were as high as 180 (Wehausen 1999). Except for occasional wandering rams, current populations are known only to use the east side of this range above Saline Valley, where water is abundant in every canyon. The current population is known to include separate northern and southern subpopulations of females and a total population of unknown size that may exceed 100 (Epps et al. 2003). Sheep on the west side of the Inyo Mountains may have suffered the fate of almost all other populations that inhabited mountain ranges immediately adjacent to the domestic sheep driveway. There is a need to investigate whether there is any use around water sources on the west side of the range by bighorn sheep females. In the absence of evidence of such use, translocation(s) of small numbers of sheep caught on the east side of that range should be considered in attempts to re-establish bighorn sheep on the west side of the Inyo Mountains. East to west natural colonization in this mountain range may be hindered by considerable woodland habitat along the upper elevations of this high mountain range.

Last Chance/Dry Mountain, Tin Mountain, Grapevine Mountains, Funeral Mountains, Black Mountains, Hunter Mountain/Panamint Buttes, Tucki Mountain, and Panamint Mountains. These herd units are all located in Death Valley National Park on both sides of Death Valley, and all the populations on the west side of Death Valley except Tucki Mountain have been sampled genetically; only the Black Mountains have been sampled on the east side of Death Valley. The ranges on both sides of Death Valley have high north-south connectivity among the bighorn sheep herd units, thus high expected gene flow. For the large genetic sampling on the west side of Death Valley this is reflected in generally high genetic diversity (Figure 3). Bighorn sheep herds in Death Valley National Park undoubtedly benefited from the removal of the large number of feral burros that once occupied this park. However, there has been a lack of monitoring of the bighorn sheep populations and the water sources that they use. The lack of availability of water and use by

DRAFT

bighorn sheep in some of the locations where Wells and Wells (1961) documented populations indicates some changes bighorn sheep distribution that needs to be documented and considered in management decisions relative to the conservation of bighorn sheep in this park.

Coso, Argus, Slate, Brown, Quail, Granite, Owlshead, Eagle Crags, and Avawatz Mountains. There is essentially continuous bighorn sheep habitat from the Avawatz Mountains to the Coso Mountains through the multiple mountain ranges listed for this section. Further, the western edge of this complex is the connection with historic habitat in the very southern Sierra Nevada. Of all the ranges listed in the subheading for this section, only the Avawatz Mountains support a native population of bighorn sheep. Bighorn sheep were re-introduced to the Argus Range from Old Dad Peak in 1986 (Bleich et al. 1990b). In 2005 a couple of small groups of bighorn sheep that included both sexes appeared by Little Lake in the Coso Range, where bighorn sheep had been absent for 50 years (Wehausen 1999, Epps et al. 2010). Genetic analyses of fecal DNA from two of these sheep identified a mitochondrial DNA haplotype common in the Old Dad Peak herd, indicating that these sheep came from the Argus Range (Epps et al. 2010). As with the Deep Springs herd, there is need to investigate the status of this natural colonization. Further south, sheep were moved from the Marble Mountains and Old Dad Peak to the Eagle Crags in 1983 and again from Old Dad Peak in 2006 because of lack of evidence of a viable population.

Gene flow in this region is greatly compromised by the absence of bighorn sheep populations in the Slate, Brown, Quail, Granite, and Owlshead Mountains. Depending on the amount of gene flow with the Kingston Range and Black Mountains, the Avawatz Mountains may be genetically isolated. Unlike most vacant desert bighorn sheep habitat in California, the Slate, Quail, and Granite Mountains have been assigned low extinction probabilities (Epps et al. 2004; Figure A1, A3) because of good habitat (rainfall and elevation), and they have natural water sources. What this series of mountain ranges suffers from is a very high density of burros (Figure 7). Restoration of metapopulation processes in this region is a high priority action that will require a major coordinated burro control program by Fort Irwin, China Lake Naval Weapons Center, and adjacent land management agencies. Burros may similarly be the factor hindering establishment of a population in the Eagle Crags. Considerable sheep proof fencing recently erected by the military in this region may greatly limit important bighorn sheep migration. The feasibility of building sheep crossings along this fence or other alternatives should be explored.

Nopah/Resting Spring Range, Kingston/Mesquite/Shadow Mountains, Clark/Spring Range Herd Units. These herd units on the southeastern edge of this metapopulation fragment have high connectivity, thus gene flow, and are known to interact considerably also with adjacent populations in Nevada (Wehausen 2011). A detailed telemetry study of the bighorn sheep in the Kingston and Clark ranges documented at least two separate demes of females in the Kingston Range (Jaeger 1994). That study also found that females from the eastern Kingston Range migrated to the lower Mesquite Mountains for bearing and rearing lambs in winter and spring, and females in the Clark Range similarly migrated to the lower Spring Range in Nevada during the lamb rearing season. Both of these lambing habitats support shorter vegetation and were considered safer (Jaeger 1994). The Kingston and Clark Mountains support native populations of deer and mountain lions, and mountain lion predation on the bighorn sheep was well documented in these herd units during that study. This area also has had cattle grazing, which raises the question of the extent to which that grazing may have subsidized the mountain lion population. Recent decades have seen considerable dynamics in the bighorn sheep populations in the Kingston and Clark Ranges. The Shadow Mountains were listed by Don McLean as a separate population in the 1940s with estimates as high

DRAFT

as 25 sheep. Currently this range is considered to be only stepping stone habitat for migrating sheep.

There was once essentially continuous bighorn sheep habitat south from Clark Mountain to the Ivanpah and Mescal Ranges, both of which were listed by Don McLean as having bighorn sheep in the 1940s. The Ivanpah and Mescal Ranges were undoubtedly once part of the habitat used by the Clark Mountain population. Interstate Highway 15 has largely severed the Ivanpah and Mescal ranges from Clark Mountain. However, the Clark Mountain bighorn sheep population continues to use the Mohawk Hills just north of Interstate Highway 15 (Jaeger 1994) and that highway has two bridges across washes in that area that bighorn sheep may use occasionally to cross under the freeway. That highway also includes a bridge east of Mountain Pass that may be similarly used. There is a need to use automated cameras to investigate whether sheep are using these potential underpasses. If sheep are not using those bridges and cannot be enticed with water to do so, the Mountain Pass area should be considered a potential candidate for building a bridge for bighorn sheep to cross Interstate Highway 15.

Soda Mountains. While this range has some trailing from past bighorn sheep use (Wehausen et al. 1987b), it is generally poor habitat with a relatively high extinction probability due to low rainfall and low elevation, despite reliable surface water at the southern end of the range (Epps et al. 2004; Figures A1, A3). This is evident in limited forage resources. While this would place the Soda Mountains at a low priority for management actions to re-establish a population, these mountains serve a potentially very important role in gene flow without supporting a bighorn sheep herd. The Soda Mountains are currently split by U. S. Highway 15 and the small portion south of the highway that has the natural surface water now supports a bighorn sheep population resulting from a recent natural colonization. A number of significant bridges that sheep can cross under along I-15 in this area provide rare and important opportunities for gene flow between the northern and north-central metapopulation fragments and this gives importance of the large portion of the Soda Mountains north of I-15. Strategic establishment of a reliable water source in the north Soda Mountains may greatly facilitate bighorn sheep migration through this range to the Avawatz Mountains, and thereby connect these two metapopulation fragments genetically.

Very Southern Sierra Nevada. There is evidence of historic bighorn sheep use of the Cache Peak/Jawbone Canyon area (Wehausen et al. 1987b) and the Chimney Peak area (Garlinger 1987). There are a couple of reasons to suspect that these areas supported desert bighorn sheep rather than Sierra bighorn sheep. First is that Sierra Nevada bighorn exhibit adaptations to living most or all of the year in alpine habitats – habitat which is lacking in this most southern region of the Sierra Nevada. Instead, the habitat available to bighorn sheep in this area is lower elevation desert habitat mostly below the woodland belt. Second, the Cache Peak and Chimney Peak areas both have natural connectivity to the desert further east and can be thought of as a westernmost extension of desert bighorn habitat in this area. For the Chimney Peak region there is direct connection with the Coso Range in the Little Lake area (Figure 4); for Cache Peak, the El Paso Mountains provide connection with the Argus Range, and with the Slate, and Eagle Crags herd units through the Lava Mountains and Almond Mountain (Figure 4). The El Paso Mountains contain Native American hunting blinds thought to have been used to hunt bighorn sheep.

There are multiple reasons to assign southern Sierra Nevada habitat to low priority for management actions. First is that it lies at the western margin of habitat in this region and therefore will have very limited sources of gene flow. Second is the potential negative influence of highways

DRAFT

395 and 14 on bighorn sheep movement to and from these herd units that might produce gene flow. Third, potential populations further east that these herd units would interact with in terms of gene flow (Coso, Slate, and Eagle Crags) currently contain few or no bighorn sheep. Therefore, potential habitat in the very southern Sierra Nevada should be given consideration for management actions for bighorn sheep only after these more eastern herd units have well established populations that themselves are part of a fully functional metapopulation. Once such a fully functional metapopulation exists to the east of the Cache Peak and Chimney Peak herd units, natural re-colonization may restore bighorn sheep to these herd units if habitat remains suitable and highways 395 and 14 are not complete barriers..

North-Central Metapopulation Fragment

This is a relatively small metapopulation fragment bounded on the north, west, and south by highway barriers of Interstate Highways 15 and 40 (Figure 4). However, at the eastern boundary this fragment extends into Nevada through connectivity with native populations south of Las Vegas in the McCullough, Highland, and Newberry Mountains. This metapopulation fragment includes at least 13 geographically distinct reproductive units and 10 defined herd units, one of which is vacant (Table 1), while another (the New York Mountains) may have never supported a reproducing population because of the nature of its habitat. Much of the bighorn sheep habitat in this metapopulation fragment is protected under National Park Service management. However, **a proposed fence around the entire Mojave National Preserve** would be potentially very detrimental to migration of bighorn sheep in this metapopulation fragment.

This metapopulation fragment currently includes two hunt zones: one in the Cady Mountains; and one in the Old Dad and Kelso Peaks area.

Cady, South Soda, and North Bristol Herd Units. As noted above, at the northern end of this north-central metapopulation fragment are potential sheep migration pathways under Interstate Highway 15 between the Cady and south Soda Mountains in the south, and the Soda Mountains north of the freeway. It is important to recognize and maintain these potential migration corridors, while attempting to enhance such migration. Those corridors place the Cady and South Soda Mountains herd units at a high priority level relative to metapopulation processes, despite mid level extinction probabilities that reflect lower elevation and rainfall. The same holds for the North Bristol Mountains as a range with a key role in gene flow with the rest of this metapopulation fragment and possibly with the metapopulation fragment to the south.

The Cady Mountains lie outside of the Mojave National Preserve at the western end of this metapopulation fragment. Around 1990 this range supported a depressed population with a reproductive base of only about 25 females under a situation of substantial cattle grazing in bighorn sheep habitat (Wehausen 1992). Remarkably, this population has increased at least 4 fold in recent years, apparently following the removal of cattle. Because the Cady Mountains population lies at the narrow western margin of this triangular metapopulation fragment (Figure 4), it has few populations with which to interact relative to gene flow, yet has a strategic geographic position relative to potential gene flow across Interstate Highway 15. Hence, it is important to maintain the current higher population size and enhance gene flow with the neighboring North Bristol Mountains to the east. The North Bristol/Old Dad Mountains herd unit plays a key role in gene flow in this region, connecting the Cady, South Soda, Granite, and Old Dad/Kelso/Marl/Club Peak herd units. Bighorn sheep were reintroduced to the North Bristol herd unit in 1992 **???** using sheep from the

DRAFT

adjacent Old Dad Peak area and currently has bighorn sheep use across a considerable amount of habitat. It could benefit from some key placement of reliable water to maximize habitat use and population size and stability.

The Mojave River once flowed through Afton Canyon. Despite upstream diversion of much of this river, subsurface water flow has continued at a level that has allowed water to flow on the surface in Afton Canyon. This has been a particularly important source of water and nutritious forage for bighorn sheep in the Cady Mountains that may have played a critical role in their persistence in this mountain range. This surface water has been on a declining trend in recent years. Efforts should be made to reverse that trend, but at a minimum sufficient water should be provided there for sheep should that surface flow continue to decline. About 20 years ago BLM constructed a fence in Afton Canyon without consideration for its effects on bighorn sheep movement in this area. That fence should be removed to allow bighorn sheep full access to resources in that canyon.

Granite, Providence, Woods/Hackberry, and Castle/Piute Herd Units. Genetically these four herd units cluster together because of high connectivity and gene flow (Epps et al. 2010; Figure 4). It is possible that this cluster of populations with high genetic diversity (Figure 3) would have extended west to the Cady Mountains had a native bighorn sheep population persisted in the North Bristol Mountains to facilitate gene flow, and the Cady Mountains population not been depressed during the 20th century. The Granite and Providence Mountains together encompass a considerable expanse of core habitat in this metapopulation fragment. Genetic diversity in both ranges is high and reflects high connectivity and high habitat quality. The high habitat quality in these ranges reflects higher elevations but also the western end of a finger of Great Basin habitat that extends into the Mojave Desert from the east here because of higher average rainfall (Figure 2). The Granite and Providence Mountains were once the center of a close network of populations with very high connectivity that would have included the neighboring South Bristol, Marble and Clipper Mountains to the south in the south-central metapopulation fragment, now separated by the Interstate Highway 40 barrier. While these latter three populations genetically cluster separately from those north of I-40 (Epps et al. 2010) because of the effects of that barrier and genetic drift, they still retain similar high genetic diversity, presumably reflecting (1) past high connectivity prior to highway construction, and (2) retention of that diversity through current high gene flow between the Clipper and Marble Mountains, and maintenance of substantial population sizes. From the standpoint of re-connecting metapopulation fragments via bridges across highways, the north end of the Marble Mountains is the highest priority location because it would maintain this center of high genetic diversity that would radiate out into both metapopulation fragments.

Recognition of an intrusion of Great Basin habitat into this part of the desert led to the introduction of deer in the New York Mountains in 1948 (Cronin and Bleich 1995) from which this species spread as far west as the Granite Mountains. Later, mountain lions discovered this resource and developed a resident population sympatric with these deer (Wehausen 1996). Those lions have also preyed on bighorn sheep and were documented to drive the Granite Mountains population down to a reproductive base of only eight females before that predation abated (Wehausen 1996); but intense lion predation resumed after the population rebounded to 20 females. Such lion predation in this metapopulation fragment may be exerting both a depressive and a destabilizing influence on population dynamics of some bighorn sheep herds, both of which would exacerbate the rate at which genetic drift will erode genetic diversity. While removal of deer and/or mountain lions is probably not a realistic management option, any actions that might counteract potential long term loss of genetic diversity could help balance the effects of this ecosystem change. Re-

DRAFT

establishing gene flow across Interstate Highway 40 discussed above would be one such action. Water developments that enhance population carrying capacity and stability in neighboring populations outside of the influence of deer and lions would be another. The North Bristol/Old Dad Mountains herd unit is particularly important in this regard because of the high connectivity with the Granite Mountains and a conduit for gene flow to the Cady Mountains.

New York Mountains Herd Unit. Earlier designations included the Castle Peaks with the New York Mountains herd. This plan instead lumps the Castle Peaks, Castle Mountains and Piute Range in one herd unit. (Table 1). By this definition the New York Mountains herd unit is characterized by mostly tall vegetation that constitutes relatively poor habitat for bighorn sheep because of visual obstruction. While this mountain range has long been listed as bighorn sheep habitat, it is not clear that it has ever supported a reproducing population. Instead it appears to serve as important connecting habitat that rams use in moving between the Castle Peaks and Castle Mountains to the east and the Providence Mountains and Marl Mountains to the west. Natural fire in the New York Mountains would improve it as bighorn sheep habitat, but this mountain range is not currently a priority for management actions.

Mescal/Ivanpah Herd Unit. These connected mountain ranges are included as a herd unit because of historic evidence of bighorn sheep use (see above), but this herd unit has not been known to support any bighorn sheep for numerous decades. As noted above, the sheep that used these ranges were most likely part of the Clark Mountain herd prior to the existence of Interstate Highway 15. Currently this herd unit is a low priority for management actions. If males are documented to cross under highway bridges on either side of Mountain Pass, these ranges should be treated as important stepping stone habitat for gene flow.

Old Dad/Kelso/Marl/Club Peak herd unit. This complex of well connected ranges in the north-central region of this metapopulation fragment supports at least four different reproductive units. This herd unit has water in natural springs in its eastern ranges, but was once thought to support only a small population of bighorn sheep (Weaver 1974). Following the addition of water developments in the drier western parts of the herd unit, the bighorn sheep population increased dramatically, and currently supports more than 300 sheep. Its documented demographic success led to the use of the sheep in the western part of this herd unit to be used for translocation stock with 2**?? (NEED TOTAL NUMBER)** translocated to other ranges over about two decades. This herd unit does not share the high genetic diversity found in the complex of herd units to its south and east (Figure 3) reflecting greater isolation from those ranges and perhaps past small population size. Management needs in this herd unit are limited to enhancing the reliability of existing water developments.

Dead Mountains Herd Unit. The Dead Mountains are a largely isolated mountain range on the eastern margin of this metapopulation. They are separated from the Sacramento Mountains to the south by Interstate Highway 40 and from the Piute Range by Piute Valley except for one relatively long migration corridor that uses Homer Mountain as a stepping stone, which requires the crossing of highway 95 (Figure 4). This herd unit is also potentially negatively influenced by feral burros (Figure 7) and was classified as extinct for about 3 decades until sheep were found there again in the 1980s (Wehausen 1999) – a possible natural re-colonization. Across the Nevada border the Dead Mountains are closely connected with the Newberry Mountains, which is a population of high genetic diversity and high gene flow with the Eldorado Mountains to the north in Nevada (Wehausen 2011). As such, the Dead Mountains are currently primarily a part of the southern

DRAFT

Nevada metapopulation fragment and may contribute little to metapopulation processes in California. This would place this herd unit at a low priority for management actions. However, immediately east and west of the junction of Highway 95 and Interstate Highway 40 there are bridges across washes on I-40 that are adjacent to sloped topography of the Sacramento Mountains that sheep should be able to cross under for migration between the Dead and Sacramento Mountains. The distance from sloped habitat in the Dead Mountains to those bridges is relatively short. Currently the Sacramento Mountains herd unit is classified as unoccupied (Table 1). These potential migration corridors need investigation. Should the Sacramento Mountains support a population of bighorn sheep in the future, the Dead Mountains might serve an important role in connecting them with a metapopulation of high genetic diversity in southern Nevada.

South-Central Metapopulation Fragment

This is a geographically large metapopulation fragment bounded on the north by Interstate Highway 40, on the south by Interstate Highway 10, on the east by the Colorado River, and on the west by Interstate Highway 15 and dense human habitation (Figure 4). It includes at least 24 extant geographically distinct reproductive units and 25 defined herd units, of which 5 are vacant (Table 1). A variety of governmental agencies have jurisdiction over most of the bighorn sheep habitat (Table 1). In the south the Colorado River Aqueduct that extends from the Whipple Mountains to the Eagle Mountains (Figure 4) is a potential internal barrier to intermountain migration. That aqueduct is not a complete barrier because (1) the water travels through tunnels in the Iron, Coxcomb, and Eagle Mountains (Figure 4), and (2) there are numerous bridges across the aqueduct for washes as well as some paved and unpaved roads that sheep can also cross. Bighorn sheep in this metapopulation fragment inhabit a great variety of habitats that vary from Sonoran Desert in the southeastern ranges to 11,000 feet on Mount San Gorgonio.

This metapopulation fragment has two centers of high genetic diversity. One is along the northern boundary in the Clipper, Marble, and South Bristol Mountains discussed above. The other is along the southern boundary in the Eagle, Little San Bernardino, and Queen Mountain herd units in Joshua Tree National Park, with particularly high genetic diversity in the Eagle Mountains (Figure 3). The Eagle Mountains are situated at a central location in a complex of closely connected mountain ranges, and once would have had considerable gene flow from three different directions: (1) east through the Coxcomb Mountains to (a) the Granite, Iron and Old Woman Mountains, as well as the Little Maria, Big Maria, Riverside, and McCoy Mountains complex, and (b) north to the Calument, Sheephole and Bullion Mountains; (2) south to the immediately adjacent Chuckwalla and Orocopia Mountains which connect to the Chocolate Mountains; and (3) west through the Cottonwood and Little San Bernardino Mountains to Queen Mountain and Mount San Gorgonio (Figure 4). Today there are multiple barriers to gene flow in this area. Interstate Highway 10 has cut gene flow to the south and the Colorado River Aqueduct may have limited gene flow to the east. Sheep can still cross unimpeded from the very south end of Coxcomb Mountains south of the Coxcomb water tunnel to the Granite and Palen Mountains, as well as across aqueduct bridges further north. Also, Highway 62 and human developments have largely isolated the San Gorgonio herd unit in the San Bernardino Mountains.

Long term conservation of genetic diversity in this metapopulation fragment will require management actions to restore and enhance gene flow in some regions as well as some enhancement of population sizes. It will also include expansion of bighorn distribution in an attempt to increase gene flow south across Interstate Highway 10 in an area with many bridges that

DRAFT

sheep can cross under. Regionally there are two clusters of core populations of high conservation priority that have low extinction probabilities because of higher elevations and rainfall. One is the Eagle, Little San Bernardino, and Queen Mountain complex mostly in Joshua Tree National Park. The other encompasses the Old Woman and Turtle Mountains, of which the Old Woman Mountains has already been the source of a natural re-colonization to the Iron Mountains (Epps et al. 2010).

This metapopulation fragment currently includes four hunt zones: Marble and Clipper Mountains; South Bristol Mountains; Sheephole Mountains; and Mount San Gorgonio.

South Bristol, Marble, and Clipper Mountains herd units. These three mountain ranges are closely situated with high gene flow, but are fairly isolated from other populations in this metapopulation fragment by relatively wide valleys (Figure 4). The South Bristol population is a natural colonization from the Marble Mountains (Bleich et al. 1996, Epps et al. 2010). These three ranges exhibit progressively increasing vulnerability to extinction from east to west (Figure A3) because of declining maximum elevations and their location in a central swath of low rainfall. However, all three mountain range have higher rainfall than ranges further south in that dry region (Figure 2), and population growth in the South Bristol Mountains since colonization in 1993 suggests better habitat quality than assigned by the extinction analysis (Figures A1, A3). The populations in these three mountain ranges were once closely allied with populations immediately to the north from which they have been cut off by Interstate Highway 40. Given the current isolation of these ranges by that highway and the long intermountain distances to the south, it is important to conserve genetic diversity in this complex to the extent possible through maintenance of relatively large, stable populations. A good distribution of water is the management option available to achieve that end and can particularly aid the South Bristol herd unit. Expansion of sheep range further west in the South Bristol herd unit toward Ludlow might lead to some needed gene flow to the Newberry/Ord/Rodman herd unit discussed below. Maintenance of genetic diversity in these herd units also would be greatly facilitated by re-establishment of gene flow across Interstate Highway 40. As noted above, the Marble Mountains is the top priority for a freeway bridge for sheep. However, there is also some potential for gene flow across Interstate Highway 40 at the north end of the South Bristol Mountains where there are three highway bridges and one very large culvert that sheep may be able to cross under. One bridge is at the very eastern edge of the South Bristol Mountains, the second is a little further west, while the third bridge is at the west end. The Marble Mountains also have a freeway bridge that sheep can cross under at the east end of their habitat. Water should be developed adjacent to that Marble Mountains bridge on both sides of the freeway as an experiment that might lead to regular use of that site as a highway undercrossing. This experiment should be high priority to determine whether a bridge across the freeway is needed.

Newberry/Ord/Rodman and Bullion Mountains herd units. The population in the Newberry and Ord Mountains has excellent habitat that is rated at low extinction probability (Figure A3) due to higher maximum elevation (6,068 feet) and higher average rainfall (Figure 2). However, this population is currently particularly isolated with probably very little gene flow from other populations, which is reflected in its below average genetic diversity (Figure 3). Genetic analyses (Epps et al. 2005) indicate that to the northeast Interstate Highway 40 has severed gene flow with the Cady Mountains and human habitation has severed potential connectivity to the south and west with the San Bernardino Mountains, the Little San Bernardino Mountains, and Queen Mountain. To the southeast the absence of bighorn sheep in the Bullion Mountains for about half a century (Wehausen 1999) would have largely ended gene flow from this direction. There are a few

DRAFT

locations where sheep may be able to cross under Interstate Highway 40 to migrate between the Sleeping Beauty portion of the Cady Mountains and the rough lava country immediately south of the highway west of Ludlow: three highway bridges over washes, one bridge across the freeway for a remote road, as well as two adjacent underpasses for a road and train tracks. However, there is currently no evidence that these receive any use by bighorn sheep, and gene flow estimates (Epps et al. 2005, 2007) suggest that it is minimal to none.

The Bullion Mountains currently support a reintroduced population that lives at the eastern end of that range. This currently separates them from the sheep in the Newberry and Ord Mountains by about 65 km of habitat lacking water, but there is evidence of recent expansion of habitat use by sheep at the western end of this interpopulation zone. Carefully placed water in this gap could expand habitat use by both populations to where there is regular gene flow. Until that connection is made it is important to minimize loss of genetic diversity in the Newberry/Ord population by maximizing its population size and stability. Currently this population numbers about 65 sheep, which appears to be an increase from what was thought to exist there two decades ago when cattle were considerably more numerous.

Two actions have potential to increase size and stability of this population. First would be the complete removal of cattle from the Newberry and Ord Mountains. There has been a clear overlap between cattle and bighorn sheep in this herd unit for a long time, and includes multiple water sources used by both species. The final decision on livestock grazing in the BLM California Desert Plan completed in 1980 stated "Eliminate livestock on bighorn sheep ranges south of I-40", but this was never implemented in the Newberry and Ord Mountains. It is time for BLM to implement that decision.

The second action is to assure adequate distribution of surface water in this region. Currently this sheep population utilizes four water sources in the Newberry Mountains and two on Ord Mountain. It is important to maintain water on both of these ranges. Given that some of these sources are maintained for cattle, it is important to assure their future for bighorn sheep or seek replacement water sources. West Ord Mountain has two water sources (Badger and Goat Springs) that currently receive no known use by bighorn sheep, but should be maintained to support potential future population expansion. East Ord Mountain has no water. A reliable water source should be developed there to expand habitat use. Sheep Spring in the Rodman Mountains does not provide consistent water, especially in the hot season when it is needed. It should be developed into a reliable water source given the need to expand sheep use of habitat to the southeast.

Bighorn sheep sign suggest that rams from this population wander west occasionally into the Granite, and Sidewinder Mountains region. Population expansion in this direction should not be encouraged with water because of the close proximity to human habitation and potential associated domestic sheep and goats.

San Gorgonio and Cushenbury herd units. As a high mountain range at the western edge of the desert in California, the San Bernardino Mountains receive considerable rainfall (Figure 2) and support primarily forest, woodland, and chaparral habitats that are mostly unsuitable for bighorn sheep. Consequently, unlike habitat to the east, bighorn sheep habitat in this range is substantially fire dependent. Bighorn sheep population dynamics in this range will reflect the frequency with which habitat accessible to bighorn sheep burns. The drier southern slope of Mount San Gorgonio and some higher steep habitat around that peak have provided sufficient temporal continuity of

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habitat to allow a bighorn sheep population to persist there. However, bighorn sheep habitat in this mountain range is now largely isolated from the rest of the desert by a variety of barriers that include highways, human habitation, and forested habitat.

Of the two herd units in the San Bernardino Mountains, the Cushenbury population is derived from a relatively recent natural colonization from the San Gorgonio herd (Epps et al. 2010). The Cushenbury population is a small isolated herd with low genetic diversity (Figure 3) that barely persists due to high mountain lion predation. It lies on the western margin of this metapopulation fragment, and because of human development barriers in this region (Figure 4) there may be little if any interchange with the Newberry/Ord population to the east. Interchange with its parent herd is also probably very low or non-existent due to habitat barriers that separate them. Consequently, the Cushenbury herd unit is very unlikely to contribute to gene flow or colonization processes in this metapopulation fragment and is therefore of very low priority for management actions.

Historically there was probably considerable migration between the Little San Bernardino and San Gorgonio herd units that is now largely severed by highway 62 (Epps et al. 2005). Similarly, there was once interchange between the San Gorgonio population and the San Jacinto Peak herd at the north end of the Peninsular Ranges, which Interstate Highway 10 has largely terminated. However, a female bighorn sheep was recently photographed crossing under the I-10 in this area headed toward the San Jacinto Peak. This gives the San Gorgonio herd unit a continuing metapopulation function and argues for pursuing ways to increase bighorn sheep migration across Highway 62. Steeply sloped habitat on either side of this freeway might allow a relatively short bridge to be constructed.

Pinto, Sheephole/Calumet, Coxcomb, and Iron Mountains herd units. Along with the Bullion Mountains, these four herd units share a number of features. First, they are all north of the Colorado River Aqueduct. Second, they all lacked natural reliable surface water. Third, they all fall in an area of relatively low rainfall (Figure 2). Fourth, they all are of relatively low maximum elevation. Fifth, because of these elevation, rainfall, and surface water characteristics they were all classified as having a high vulnerability to extinction, suggesting habitat of limited potential (Epps et al. 2004). Indeed, the Bullion, Pinto, and Iron Mountains populations clearly went extinct in the 20th century (Wehausen 1999). If not extinct, the population in the Sheephole Mountain was effectively extinct prior to translocations of sheep there in the mid 1980s (Bleich et al. 1990), and the Coxcomb population apparently also went extinct briefly (Epps et al. 2010), and possibly repeatedly. Sixth, the extinction vulnerability of all five of these herd units declines to a mid value when reliable water is provided (Figure A3). Alone this would relegate these herd units to a low priority for management actions. However, because of geographic locations they all play potentially important roles in gene flow in this region, which moves them to higher priority categories. The importance of the Bullion Mountains to the Newberry/Ord/Rodman herd unit was addressed above. The Sheephole/Calumet herd unit links the Pinto, Coxcomb, and Iron Mountains with the Bullion Mountains (Figure 4), thus could be a conduit of gene flow potentially all the way to the Newberry/Ord/Rodman herd unit discussed above. The Pinto and Coxcomb Mountains both connect the Sheephole Mountains with populations of high genetic diversity in the southern and western parts of Joshua Tree National Park, while the Iron Mountains link this whole system with the Old Woman Mountains (Figure 4). Currently all but the Pinto Mountains have bighorn sheep herds, and all but the Pinto Mountains have water developments for sheep. The Sheephole Mountains herd unit has consistently supported a bighorn sheep population since water was provided and sheep were translocated to that range in the mid 1980s. The Iron Mountains support a

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small herd derived from a recent natural colonization that uses one water development, while the Coxcomb Mountains apparently support only a small herd (Epps et al 2003) that may be experiencing regular extinction and re-colonization, perhaps because the multiple water developments there have not been consistently reliable.

Given the potentially important roles of all of these herd units in local gene flow in this region, they should be a focus of attention to see what might be done to increase size and stability of bighorn sheep populations. The Pinto Mountains are not known to have supported a bighorn sheep population for half a century (Wehausen et al. 1987b). While currently there may be some gene flow through the Pinto Mountains via rams, this may be relatively small given that this range represents about 45 km of mountain habitat with no water. While the Pinto Mountains fall in the influence of the central dry region in the middle of this southern desert (Figure 2), this range receives somewhat more rainfall on average, especially at its western end (e.g. relative to the Iron and Coxcomb Mountains) to potentially support a significant resident population of bighorn sheep if multiple water sources were added. Such a resident population would greatly enhance gene flow in this region, thus its establishment should be a high priority. A second reliable water source in the Iron Mountains is a minimum to aid population stability there, and water availability in the Coxcomb Mountains needs attention relative to the role of that mountain range in gene flow both north and south of the Colorado River Aqueduct.

Queen, Little San Bernardino, and Eagle Mountains Herd Units. Genetically these three herd units cluster together (Epps et al. 2010) indicating high gene flow, and this explains the maintenance of relatively high genetic diversity among these herd units (Figure 3). Given their close proximity, the Orocopia and Chuckwalla Mountains would have been part of this cluster of populations with high gene flow and high genetic diversity prior to the construction of Interstate Highway 10. The particularly high genetic diversity in the Eagle Mountains (Figure 3) may in part reflect its earlier central location in this population cluster prior to Interstate Highway 10.

Of note is the finding that the native population in the Granite Mountains to the east of the Eagle Mountains also clusters genetically with these three herd units (Epps et al. 2010) and has maintained relatively high genetic diversity (Figure 3), despite its apparently small population size. This suggests continual gene flow (and perhaps colonists) from the Eagle Mountains to the Granite Mountains despite the Colorado River Aqueduct. This has almost certainly occurred via the Coxcomb Mountains, and possibly includes a strong involvement of the very southern Coxcomb Mountains, where a migrating sheep can readily cross the Colorado River Aqueduct where it goes through the mountain (Figure 4).

Given the isolation of the Queen, Little San Bernardino, and Eagle Mountains complex due to migration barriers of Interstate Highway 10 and part of Highway 62 (Figure 4), it will be important to take actions that enhance the integrity of these three herd units as remaining core populations of high genetic diversity in this metapopulation fragment. Maintenance of reliable water will help maintain this core center of genetic diversity, but expanded habitat use would likely further serve this end. The absence of bighorn sheep in the Pinto Mountains results in the Queen Mountain population being situated at the end of a string of interacting groups of sheep that may once have formed a full circle around Joshua Tree National Park. This places the Queen Mountain population in a position of potentially less gene flow to counteract genetic drift and its somewhat lower level of genetic diversity (Figure 3) may reflect that gene flow limitation. Expansion of occupied sheep range into the Pinto Mountains should help remedy that. There may also be

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opportunities to enhance population stability, size, and distribution in the Little San Bernardino Mountains herd unit.

In addition to potentially benefiting sheep within Joshua Tree National Park, strategically placed water sources in the Cottonwood Mountains may produce badly needed gene flow south across Interstate Highway 10 west of Chiriaco Summit. In a stretch of 14 km east of Cactus City there are 17 bridges across washes and one across a road under the freeway that sheep could potentially use as underpasses to reach the south side of the freeway. In this region there is adequately steep mountain topography that extends to the freeway or very close to it on the north side which would allow bighorn sheep to approach the freeway at close range with comfort and thereby see where they could cross under the freeway to head to the Orocopia Mts or Mecca Hills. Gene flow into that southern metapopulation fragment is badly needed given its very limited number of herd units (see below). A population centered close to these potential freeway crossing points should maximize their use, and the high genetic diversity in the Joshua Tree National Park will result in migrants of high heterozygosity.

Granite/Palen, Little Maria, McCoy, Big Maria, and Riverside Mountains Herd Units. These mountain ranges all lie in the central dry region of the southern desert, where average growing season rainfall is no more than 75 mm (3 inches; Figure 2). Further, maximum elevations of some of the ranges are low, and all populations have high extinction probabilities in the absence of management activities (Epps et al. 2004), and all but the Granite/Palen herd unit have been known to go extinct. Relative to metapopulation processes, this set of herd units also suffers from being on the metapopulation margin due to the Colorado River (Figure 4) and potential isolation by the Colorado River Aqueduct to the north (Figure 4). Alone, these factors would relegate all of these herd units to the lowest priority for conservation actions and the McCoy and Riverside Mountains herd units in particular. However, a couple of factors increase that priority for some of these herd units. First is the finding that there has apparently been considerable gene flow from the Eagle Mountains to the Granite/Palen herd unit. Second is the recent natural colonization of the Little Maria Mountains, which almost certainly came from the Granite/Palen herd unit. Those two herd units are virtually connected and use of the Little Maria Mountains may simply be part of the home range of sheep in the Granite/Palen Mountains herd unit. Third is the very high opportunity for gene flow between the Granite and Iron Mountains due to the short distance between those ranges and the lack of a major barrier there (Figure 4). This is particularly important because this connection could provide gene flow to and from the Old Woman Mountains via the Iron Mountains. Fourth are the much lower extinction probabilities for the Granite/Palen and Big Maria herd units when reliable water is provided (Figure A3). Because the Little Maria Mountains provide an essentially continuous link between the Granite and Big Maria Mountains, all three of these herd units may warrant higher priority for conservation actions. Because of its direct linkage for gene flow, the Granite/Palen herd unit should be given the higher priority and should be part of a test of multiple mountain ranges in this region for the population effects of provisioning reliable water (see Monitoring and Research). Results of that test will determine if similar actions are warranted further east in the Little and Big Maria Mountains.

Old Woman/Piute and Turtle Mountains herd units. Higher maximum elevations and rainfall (Figure 2) coupled with reliable natural water have resulted in low extinction probabilities for both of these herd units (Epps et al. 2004; Figures A1, A3). Both should be viewed as long term core populations in the eastern region of this metapopulation fragment. Both mountain ranges are somewhat isolated because of large expanses of valley bottom habitat in some directions (Figure 4),

DRAFT

but for the most part those distances are not so extreme as to preclude meaningful levels of migration. For instance, a ram caught and marked in the Turtle Mountains was identified in the Old Woman Mountains; but gene flow between these two ranges is not high enough for them to cluster together genetically (Epps et al. 2010), i.e. migration is not high enough to counteract genetic drift. Sheep caught and radio collared in the Old Woman Mountains have been documented to visit the Ship, Little Piute, and Iron Mountains, and a natural re-colonization in the Iron Mountains came from the Old Woman Mountains (Epps et al. 2010).

Detailed demographic studies of the Turtle Mountains population estimated the reproductive base at just over 50 females (Wehausen 1992); thus, the total population size probably averages around 100 total sheep with dynamics driven by year-to-year variation in rainfall. Priority management actions for this population should focus on maintaining reliability of existing water sources.

The Old Woman Mountains is a large range with multiple sections and supports at least two different reproductive units (Wehausen 1992). However, yearly mark-resight estimates during 1984-91 put the reproductive base at only 35-55 ewes, which appears low for such a large range with good forage resources (Wehausen 1992). Multiple disease episodes have been documented in the bighorn sheep there that likely have their origin in cattle grazed there. One was characterized by high spring lamb mortality due to pneumonia with highest lamb losses in wetter years of better spring nutrition (Wehausen 1992), suggesting the involvement of an insect vector (e.g. the hemorrhagic diseases blue tongue or epizootic hemorrhagic disease). The other documented disease episode in the early 21st century included respiratory disease of adults also. During 1984-91 the number of ewes in the Wilhelm Spring subpopulation on southeastern arm of this range increased steadily from about 5 to 22 (Wehausen 1992). That so few ewes existed in 1984 is strongly suggestive of a prior major die-off from introduced disease. Cattle were documented to foul water sources otherwise available to bighorn sheep in this range (Wehausen 1988b). The final decision on livestock grazing in the BLM California Desert Plan completed in 1980 stated "Eliminate livestock on bighorn sheep ranges south of I-40", but for the Old Woman Mountains that decision was immediately reversed by an amendment that instead permitted cattle grazing. That amendment should be reversed and the cattle removed from the Old Woman Mountains to allow size and stability of this core population of bighorn sheep to attain its demographic potential and thereby fullfill its important metapopulation role. It is likely that the bighorn sheep in the Old Woman Mountains will show a demographic response similar to the Cady Mountains after cattle are removed. A considerably larger bighorn sheep population in this herd unit would significantly slow the effects of genetic drift on genetic diversity. This population probably once also occupied habitat north through the Piute Mountains but may have avoided the Piute Mountains in recent years due to feral burros there. The current BLM program to eliminate that burro population in the Piute Mountains should allow expansion of bighorn sheep into that range. It will be important to assure reliable water there for sheep.

Sacramento, Chemehuevi, and Whipple Mountains herd units. These three herd units at the eastern margin of this metapopulation fragment are bounded on the east by the Colorado River (Figure 4). Essentially continuous sloped habitat connects the Sacramento and Chemehuevi herd units. Prior to the construction of Interstate Highway 40 these two herd units would have had high gene flow with the Dead Mountains to the north and thereby be connected into a metapopulation of high gene flow and high genetic diversity in southern Nevada (see Dead Mountains above) – gene flow that would have extended south to the Whipple Mountains. That gene flow also would have

DRAFT

extended west from the Sacramento Mountains to the Piute, Old Woman and Turtle Mountains, with the Stepladder Mountains acting as a major steppingstone (Figure 4). Thus, the Sacramento Mountains population may have once been a significant metapopulation hub for gene flow. Despite an estimated population of 60 as recently as the early 1980s, (Wehausen 1999), bighorn sheep disappeared from the Sacramento Mountains some time in the late 20th century (Epps et al. 2003). With reliable water this range has a relatively low extinction probability (Figure A3), thus could again play an important metapopulation role on the edge of this metapopulation fragment. Two bridges over washes on Interstate Highway 40 at the north end of the Sacramento Mountains noted above (see Dead Mountains) may increase that role further. A natural expansion of the sheep from the Chemehuevi Mountains to the Sacramento Mountains is likely. An unresolved issue is the potential negative influence of various forms of human intrusion into this range from Needles, which lies a close distance to the east. The Sacramento Mountains need regular detailed ground surveys to ascertain if a reproducing population exists there. Clint Epps found fecal pellets of only 2 rams in his work there just after the turn of the 21st century.

The Chemehuevi Mountains have suffered impacts of feral burros for a long time (Figure 7), which may have accounted for low population estimates there through the 20th century (Wehausen 1999). However there are some indications that this population has increased somewhat in recent years, and a helicopter count in 200**?** logged **??** sheep **I NEED A COPY OF THAT FLIGHT REPORT**. Because of the close connection with the Sacramento Mountains, the Chemehuevi population could play a significant future metapopulation role if it could reach the population potential of its habitat in the absence of the competing influence of burros. Burros should be removed and maintained at the lowest possible density.

The Whipple Mountains similarly have suffered from a sympatric burro population (Figure 7). This is a large mountain range in the Sonoran Desert with relatively low extinction probability (Figures A1, A3) because of higher elevation and higher average rainfall (Figure 2) and should be able to support at least 100 sheep. Despite this favorable habitat, this population went extinct and was reintroduced via translocations in 1983, 1984, and 1985 that totaled 78 sheep (Bleich et al. 1990). However, it has maintained an estimated population size considerably smaller than that founding number, of only 25-50 (Epps et al. 2003). Like the neighboring Chemehuevi Mountains, there is a need to remove burros from this range and to carefully assess the bighorn sheep population response. There is a migration corridor between the Whipple and Turtle Mountains (Figure 4). Given the limited avenues for gene flow in this region (Figure 4), that migration corridor is potentially important to both populations. A larger population in the Whipple Mountains would slow genetic drift and increase gene flow to the Turtle and Chemehuevi Mountains, both of which are currently relatively isolated (Figure 4). Potential historic gene flow with the Riverside Mountains (Figure 4) was likely always low at best because of the long distance and very marginal habitat in the Riverside Mountains, and is probably non-existent today.

DRAFT

Southern Metapopulation Fragment

This metapopulation fragment lies south of Interstate Highway 10 and is by far the smallest (Figure 4). Its future is uncertain in part because it contains only four herd units, one of which is quite isolated in poor habitat at the southern margin of this metapopulation fragment. The Chuckwalla and Orocopia Mountains at its north end were once part of a set of populations with high connectivity and genetic diversity (see above; Figure 4), but that connectivity has been severed by Interstate Highway 10 (Epps et al. 2005, 2007). The long term future of this metapopulation

fragment will likely depend on north to south migration across Interstate Highway 10 to maintain genetic diversity. The potential for such migration was discussed above relative to a region south of the Cottonwood Mountains where there are numerous potential bridges where sheep might cross under Interstate Highway 10. In addition, there is an area a little east of Chiriaco Summit on Interstate Highway 10 where a part of the Orocopia Mountains extends north to the freeway, and where there are two bridges across washes that sheep might use to cross under the freeway. Because of the differences in distances to sloped habitat on either side of the freeway, this potential crossing region is more likely to produce south to north migration, whereas the region west of Chiriaco Summit is more likely to produce north to south migration, which is the migration most needed for this metapopulation fragment.

This metapopulation currently includes one hunt zone in the Orocopia Mountains, but previously had a second one in the East Chocolate Mountains.

Orocopia Mountains, West Chocolate Mountains, and Chuckwalla Mountains herd units. These three herd units are the core of this metapopulation fragment given that bighorn sheep use of the West Chocolate Mountains is largely at its north end and includes considerable interchange with the Orocopia Mountains.

Prior to 1989 the highest population estimate for the Chuckwalla Mountains was 43 in 1940 with subsequent values only 10-25 (Wehausen 1999). It is possible that this population has regularly depended on colonists from the Orocopia and West Chocolate Mountains to persist. In 1989, 43 sheep from Old Dad Peak were translocated to the Chuckwalla Mountains (Bleich et al. 1990), at which time it was not clear that a reproducing population persisted. The estimate prior to that action was only 10 sheep (Wehausen 1999). The status of this population is currently unknown, but estimates since the 1989 translocation have not projected this population to have increased from the numbers released there (Torres et al. 1994, Epps et al. 2003).

This entire metapopulation fragment lies in southern zone of low growing season rainfall, but these three herd units differ from the East Chocolate Mountains in receiving on average about 1 more inch of rainfall. At the lower end of rainfall an additional inch translates to considerably more nutrient intake (Wehausen 2005). This higher rainfall coupled with higher elevations result in relatively low extinction risks for the Orocopia and Chuckwalla Mountains, compared with the West Chocolate Mountains (Figure A3). Given the close connectivity of the Orocopia and Chuckwalla Mountains, this finding potentially places a high emphasis on both of those populations as the core of this metapopulation fragment. This in turn puts priority on development of population data for the Chuckwalla Mountains to better understand the role of this herd unit in this metapopulation fragment.

East Chocolate, Cargo Muchacho, and Palo Verde Mountains herd unit. This herd unit is situated at the southern margin of this metapopulation fragment bounded by the Colorado River, and thus has very limited opportunities for gene flow. It also suffers from chronic low rainfall, having the lowest average rainfall of all herd units (Figure 2). Further, its habitat is at low elevation with very limited elevational relief. This translates to poor habitat with a high extinction probability (Epps et al. 2004), even with reliable water (Figure A3). In addition, it has a long history of sympatric burros (Marshal et al. 2008; Figure 7). This bighorn sheep population has undergone extreme dynamics over the past 25 years, which is consistent with its poor habitat quality and possible competition from burros (Marshal et al. 2008). Given it poor habitat this population has

DRAFT

probably experienced repeated extinction and re-colonization events over longer time periods, with re-colonization most probably from the West Chocolate Mountains (Figure 4). Given these features, it is not surprising that this population has the lowest measured genetic diversity among desert bighorn sheep populations in California (Figure 3). This herd unit is probably a net importer of colonists and genes and may contribute little if anything to this metapopulation fragment as a result. On that basis it is a low priority for management actions. However, before that low priority is completely accepted, some actions are warranted to better understand the role of habitat at this apparent extreme. Given that this population reached a significant size in the recent past, burros should be controlled for at least a decade while data are collected on the bighorn population to better understand bighorn sheep population dynamics at this habitat extreme without a potential competitor. In addition to testing the role of feral burros in bighorn sheep population dynamics, this will also serve as another test of the scientific premises of this plan relative to the role of habitat quality.

Transverse Range Metapopulation Fragment

This most western metapopulation fragment lies west of Interstate Highway 15 and is bounded on the south by the Los Angeles Basin. It differs significantly from all other metapopulation fragments addressed in this plan in receiving notably higher growing season rainfall (Figure 2). Unlike most desert bighorn habitat further east, that higher rainfall enables a climax chaparral vegetation of high stature that is unsuitable for the long term persistence of bighorn sheep because visibility is greatly compromised. The persistence of bighorn sheep in this habitat requires fires that remove this tall vegetation on a regular basis. This is a sufficiently different conservation challenge relative to most of the rest of desert bighorn sheep range covered by this plan as to require its own separate conservation plan. Given that fire will be a fundamental part of such a plan, it should also include the San Bernardino Mountains where fire is similarly an issue for the bighorn sheep.

DRAFT

Summary of Implementation Actions by Three Priority Categories

All actions listed below are needed. They are categorized here by perceived importance to metapopulation processes. However, some actions will be more easily accomplished than others thus may be completed sooner regardless of priority classification.

Priority 1. Actions to enhance size and stability of populations and/or migration that involves (a) core populations, (b) otherwise important populations (White Mountains), or (c) gene flow between metapopulation fragments.

1. Eliminate the threat of contact with domestic sheep and goats in the White Mountains.

2. Eliminate burro competition from the Coso Range, Argus Mountains, Slate Range, Brown, Quail, and Granite Mountians, and Eagle Crags, and take other potential actions to re-establish populations and gene flow throughout this region.

3. Add water to the North Bristol and Old Dad Mountains

4. Experiment with the use of water to establish the use of freeway bridges as bighorn sheep underpasses to begin reconnecting metapopulation fragments at the north ends of the Marble

Mountains and South Bristol Mountains (I-40), the Soda Mountains (I-15), and Cottonwood Mountains (I-10). If this approach proves successful, apply it at Mountain Pass and at the junction of Highway 95 and I-40. If this approach fails, initiate planning for bighorn sheep bridges, beginning at the north end of the Marble Mountains.

5. Remove cattle from Old Woman Mountains, and remove burros and provide reliable water in Piute and Little Piute Mountains.

6. Develop at least 2 water sources in the Pinto Mountains and take additional actions if needed to re-establish a bighorn sheep population in those mountains.

7. Maintain current availability of water at natural and developed sources used by desert bighorn sheep.

Priority 2. Actions to enhance size and stability of populations and/or migration that involves (a) populations at metapopulation margins, (b) populations in lower quality habitat, and/or (c) where desired result is uncertain (enhancing populations near freeway bridges to increase inter-fragment gene flow).

8. Remove cattle and increase water distribution in the Newberry/Ord/Rodman herd unit.

9. Add water in the Bullion Mountains to enhance gene flow to Newberry/Ord/Rodman herd unit.

10. Bridge Highway 62 for bighorn sheep and develop a plan for the use of prescribed fire for habitat management in the San Gorgonio herd unit.

11. Provide reliable water in the Coxcomb Mountains.

12. Develop another water source in the Iron Mountains.

13. Provide reliable water in the Riverside Granite Mountains.

14. Eliminate competition from feral burros in the Chemehuevi and Whipple Mountains.

15. Remove all old livestock fencing that is no longer needed and that is potentially a barrier to bighorn sheep movements. For fencing parallel to freeways at bridges that sheep might cross under, reconfigure the fencing to connect to either end of the bridge so as to provide an unobstructed corridor under the bridge.

16. Replace old high maintenance water systems with reliable low maintenance ones where possible, and enhance reliability of water sources wherever possible.

Priority 3. Actions to enhance size and stability of populations and/or migration that will probably have only a small contribution to metapopulation processes in California.

17. Investigate potential use of the west side of the Inyo Mountains and take actions to re-establish bighorn sheep there if needed.

DRAFT

18. Eliminate burro competition in the Dead Mountains.

19. Eliminate burro competition in the East Chocolate Mountains.

MONITORING AND RESEARCH

Adaptive management is a system that uses information input in a decision tree. This plan calls for such information input relative to certain topics. Some of that information will be derived from research, while some will come from monitoring data. Additionally, research is needed relative to potential methods for some of the monitoring needed. This plan distinguishes metapopulation level from herd unit level relative to multiple topics, and this section is also organized by those two levels.

Research and monitoring both involve the collection of data. Monitoring refers to the development of regular data to track changes over time relative to some measure of interest, while research typically involves more intensive investigation of specific questions of interest. While this section attempts to segregate monitoring and research, the two are not entirely independent. For instance, long term monitoring data may be used in a research context. However, research often requires data of a higher resolution than monitoring in order to be able to distinguish among competing alternatives. Monitoring and research also overlap to the extent that to be most effective both need to be based on adequate problem analyses. Critical aspects of such problem analyses include detailed explorations of the questions for which data are needed, and analyses of what data are needed, what resolution is needed for each data type, and the best methods to obtain those data.

Metapopulation Process Monitoring

Colonization/Extinction Dynamics

Desert bighorn sheep in California are in a period in which colonizations have exceeded extinctions (Table 3) and this pattern is an important basis of this plan. Those dynamics should be monitored closely. Vacant habitat patches need repeated careful evaluations to detect further colonizations, while extant populations need monitoring to detect extinctions. This latter aspect can be monitored in most ranges by those who check water source regularly. A reporting system concerning bighorn sheep sign around water needs to be developed, implemented, and incorporated into a data base. Such a system should be simple, yet have the resolution to detect declining use of a water source over 5-10 years and to expose any population potentially nearing extinction. The Society for the Conservation of Bighorn Sheep water monitoring system can be the framework for much of this monitoring of bighorn sheep sign for extant populations and should provide annual data for most ranges and often multiple locations in a mountain range.

Recently colonized herd units should be The smallest populations will be most vulnerable to extinction. A list of such populations should be maintained and those ranges should be the focus of more intensive monitoring.

Investigations of vacant habitat patches need a well-designed, biologically based procedure. This procedure should first identify what constitutes occupancy and what information is needed to establish occupancy. Minimally this should include the presence of females, but potentially also include evidence of reproduction. Second, it would be appropriate to include such evidence in

DRAFT

multiple years to establish occupancy. A potentially useful approach to occupancy investigations will be a dichotomous key that begins with determination if known water sources exist. Known water or potential tinajas should be the first sites investigated.

Recently colonized habitat should be monitored at least every two years to verify continued occupancy and hopefully begin developing some information on population growth. This level of monitoring should continue until the population is clearly established.

Gene Flow and Genetic Diversity

Maximizing connectivity and gene flow is fundamental to this plan and a fundamental goal is the maintenance of genetic diversity. There is the potential for genetic diversity to increase with greater connectivity, including re-establishment of migration across current barriers. There should be periodic attempts to monitor genetic diversity across the desert as one assessment of the success of the recommendations of this plan. Most bighorn sheep populations in focal region of this plan have already been sampled genetically and that DNA run for numerous microsatellite loci that provide measures of genetic diversity. There is a need to sample the remaining populations to complete the baseline data. Second, in 25-30 years this sampling should be repeated to provide new data for the 30 year review. That will represent a time span of at least 5 generations between samplings. A similar time frame was sufficient to detect changes in genetic population structure resulting from the construction of highway barriers (Epps et al. 2005).

Highway Underpass Monitoring

The implementation section of this plan identified numerous locations where bighorn sheep may be able to migrate across major freeway barriers under bridges over washes or on occasional roads over or under freeways. The extent to which any of these is actually used by bighorn sheep is unknown and for many sections of these highways gene flow estimates suggest that use is low enough to classify these roads as essentially complete barriers (Epps et al. 2005, 2007). However, some of these potential freeway underpasses occur where genetic data are lacking for various reasons. There is a need to better understand if any such potential migration corridors are used. Automated cameras should be deployed at a few of the bridges most likely to be used to determine if any use is occurring. If use is detected this monitoring program should be increased to more bridges.

DRAFT

Metapopulation Research

Viability of Southern Populations

An important scientific basis of this plan is the finding that numerous ranges in the southern part of the California desert suffer from low average annual rainfall. As a result, the ranges in this zone have been placed in the lowest priority classification unless they are potentially important nodes for gene flow. The premise that ranges in this dry zone can support only relatively small and highly fluctuating populations of bighorn sheep should remain open to question. The fundamental underlying question is the relative importance of rainfall and its influence on nutrient availability relative to summer water availability. Of the ranges in that drought zone the Iron, Coxcomb, Granite, Chuckwalla Mountains, and East Chocolate Mountains have both sheep and water developments. To evaluate whether this region can support sustained viable bighorn sheep herds,

key demographic variables of the populations in the Iron, Coxcomb, and Riverside Granite Mountains should be measured and monitored over numerous years coincident with ongoing efforts to provide reliable water. These three ranges have been chosen because they play major roles in gene flow in this region. If resources are available, the Chuckwalla Mountains could be added to that list. Collection of similar data on populations in higher rainfall zones should be continued for comparison. This research should provide a better understanding of how geographic variation in rainfall affects population parameters. If initiated in a timely manner, by the 15 year review the resulting information should be able to inform decisions on whether other ranges in the region will warrant actions to enhance population sizes.

Herd Unit Demographic Monitoring Research

Monitoring of populations of desert bighorn sheep in recent years has been done largely by helicopter surveys conducted in the fall, primarily September and October. This data collection approach has advantages and disadvantages. On the negative side it is expensive and can be expected to increase in expense as fossil fuels increase in price. Second it is dangerous, as evidenced by many fatalities of biologists from helicopter crashes. While these two factors alone are reasons to look for alternative methods, there are additional shortcomings to helicopter surveys. One is the limitation in the classification of the sheep seen. Yearling females are an important class of sheep to monitor relative to population dynamics, but this class cannot be distinguished reliably from a helicopter. Other classification errors have been common, often involving larger lambs misclassified as females. This occurs because lambs can vary greatly in size within and between years due to long lambing seasons and interannual variation in nutrient availability. In very recent years the addition of digital photography to helicopter surveys in California has illustrated the frequency of errors in classifications, while also providing a means to correct those errors. However, the addition of digital photography as a tool to improve data from helicopter counts requires observers with adequate camera experience on both sides of the helicopter on all survey flights. Another shortcoming of helicopter surveys is a potentially high variation in observer experience and ability and its large effect on data quality.

On the positive side, well planned and executed helicopter surveys can be an effective sampling tool. While such surveys typically record somewhat less than half of the sheep present, surveys with consistent effort have a potentially high resolution to track population trends (Wehausen and Bleich 2007). Helicopter sampling data have the potential to be run through various estimators to produce population estimates of population sizes and precision. The simultaneous double count has been used extensively in California, but it estimates only the number of sheep available to be seen. Below is a discussion of some potential alternatives to helicopter surveys that warrant research and consideration for use in California. It is not clear that any one method, including helicopter surveys, is best for every mountain range. Consequently, a mix of methods may be the most efficient approach to monitoring desert bighorn sheep populations in California. What that optimal mix is will depend on what data of what resolution are needed.

Walking Ground Counts

Like helicopter surveys, ground counts provide a minimum count unless collared sheep are present to allow the use of a mark-resight estimator. Ground counts have several advantages. First is that experienced personnel can develop herd composition of data of higher detail and accuracy than are obtained from helicopter surveys. Second, it has been found in multiple situations that a

DRAFT

small experienced team can count considerably more sheep than a helicopter survey. Coordinated ground counts that cover a defined area in the same season via fixed routes and effort have the potential to provide a reliable index that will track population trends similar to helicopter surveys, except with a higher proportion of the population sampled. There is a need for well planned research that further explores this potential option. In particular, May and June are known to provide particularly optimal distribution of sheep for counts of ewes and associates in some mountain ranges. For more southern hotter ranges part or all of April may prove to be an optimal time. A couple of conditions make these spring months optimal for this. First, sheep are already drinking water on a regular basis even if less frequent than in mid summer, and have consequently limited their geographic distribution to a region near water. This allows the sampling to focus on a limited area. Second, in many years (of reasonably good forage growth) these female groups still maintain large group sizes typical of nursery groups earlier in the growing seasons. This makes them more visible and enhances the number of different sheep that can be seen during a count. In larger populations a single observer can classify over 100 sheep in a day under these conditions, and a small coordinated group of trained field biologists should be able to sample a large proportion of the population. This approach does not work later in the hot season for desert bighorn because group sizes diminish greatly and sheep activity behavior changes with higher temperatures. Water hole counts later in the hot season also do not compare because of the limited ability to distinguish different individuals. This approach of coordinated ground counts using multiple observers has been used successfully for years to develop excellent demographic data on bighorn sheep populations in the Sierra Nevada.

Camera Minimum Counts

It has long been recognized that data on desert bighorn sheep can be developed at point water sources in summer. Water hole counts were one of the earliest modes of data collection. Time lapse cameras were the first attempt to automate data collection at water sources. Technology in recent decades has allowed still photography to be replaced with short lengths of video footage triggered by animals via infrared or other sensors. Most recent technology allows video information to be stored digitally rather than on video cassette tapes. When cameras are carefully deployed, such photographic information provides close pictures of sheep with high detail. At that level of detail, many mature rams in a population should be recognizable as individuals, as will a considerable number of sheep of other sex and age classes. There is a need to research the use of such technology to develop minimum counts. This might be particularly cost effective for hunted populations as a way to allocate hunting tags.

Another possible measure is the number of females photographed in a fixed time period (e.g. 1, 2 , or 3 days) once full summer heat has occurred. The length of this period could be determined by examining past video footage and developing statistics on the frequency of water visits by marked females. Research could then compare numbers of females photographed in various time periods with mark-resight estimates to evaluate possible simple photographic measures that might be used as a good population index in situations lacking marked sheep. As an index that approximates a minimum count, it is not important if a small percentage of the sheep are counted twice; those double counts may balance out a similar percentage not counted at all. Calibration with independent data on population size is critical for evaluating this approach.

DRAFT

Camera Mark-Resight Estimates

Automated video cameras set at point water sources in summer in conjunction with collared sheep have been used for nearly two decades in California to develop mark-resight population estimates of ewes. In that footage there have also been many ewes with physical characteristics that allow them to be recognized individually. There is need to research the potential to use only such naturally marked ewes for such mark-resight estimates. The same could be done for rams provided that the cameras were run later in the summer when the rut brings rams into water sources used by females. For some mountain ranges this might be a particularly inexpensive way to develop population estimates in addition to minimum counts. This is a method available only for camera data taken a close range where naturally marked individuals will always be recognized. Such individuals cannot be consistently recognized from a helicopter or during ground counts.

Fecal Genotyping

DNA extracted from bighorn sheep droppings can be used to identify sheep individually, determine their gender, and to separate bighorn sheep dropping from deer droppings. It is known from considerable prior genetic data on desert bighorn sheep in California that genetic diversity is high enough to allow reliable identification of individuals with a relatively small number of microsatellite loci (DNA fingerprinting). The use of DNA fingerprinting to determine the total number of bighorn sheep (genotypes) in a population is unlikely to be a cost effective tool for assessing sizes of populations larger than about 25 because of the laboratory expense associated with the large number of redundant samples from the same individuals that typically have to be run to approach the total number of different genotypes. This approach has been very effective in the Sierra Nevada for assessing sizes of smaller populations where sheep are difficult to find. For desert bighorn sheep it may be similarly very effective for developing demographic data for mountain ranges with few sheep, such as newly colonized ranges. Helicopter flights in such ranges can be very inefficient, and low population sizes can have results strongly influenced by chance events (e.g. encountering or not encountering a key group of sheep).

Fecal genotyping also has the potential to provide population estimates. One is the simple plot of number of different genotypes against the number of samples genotyped. This relationship will be curvilinear and asymptotic. It will be necessary only to clearly elucidate that curvilinearity and fit an appropriate function to the data to project the asymptote.

A second genotyping estimation procedure is a form of mark-recapture estimation. Identification of a genotype is equivalent to marking an animal in the field and each additional sample of the genotype represents a recapture. The same data used for the previous asymptotic estimation approach could be used for mark-recapture estimation. Further, many random resamplings of the data that each re-allocate data to marking vs resampling phases could add precision estimates. An attempt to use fecal genotyping to estimate the size of a bighorn sheep population in the Inyo Mountains of California found that population substructuring can significantly confound this approach. Its valid application will require a careful sampling protocol and prior knowledge of the distribution for the population in question at the time when fecal samples are collected.

DRAFT

Research that compares costs and results of fecal genotyping relative to other population monitoring methods may find this approach a useful tool for some situations. There is a need to identify what constitutes those situations.

Ram Estimates from Ewe Counts

Ewes are often easier to count and/or estimate than rams because of sexual segregation during much of the year and the wider distribution of rams when ewes can be more concentrated and potentially counted. It should be possible to use past data on sex ratio to produce reasonable estimates of the number of rams in populations if a good ewe count exists. A good source of past sex ratio data would be helicopter surveys carried out during late summer and early fall when the sexes are typically mixed during the breeding season.

Herd Unit Level Monitoring

Water Availability

This plan treats water as a particularly important habitat component that will determine population distribution, size, and stability. Insufficient water has the potential to result in high losses of lambs and weaker adults and consequently can undermine population stability. This factor can move small populations toward extinction quickly. The potential importance of this resource to desert bighorn sheep has long been recognized, and the Society for the Conservation of Bighorn Sheep in coordination with CDFG has a long history of monitoring water sources, especially those that depend on impounded rainwater. This monitoring needs to continue if not increase, and be incorporated into an adequate data base system that is shared and itself monitored by individuals from both of these organizations. It is important for repair needs to be identified and fixed in a timely manner to maximize the probability of collecting rain prior to each hot season.

Monitoring Population Parameters

There are three basic demographic variables that might be monitored: population size, recruitment, and adult survivorship. Females are the reproductive base of populations and these three variables will provide the most useful demographic data if focused on that gender. Data on the size of a female population might track population change, while data on the female survivorship and recruitment might allow a parsing of what underlies that change. The balance between losses from adult mortality and gains from lamb recruitment largely drive the dynamics of desert bighorn sheep populations.

Survivorship. Except where mountain lion predation has been a significant factor, survivorship of desert bighorn sheep females has been very high where measured. To monitor it across the range of desert bighorn sheep would require deployment of radio collars on a significant proportion of the females in each population and regular (e.g. monthly) development of data on whether each collared sheep is still alive, as well as the investigation of any mortality signals. Table 2 lists 64 herd units, of which 11 are currently vacant, leaving 53 that contain sheep. Monitoring survivorship in all of these herd units would be very expensive and would largely just verify the known high survivorship of desert bighorn females. Survivorship should be monitored only where (1) the population is of particular concern (e.g. an endangered species), and (2) there is reason to think that this

DRAFT

survivorship may be an important factor in population dynamics. In short, measurement of survivorship is a research tool for intensive demographic studies, not a monitoring tool.

Recruitment. Recruitment is a variable much more amenable to measurement than survivorship. It can be measured as the ratio of (1) lambs to all ewes (e.g. helicopter data), (2) lambs to adult ewes (good ground count or camera data), or (3) yearling ewes to adult ewes (good ground or camera data). The first of these suffers from inclusion of yearling ewes in the denominator, a class the does not produce lambs. Because recruitment varies greatly from year to year, the proportion of yearling ewes in the denominator of this ratio can vary considerably thereby rendering this a crude measure of recruitment. To be meaningful, lamb recruitment ratios need to be measured from late spring to early fall after the major late winter and spring period when most lamb mortality occurs. However, the measure that most closely measures true recruitment is the ratio of yearling ewes to adult ewes, which requires the ability to accurately classify yearling ewes. This can be done in ground counts in late spring and from good camera data in early summer.

Just as survivorship cannot be monitored for 53 populations, neither can recruitment. If data could be obtained from 13 populations every year (which itself would take a large commitment), there would be data for each population every 4 years. It is not clear what meaningful question such data could address. In short, to provide useful information recruitment needs to be measured annually, limiting this variable to intensive demographic studies for research or detailed monitoring of focal populations identified because they are harvested or otherwise important.

Population Size. Development of herd size information for desert bighorn sheep in California has a long history that for some populations extends back to the early 20th century (Wehausen et al. 1987, Wehausen 1999). Beginning in the late 1930s there were attempts of inventory known populations about once every 10 years. The numbers generated in the early years were probably mostly minimum numbers seen in casual visits to mountain ranges or that someone reported. Consequently those numbers have an unclear relationship to actual population sizes. Beginning in the late 1960s population size estimates were based on increasing amounts of information, including considerably greater field effort for each mountain range and increasing use of helicopter surveys; however, many of those numbers continued to lack a clear basis until the 1990s. Since then yet increasing amounts of information have been the basis of population size figures including some form of quantitative estimator for many herd units.

A first question concerning population monitoring is what role herd unit population estimates play in the conservation of desert bighorn sheep in California. One is bureaucratic reporting of total numbers of desert bighorn sheep in the state. This is a political need, but not clearly an ecological need. Ecologically it is important to monitor population sizes of herd units included in the hunting program, and especially any herd units that might be used as a source of translocation stock. Because translocations remove part of the reproductive base of populations it is important to closely monitor not only the size of that reproductive base, but also its dynamics. When translocations of desert bighorn sheep began in California in the early 1980s such data were lacking. After multiple years of such removals an analysis of the age structure of the animals removed from the Marble Mountains showed a lack of recruitment to replace those removals, and the mining of that population was quickly terminated.

Ecologically it would be desirable to be able to track population size trends by herd unit fragment as a potential measure of the success or failure of conservation activities, but it is unclear

DRAFT

that this can be done with meaningful resolution. Exact numbers of desert bighorn sheep in any population can rarely be determined, and estimates based on statistical estimators typically have wide confidence intervals. In recognition of the inherent crudeness of populaltion data, beginning in the early 1990s population size reporting for California has used a categorical system with 8 categories: extinct, <25, 25-50, 51-100, 101-150, 151-200, 201-300, >300 (Torres et al. 1994, 1996; Epps et al. 2003).

Because adult and yearling females represent the core reproductive base of each population, they should be the focus of efforts to count or estimate sizes of herd units. Population size monitoring should develop a new reporting system that includes two figures: the reproductive base (adult and yearling females) and the total population or total adult population. Sexual segregation during part of the year makes this a particularly important consideration for data collected when the sexes are segregated. Numbers of adult males can be estimated from data on females based on past male:female ratios collected when the sexes are agregated to give adequate data to put the total herd size in one of the above categories. Development of data on population sizes will be most efficient during time periods when sheep are most concentrated geographically. For desert bighorn sheep this is typically during the warmer months of the year when they live near water, and a variety of potential methods discussed above might be applied to develop data on population sizes; however, the efficacy of different methods will vary among herd units because of multiple factors. Each herd unit should be evaluated relative to potential methods and one or more methods chosen, ideally on the basis of attempts to apply potential methods.

The general low resolution of population data, as reflected in the categorical reporting system used, needs to be recognized in considering uses of such data. While focusing population monitoring on adult and yearling females may increase data resolution, it remains unclear that it will be sufficient to detect other than large changes within metapopulation fragments over relatively long time periods. Of the 53 occupied herd units, the 9 currently in hunt zones will need regular monitoring as part of the hunting program. That leaves 44 additional herd units that need regular data on herd size. If 5 of those units were targeted for data development every year, and hunt zone units were surveyed every other year, that would amount to about 10 herd units surveyed each year, which judging from past efforts would be challenging. At that rate it would take 9 years to develop data on every herd unit, and a goal of developing data on every herd unit at least once every ten years could be met. Coupling that time frame with the nature of data resolution would result in a very limited ability to detect changes on a metapopulation fragment level.

If monitoring of unhunted herd units were increased to 9 per year, all herd units could be covered every 5 years, providing a better time frame for attempting to detect changes in metapopulation fragments. With hunted populations this would amount to population data developed for 13-14 herd units each year. Population monitoring in California has lacked any such schedule or clear goal, and results of that lack of planning are evident in the data.

Assuming an average of 6 hours of helicopter time per herd unit and $1000 cost per hour, 5 herd units per year would require a $30,000 yearly commitment on top of the commitment necessary to monitor hunt zone herd units, whereas an additional 9 herd units per year would cost $54,000. Research on potential alternative monitoring methods outlined above may be able to greatly decrease the monitoring costs for many herd units and allow more regular monitoring. That research needs to take place, and following it a monitoring plan should to be prepared that lays out clear goals, methods to be deployed for each herd unit, a monitoring schedule, and cost.

DRAFT

Interagency cooperation on monitoring might greatly enhance its frequency and success, in part by sharing the cost burden. For instance, the National Park Service lands include 18 of the occupied herd units in Table 2.

TIME LINE FOR MANAGEMENT, MONITORING, AND RESEARCH ACTIONS

First Five Years

1. Experiment with and evaluate the potential use of water near freeway bridges to enhance bighorn sheep use of such bridges as underpasses. Use automated cameras to monitor some other key bridges that sheep might be using as freeway underpasses.

2. Work with various land owners to eliminate the threat of contact between bighorn sheep and domestic sheep or goats in the White Mountains.

3. Work with BLM or other agencies to eliminate any other domestic sheep allotments near bighorn sheep habitat.

4. Work with BLM to eliminate cattle and feral burros from the Old Woman/Piute Mountains herd unit, and cattle from the Newberry/Ord/Rodman herd unit.

5. Develop an interagency working group to eliminate burros from potential bighorn sheep habitat in the Coso Range, Argus Mountains, Slate Range, Brown, Quail, and Granite Mountians, and Eagle Crags.

6. Work with BLM to plan the elimination of competition from burros in the Chemehuevi, Whipple, Dead, and East Chocolate Mountains and initiate the process.

7. Develop water in the Pinto Mountains and North Bristol/Old Dad Mountains herd units, and in the Rodman Mountains, and begin adding water to the Bullion Mountains.

8. Begin developing reliable water in the Iron, Coxcomb, and Riverside Granite Mountains, and establish methods of long term collection of demographic data in these herd units to evaluate habitat potential.

9. Work continuously to maintain water currently available to bighorn sheep throughout the desert.

10. Develop a plan for the replacement of older water developments with new low maintenance systems and begin that process.

12. Work with the Society for the Conservation of Bighorn Sheep to develop a reliable approach to obtaining and data basing regular information on water and sheep use near water.

11. Evaluate multiple potential methods for development of demographic monitoring data.

13. Investigate all vacant herd units to determine if natural colonizations have occurred.

14. Begin the planning for construction of a bridge across Highway 62 for bighorn sheep.

DRAFT

15. Begin the removal/alteration of livestock fencing to enhance bighorn sheep movements.

16. Research potential monitoring methods, experiment with the application of different methods in a variety of herd units, and develop a monitoring plan.

17. Continue the desert bighorn sheep hunting program and expand it where appropriate.

Second Five Years

1. If water near freeway bridges does not adequately enhance their use as underpasses, begin planning the construction of bighorn sheep overpasses.

2. Complete the elimination of burros in bighorn sheep habitat in the Coso Range, Argus Mountains, Slate Range, Brown, Quail, and Granite Mountians, and Eagle Crags if not accomplished in the first five years.

3. Complete the elimination of burros in the Chemehuevi, Whipple, Dead, and East Chocolate Mountains.

4. Continue investigation of habitat potential of the Iron Mountains, Coxcomb Mountains, and Riverside Granite Mountains via demographic data.

5. Again investigate all vacant herd units to determine if natural colonizations have occurred. Consider translocations to some vacant herd units deemed more important to metapopulation processes.

6. Continue the process of replacing older water developments with new low maintenance systems.

7. Continue the desert bighorn sheep hunting program and expand it where appropriate.

Third Five Years

1. Again investigate all vacant herd units to determine if natural colonizations have occurred.

2. Continue the process of replacing older water developments with new low maintenance systems.

3. At the end of the third five years evaluate progress in achieving plan goals and the plan itself; revise the plan if deemed necessary.

4. Continue the desert bighorn sheep hunting program and expand it where appropriate.

DRAFT

APPENDIX I
EXTINCTION MODEL RERUNS

Extinction/re-colonization dynamics play a key role in this metapopulation plan. Similarly, differences among mountain ranges in their habitat quality and extinction probabilities provide an important basis for evaluating metapopulation roles of different mountain ranges and priorities for management actions. Epps et al. (2004) applied a logistic regression analysis to past extinction patterns of desert bighorn sheep populations in California that evaluated numerous potential covariates. Four covariates emerged as statistically significant extinction correlates: past domestic sheep grazing (-), maximum elevation (+), average annual precipitation (+), and existence of reliable surface water (+). Mountain ranges in which bighorn populations were more likely to persist had higher maximum elevation, more rainfall, reliable surface water, and no past domestic sheep grazing.

Because of the foundational importance of that extinction analysis to this conservation plan, those results were explored in detail to investigate statistical robustness of the model to data base changes, and to tailor the model to the needs of this plan. This was done via six reruns of the analysis using different data sets. The first rerun simply corrected a few errors discovered in the data base used. The second rerun altered some population definitions. This entailed combining some adjacent mountain ranges known to be used by a single population, and changing the extinction status of a couple of populations to better match available data. Models 3-5 began with the data base from model 2 and sequentially removed populations that because of habitat characteristics did not represent most of the habitat covered by this plan. In model 3 the northern White Mountains were removed as the only population with extensive alpine habitat and altitudinal migration. That model also removed the San Gabriel Mountains and three historic locations in the Transverse Range to the north because that region has much higher rainfall and resultant tall vegetation compared with the desert habitat covered by this plan. Model 4 also removed the San Bernardino Mountains because of high elevation and high rainfall, as well as the Peninsular Ranges, which are not covered in this plan. Model 5 removed any remaining habitat patches that had past domestic sheep grazing to limit the model to just three habitat variables. Models 1-5 resulted in a sequential attrition of habitat patches used in the analyses from 80 to 57 (Table A1), a 29% decrease. Model 6 added back a few mountain ranges removed by the population redefinition in Model 2. Model 6 simply approached this question from the standpoint of habitat patches available to sheep that were either vacant or occupied prior to known natural re-colonizations or active management programs for sheep near the end of twentieth century. Because past domestic sheep grazing was still removed as a variable, Model 6 used bighorn sheep presence or absence to develop a model that would assign a relative habitat quality level to each patch based only on habitat variables. Additionally, it did this using only data from the region covered by this plan. This model was considered the most appropriate one to use for planning purposes.

These model reruns found the extinction model of Epps et al. (2004) to be very robust. All four variables remained statistically significant in every rerun in which they were included (Table A1). Variable weightings in these models exhibited the following hierarchy of importance (highest to lowest): past domestic sheep, maximum elevation, rainfall, and surface water (Table A1). However, in Model 6 the relative weightings of the three habitat variables were more equal, with surface water about the same as rainfall, and those two variables only slightly less important than maximum elevation (Table A1). While this model had the lowest overall R^2 value (Table A1), that value was twice what it was for models that included only those three habitat variables for the data

DRAFT

bases used for models 1-4. The higher R^2 values for Models 1-4 (Table A-1) was driven by the important role of past domestic sheep grazing in those analyses.

Table A1. Results of extinction analysis reruns. All variables tested in these model reruns retained statistical significance (P<0.0001). N is the resulting number of habitat patches used in each rerun. Values tabulated for each of the four variables are relative weights from AIC_c analysis derived from models of all variable combinations. Those weights measure the relative importance of each variable in the extinction model. Models 1-5 are sequential cumulative removals of habitat patches, thus the declining N values. Model 6 altered model 5 by reversing some population redefinitions begun in model 2 to simply approach this question by habitat patches (mountain ranges) as occupied or vacant prior to known natural re-colonizations and water development projects.

Model	N	R^2	Dom. Sheep	Max. Elev.	Rainfall	Water
1. 3 errors corrected	80	0.47	1.000	0.967	0.964	0.616
2. 5 population redefinitions	75	0.47	1.000	0.944	0.961	0.377
3. North White Mts. & 4 Transverse Range patches removed	70	0.44	0.999	0.975	0.783	0.450
4. Patches in Peninsular Ranges & San Bernardino Mts. removed	62	0.39	0.999	0.975	0.636	0.444
5. Remaining ranges with past domestic sheep removed	57	0.32	-	0.975	0.641	0.449
6. Population redefinitions returned to individual ranges	61	0.31	-	0.869	0.711	0.697

Of the four variables retained by these models, two are amenable to management actions; risk of contact with domestic sheep can be eliminated, and drinking water can be added to ranges that lack reliable natural surface water. These extinction models also were used to evaluate how extinction probabilities (habitat quality) changed when these two variables are eliminated as extinction factors, i.e. were mitigated. This was done by altering Model 6 to represent a situation of reliable surface water universally available, and applying the resultant model to all pertinent ranges. Figure A1 presents extinction probabilities from the model of Epps et al. (2004). Figure A2 applies Model 6 to all desert ranges covered by this plan, thus eliminates negative influences of domestic sheep grazing. Figure A3 applies Model 6 under a situation of reliable surface water in every habitat patch, thus corrects both domestic sheep grazing and water deficiencies. Figure A3 can be viewed as a map of habitat potentials under management relative to population persistence, and is based on two variables: maximum elevation and average annual rainfall.

DRAFT

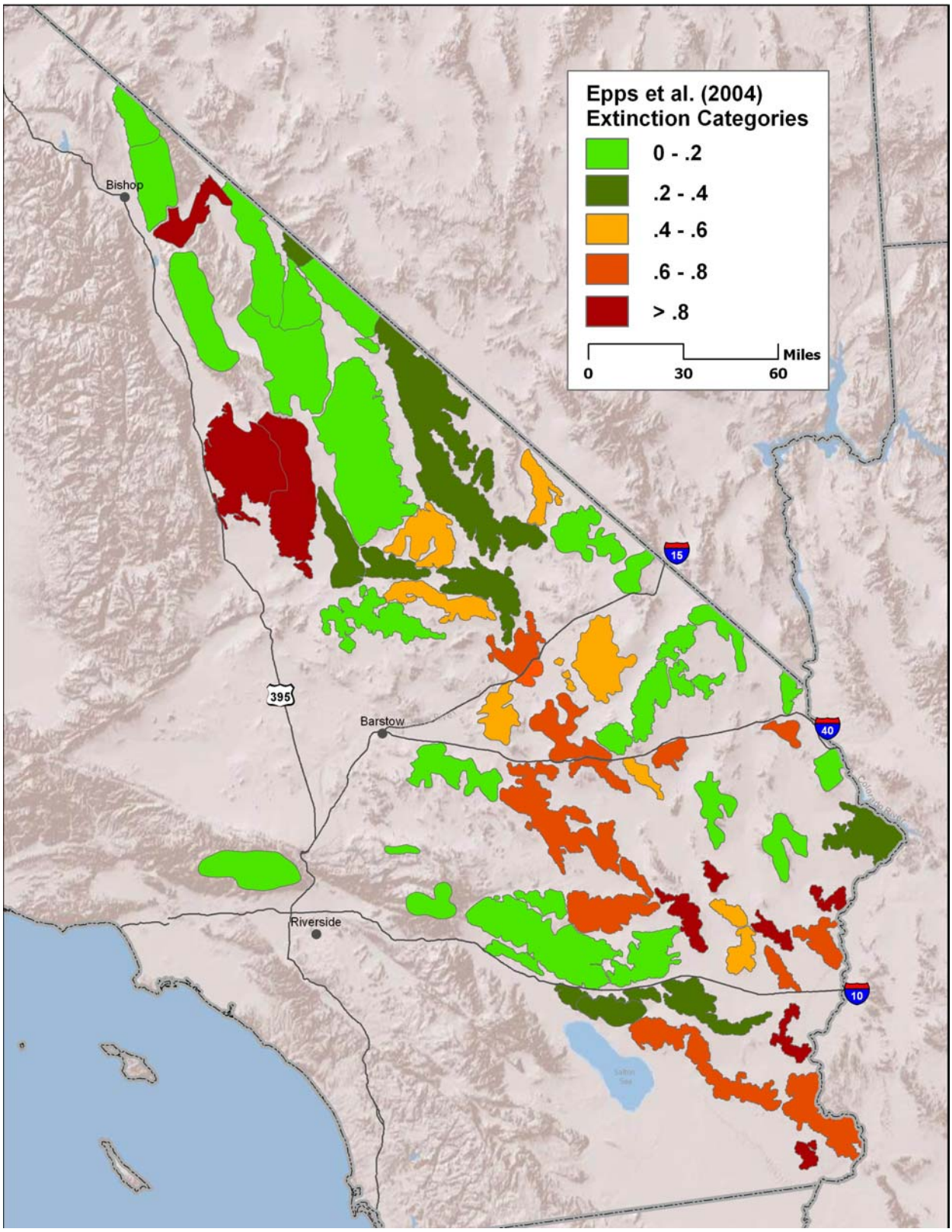

Figure A1. Extinction risk categories of Epps et al. (2004)

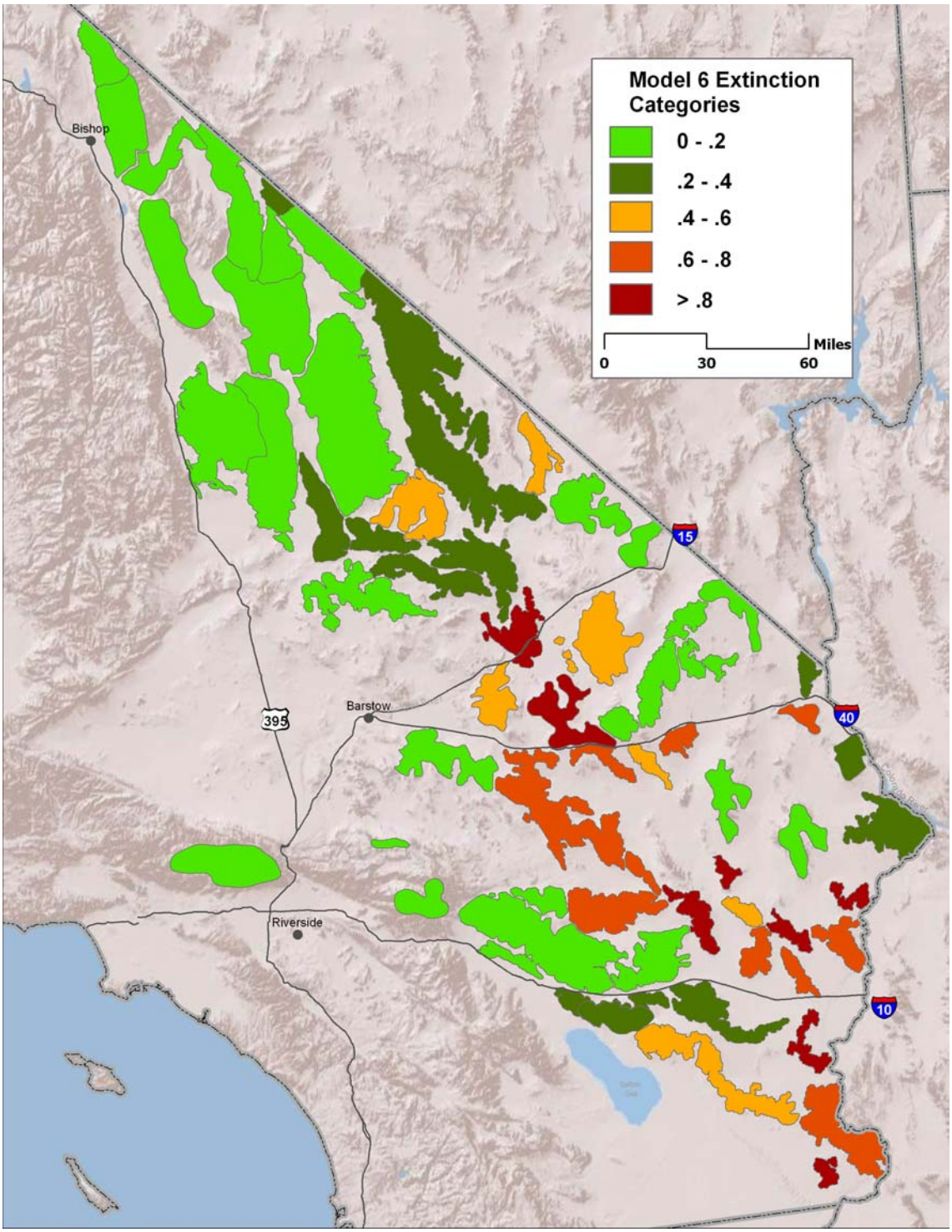

Figure A2. Extinction risk categories predicted by Model 6.

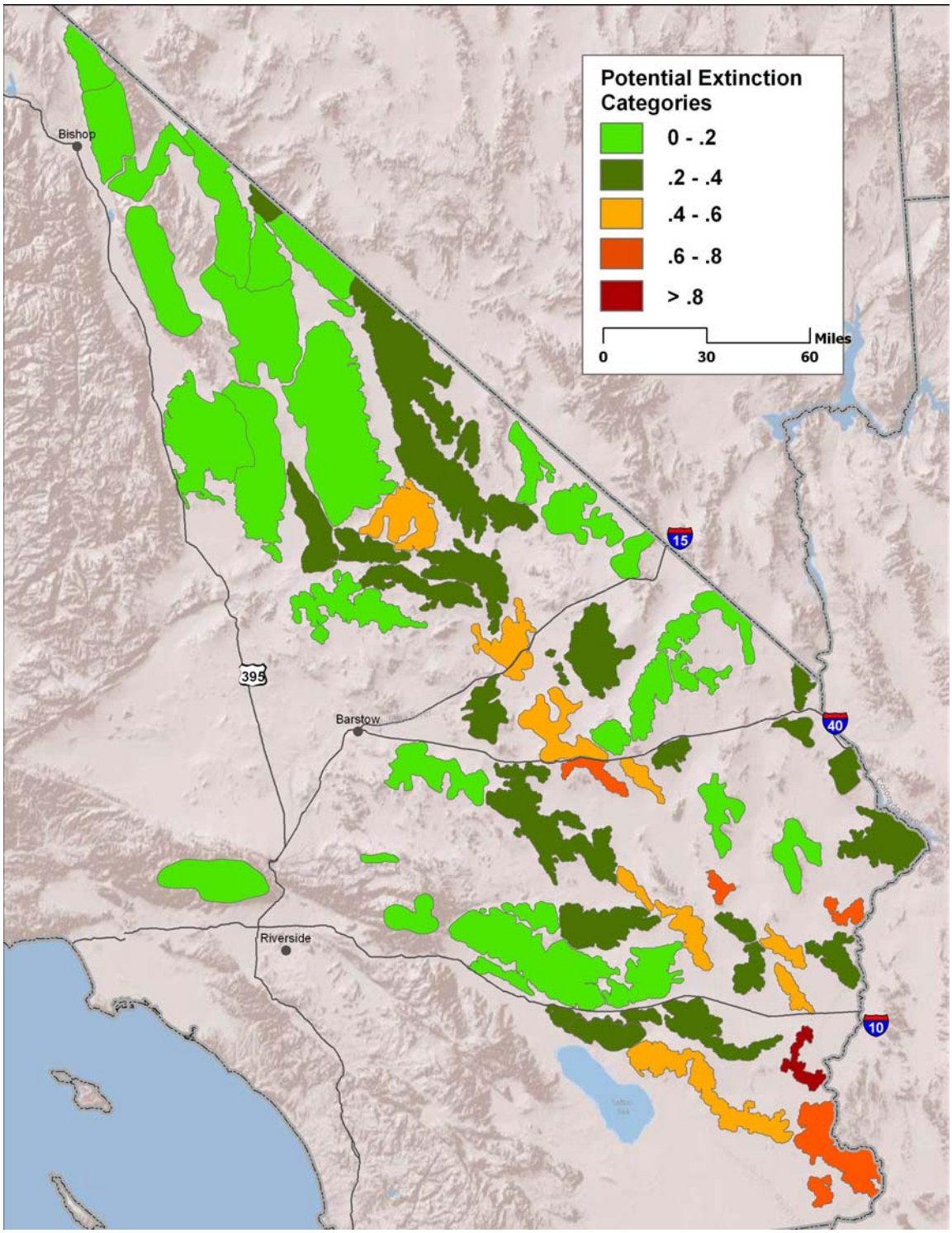

Figure A3. Extinction risk categories predicted by model 6 under the situation of universal availability of reliable water.

APPENDIX II
CLIMATE CHANGE

When viewed from an adequate time perspective, the Earth's climate has been through continual change. For instance, over the past half million years there have been repeated glacial cycles each of about 100,000 years length split approximately as 85% glacial and 15% interglacial. Each of those cycles has seen radical changes in temperature and precipitation. Currently we are about 14,000 years into an interglacial period which may be nearing its end. Temperature changes have been very steep as the climate has entered and exited glacial periods, and rainfall coupled with cooler temperatures at glacial peaks have resulted in valleys like Death Valley becoming huge lakes.

Desert bighorn sheep have existed as a separate subspecies for 300,000 – 400,000 years (J. D. Wehausen, unpubl. data), thus have persisted through probably at least three glacial cycles. During those cycles their habitat has changed greatly with much of it becoming woodland during glacial times and thereby disappearing as suitable bighorn sheep habitat. The result is that during glacial peaks the distribution of these sheep has probably been restricted to one or more refugia in the southern desert region possibly south of California, and has expanded north during interglacial periods.

While these changes are not on a time scale considered for conservation planning, it is background that gives important perspective to the question of climate change. The current concern about climate change involves the ongoing rapid climate change evident in certain regions of the planet. While globally this amounts to a net warming, the direction of temperature change will not be positive everywhere. Those temperature changes in turn will generate a variety of changes in precipitation patterns. Relative to desert bighorn sheep in California, the fundamental question is how temperature and rainfall will change, and how this will affect sheep demographically.

To understand and potentially project the influences of future climate change relative to desert bighorn sheep in California, it is important first to understand in detail the current role of different climate variables in the biology and population ecology of this animal. Of particular importance is forage growth and nutrient availability, for which the major driving variable is the amount of rainfall during the cool (October-April) season (Wehausen 2005). Should the amount of rainfall in this period decline, it will have a negative influence on nutrient intake, reproductive success, and population carrying capacities for desert bighorn sheep. The opposite might be expected for increased rainfall, but there may be an upper limit beyond which it also becomes detrimental (Wehausen 2005). Early rainfall (October and November) that initiates growth of winter annual plant species can be distinguished from rainfall in key months later in the growing season (January and February) in relative importance to nutrient intake by bighorn sheep (Wehausen 2005). Those differences would allow a more refined assessment of the influence of a change in rainfall on bighorn sheep nutrient intake, reproduction, and carrying capacity if precipitation changes could be predicted at that detail.

Temperature plays an important role in the seasonal pattern of nutrient availability for bighorn sheep. The cool season growing season is crucial for nutrient intake by desert bighorn sheep for two reasons. First, cool season rainfall is typically widespread and soaking compared with localized rain from summer monsoonal cloud bursts, most of which runs out of mountain ranges as flash floods. Second, cool temperatures outside of the hot season conserve soil moisture,

DRAFT

allowing plants to draw on that moisture for a relatively long growing season before soil moisture becomes limiting. This effectively extends the season of high nutrient availability to sheep. Production of new green plant growth typically increases through the cool season to a peak in spring followed by a couple of months during which plant growth slows and dries up. Diet quality for desert bighorn sheep follows this pattern closely (Wehausen 2005).

Year-to-year variation in temperature during the winter-spring growing season influences diet quality of sheep in two ways. During the coolest months (e.g. December), early forage growth is limited by low temperatures and can be accelerated or slowed by warmer or colder temperatures, respectively if soil moisture is adequate for plant growth (Epps 2004b). Temperature variation later in the growing season has the opposite effect; warmer temperatures accelerate the depletion of soil moisture and the spring decline in diet quality (Epps 2004b), which typically reaches its lowest point in July, but earlier or later depending on the amount of cool season rainfall. While these temperature effects on diet quality are measurable, both are small compared with the influence of the amount of cool season rainfall (Epps 2004b). Should there be an overall warming in the California desert region, opposite effects at different times in the growing season may cancel each other to some extent relative to total growing season nutrient intake by bighorn sheep. However, diet quality during spring is particularly influential on survival of growing lambs; thus, temperature changes that affect spring nutrient availability may have a more pronounced demographic effect than those affecting earlier growing season nutrition.

Details of climate change have commonly eluded climate modelers (Kerr 2011). The deserts of California are no exception, with in some cases major differences between different forecasts. While all climate modelers have projected increasing temperatures overall, they have differed in the magnitude of that change (Epps et al. 2004b). More importantly, they have disagreed on whether the desert will get wetter or drier. Given that variation in cool season rainfall has a notably larger influence on diet quality than temperature, and potentially also on availability of surface water for drinking in summer, these divergent climate projections do not allow a meaningful evaluation of potential effects of climate change on desert bighorn sheep (Epps 2004b).

This leaves analysis of actual long term climate data as the tool available to evaluate the potential direction of climate change on specific climate variables and desert bighorn sheep. If climate change is warming the desert region, this should be evident in temperature trends by month over the past century through a preponderance of positive slopes in simple linear regressions of long term data. Negative slopes would be expected if cooling is occurring instead. Looking at this by month also allows the potential elucidation of which months are currently most affected; and this in turn permits use of the knowledge summarized above to make a biological projection of how changes can be expected to affect desert bighorn sheep.

Changes in Temperature

Long term data from 22 sites in and surrounding the California desert region were examined for temperature patterns. Only data sets at least 50 years in length were used to evaluate potential temperature changes. The 22 sites were bounded in the south by Brawley and Parker (Arizona), and in the north by Independence in the Owens Valley and the Desert Game Range north of Las Vegas in Nevada. The data sets varied in length from 53 to 118 years, with an average length of 78 years (Table A2). Analyses recorded regression slopes and the probabilities that they were different from zero. Results were then categorized by those probabilities and slope signs.

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Table A2. Results by site of linear regressions of monthly average temperature on year.

				Positive Slopes		Negative Slopes	
Location	State	Time Period	Years	$P \leq 0.05$	$P \leq 0.10$	$P \leq 0.05$	$P \leq 0.10$
Haiwee	CA	1923-2010	88	10	11	0	0
Independence	CA	1925-2010	86	7	7	0	0
Iron Mt	CA	1935-2010	76	6	9	0	0
Needles	CA	1948-2010	63	6	6	0	0
Blythe	CA	1913-2010	98	4	4	2	2
Boulder City	NV	1931-2004	74	5	6	0	0
EagleMt	CA	1933-2010	78	1	1	4	5
29 Palms	CA	1935-2010	76	4	5	0	0
Daggett	CA	1948-2010	63	4	4	0	0
Desert Game Range	NV	1940-2010	71	4	4	0	0
Trona	CA	1920-2010	91	0	0	3	6
Palm Springs	CA	1922-2010	89	2	4	0	0
Victorville	CA	1938-2009	72	2	4	0	0
Hayfield	CA	1933-2010	78	1	3	0	0
Inyokern	CA	1948-2010	63	1	2	0	0
Searchlight	NV	1913-2010	98	1	2	0	0
Brawley	CA	1910-2007	98	0	2	0	0
Randsburg	CA	1937-2010	74	0	0	0	1
Pahrump	NV	1958-2010	53	0	0	0	0
Mitchell Caverns	CA	1958-2010	53	0	0	0	0
Mountain Pass	CA	1955-2007	53	0	0	0	0
Parker AZ	AZ	1893-2010	118	0	0	0	0
Totals				58	74	9	14

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Sites varied from four (Mitchell Caverns, Mountain Pass, Pahrump Nevada, and Parker Arizona) that had no months with regression slopes significant at P≤0.10 to one (Haiwee Reservoir) that had significant positive slopes for 10 months at P≤0.05 and 11 months at P≤0.10. Overall there was a preponderance of positive slopes. For 67 slopes significant at P≤0.05, there were 6.4 positive slopes for each negative slope. For 87 slopes significant at P≤0.10 that ratio was 5.3:1 (Table A2). This suggests a general warming trend. However, there was variation among sites in whether positive or negative slopes prevailed. While most sites with significant results had a preponderance of positive slopes, at two sites (Eagle Mts and Trona) negative slopes prevailed (Table A2).

When considered by month, June exhibited the strongest evidence of temperature increase with half (11) of sites yielding significant slopes at P≤0.05 and 12 sites at P≤0.10. August was a close second to June, but the entire May – August period exhibited considerable evidence of a warming trend (Table A3). January also showed strong evidence of a warming trend at many sites, as did March (Table A3). Only December had evidence of what might be a cooling trend (Table A3).

For the 6 different months with considerable evidence of warming, the rates of change (regression slopes) exhibited an inverse relationship with average monthly temperature: lowest for the hottest months (July and August), and sequentially higher for June, May, March, and January (Table A3). While increased temperatures in January may increase diet quality, warmer temperatures in June, May, and March will have respectively increasing negative influences on diet quality because of (1) respective increasing magnitudes of the rates of change and (2) timing relative to cumulative effects on diet quality at the end of the growing season; higher temperatures in June will only affect the very end of the spring decline in diet quality, whereas increased loss of soil moisture from warmer weather in March will affect diet quality in April, May, and June.

Table A3. Results by month of linear regressions of monthly average high temperature on year compiled by slope sign (+/-) and significance level for sites listed in Table A2. Average rates of change and r^2 are only for the samples with the dominate slope sign.

	Significant results (+/-)			Average rate of change (° F /C per century)		Average r^2	
Month	$P \leq 0.05$	$P \leq 0.10$	$P \leq 0.15$	($P \leq 0.05$)	($P \leq 0.10$)	($P \leq 0.05$)	($P \leq 0.10$)
June	11/0	12/0	12/0	4.8/2.7	4.6/2.6	0.102	0.097
August	10/1	12/2	13/2	3.9/2.2	3.7/2.1	0.130	0.123
January	8/0	10/0	11/0	6.3/3.5	5.7/3.2	0.098	0.087
July	7/1	9/2	10/2	4.2/2.3	3.6/2.0	0.139	0.123
May	7/0	8/1	10/1	5.1/2.9	4.8/2.7	0.083	0.077
March	6/0	9/1	9/1	5.5/3.0	5.3/2.9	0.081	0.070
October	3/0	5/0	6/0	3.9/2.2	3.6/2.0		
December	1/3	1/4	1/6	-4.0/-2.2	-3.9/-2.2		
September	2/1	3/1	3/3				
February	2/0	3/0	4/1				
November	1/1	2/1	4/1				
April	0/2	0/2	0/2				
Totals	58/9	74/14	83/19				

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It is important to put these changes in the context of considerable year to year variation in monthly average high temperatures. The highest amount of variation explained by a regression slope was 29% (August for Independence), but on a monthly average basis the highest for slopes significant at $P \leq 0.05$ was only 13.9% for July (Table A3), a month for which the range was 5.7 - 28.9%. What this indicates is that most of the temperature variation is not related to long term warming or cooling trends. There are two components to this large amount of unexplained variation. One is what appears to be random year to year variation. The other is longer term patterns of warmer and cooler periods. For instance, there was a notable cool period centered in the early 1920s (Figure A4). Relative to potential long term temperature trends suggested by these analyses, what these large unexplained proportions of temperature variation indicate is that the current potential effects of climate change are mostly quite small compared with other variation. However, should they continue along the trend lines elucidated here, there will eventually be measurable demographic effects, and it appears that those effects will be negative.

Changes in Precipitation

Deserts are water limited ecosystems driven by very limited soil moisture during much of the year. Precipitation in the California desert region is highly variable from year to year (Figure 6), but for cool season rainfall there is no discernable directional trend over time. Instead the long term pattern in rainfall across the entire desert is dominated by a mid twentieth century drought period (Figure A5). Should a clear directional trend in precipitation develop, it will be become evident in data such as those analyzed here. Given the high variability in precipitation evident in the past, it will likely take many more years of data before a statistically meaningful trend might emerge.

Climate Change Mitigation

While rainfall is the primary driver of nutrient intake and reproductive success of desert bighorn sheep, continued temperature increases during the growing season may translate into lower overall nutrient availability and intake. Lower nutrient intake will result in a decline in the density of bighorn sheep that a given area will support. There is no reasonable mitigation for this density change. However, from a larger landscape perspective it may be possible to mitigate this in some situations by increasing the distribution of bighorn sheep. This would effectively increase the overall nutrient intake of the population and expand its total size. Increased distribution of water is the mechanism that can increase distribution of these sheep.

On an ecosystem level, warmer temperatures will result in higher loss of water through evaporation and transpiration. This may affect natural availability of surface water in some situations. Higher hot season temperatures also will translate into higher water needs by bighorn sheep during those months to maintain physiological health. Again, the one management action available to potentially mitigate this situation is to provide reliable drinking water.

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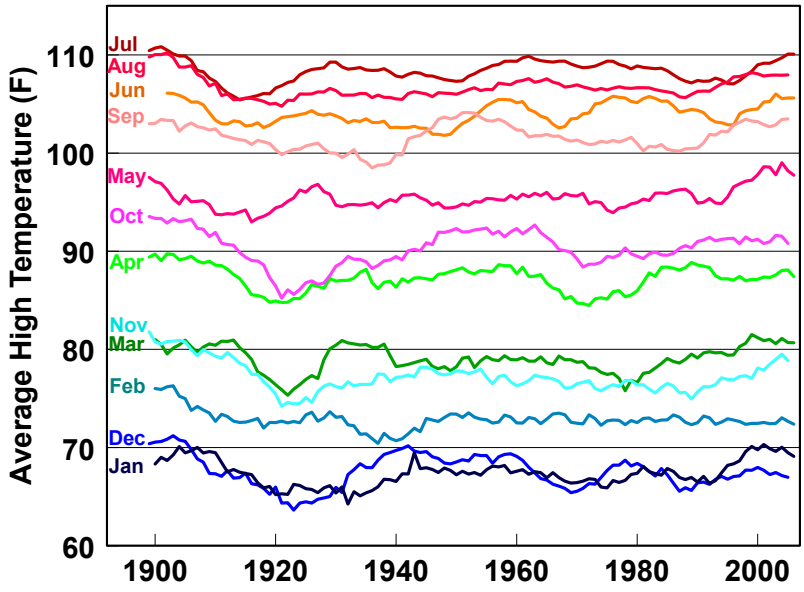

Figure A4. 15 year running means of monthly average high temperatures for Parker Arizona by month.

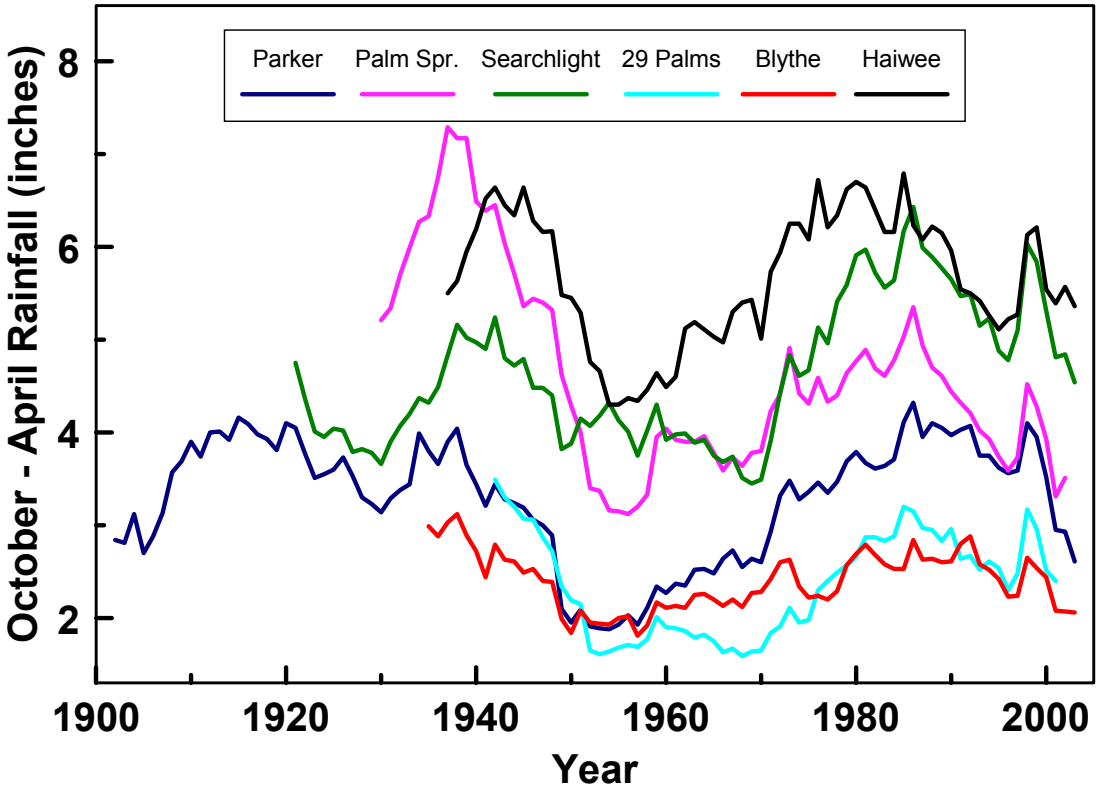

Figure A5. 15-year running means of cool season precipitation for 6 long term data sets in and adjacent to the California desert.

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Attachment 3: NGO DRECP Durability MOU comment letter (February 12, 2015)

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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,

Garry George
Audubon California

Greg Suba
California Native Plant Society

Ryan Henson
California Wilderness Coalition

Lisa Belenky
Center for Biological Diversity

Kim Delfino
Defenders of Wildlife

David Lamfrom
National Parks Conservation Association

Helen O'Shea
Natural Resources Defense Council

Barbara Boyle
Sierra Club

Attachment 4: Letter to BLM Desert Advisory Committee from Lorelei Oviatt, Director, Planning and Community Development Department, Kern County (March 15, 2014)

PLANNING AND COMMUNITY DEVELOPMENT DEPARTMENT

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DEVELOPMENT SERVICES AGENCY

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March 15, 2014 - Palm Springs Meeting

Bureau of Land Management
Desert Advisory Committee (DAC)

RE: Desert Renewable Energy Conservation Plan (DRECP) – Kern County Comments

Dear DAC Members,

Thank you for the opportunity to provide comments on the Desert Renewable Energy Conservation Plan (DRECP) and the participation of the Bureau of Land Management. Supervisor Scrivner, as a member of the DAC, has asked that I provide these comments in my role as the designated stakeholder from Kern County on the DRECP Stakeholder Committee.

As a designated representative of Kern County I have participated in the discussion and formulation of the DRECP since its beginnings in 2009. The Kern County Board of Supervisors has been briefed on the development of the DRECP and provided direction for our comments and positions on the DRECP concepts. Kern County leads California in renewable energy production projects both permitted and constructed at 8142 MW county-wide (wind and solar PV, including roof-top) with only a very small portion on BLM land.

Counties have been asked to become partners in the (DRECP) and permit holders for Incidental Take Permits and coverage for Special Species. While the DRECP was originally focused on public lands, it has proposed that areas on private land be included for consideration. Further the conservation strategy clearly includes private lands for conservation for specific species such as the Mohave Ground Squirrel and Desert Tortoise. As Solar PV and Wind energy projects on private land are exclusively the jurisdiction of local decision makers, it is important that the concerns and issues of counties be resolved in the formulation of the plan. This is a unique Natural Community Conservation Planning (NCCP) Program as it only provides coverage for one industry; renewable energy developers which provide a California wide benefit. Counties have many other constituent needs and limited land use in the desert after military and other federal/state owned lands as well as private conservation lands are eliminated from development potential. Therefore this NCCP conservation strategy should be uniquely designed as well to ensure the future development potential and economic growth for all county private lands.

The following items have been consistently provided to the DRECP team as matters for inclusion and resolution.

- Renewable Energy Project Developer Mitigation Fee Conservation Strategy:

  - ✓ No acquisition of private lands for mitigation.

  - ✓ Funds should be used for enhancement of Public Lands including State owned lands.

  - ✓ Any limited acquisition of private land for corridors or special plants has to provide a monetary enhancement to the county or city where the private land is located to offset the loss of property taxes. PILT (Payment in Lieu payments from the Congress) are already capped for the larger counties and therefore will not offset the loss.

  - ✓ Any elimination of multiple uses on public land (such as OH, mining, or grazing) due to a renewable energy project should be mitigated with an additional area or funding for private land development of the eliminated use. With this policy renewable energy developers will be discouraged from displacing existing land uses or be required to mitigate the loss.

- Objection to "Business as Usual" Strategy:

  - ✓ Renewable energy is unlike residential/commercial development in a standard NCCP in which each county can expect some share of the growth (benefit) to offset their share of land acquisition (cost). In this case, it is possible that all the projects will occur in one county while all the mitigation for a particular species will occur in another county. Where is the balance and why participate?

  - ✓ The desert already has significant public lands (1/3 military, 1/3 BLM/State, 1/3 Private). Giving up more is not tenable for decision makers.

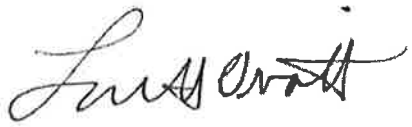
  - ✓ Current Recovery Plans (i.e. Desert Tortoise) and other studies have shown that the recommended measures for the recovery of a variety of species have not been a success due to lack of funding and inconsistent implementation. A focused approach is even more important now rather than adding more land that will also not have funding to be managed.

While we appreciate the extensive biological information and land use mapping the DRECP have accomplished the fundamental elements of the conservation strategy for the plan have not completely addressed our concerns. Therefore, Kern County has declined to execute the MOU for cooperation on the DRECP and to date, have not agreed to full participation when adopted. Our renewable

energy developers have not indicated that the DRECP would be useful for projects on private land and our concerns remain for our users of Public lands.

We remain committed to our participation in the discussion and formulation of this new NCCP and promotion of renewable energy on private lands. Thank you for the opportunity to provide Kern County comments on the DRECP and BLM's participation.

Sincerely,



LORELEI H OVIATT, AICP, Director
Kern County Planning and Community Development Department

Cc: Supervisor Zack Scrivner 2nd District – Kern County

Attachment 5: Memorandum from Director Dale Hall to Assistant Regional Directors, "Final General Conservation Plan Policy" (October 5, 2007)

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Washington, D.C. 20240

In Reply Refer To:
FWS/AES/DCHRS/032359

OCT 05 2007

Memorandum

To: Assistant Regional Directors, Regions 1, 2, 3, 4, 5, 6, and 7
Manager, California/Nevada Operations Office

From: Director H Dale Hall

Subject: Final General Conservation Plan Policy

Purpose

The Service is committed to developing policy for streamlining and reducing the processes associated with developing Habitat Conservation Plans (HCPs) under section 10(a)(1)(B) of the Endangered Species Act (Act). To that end, we have developed an approach, outlined below, that we believe will achieve these goals as well as providing an equal or better conservation benefit to threatened and endangered species. In brief, this approach, known as a "General Conservation Plan (GCP)," allows the Service to develop a 10(a)(1)(B) conservation plan suitable for the needs of a local area, complete all NEPA requirements for 10(a)(1)(B) incidental take permit issuance, and then issue individual permits to landowners who wish to apply for an incidental take permit (ITP) and demonstrate compliance with the terms and conditions of the GCP. The time and workload associated with the development of this type of plan should be much less than the traditional HCP, since the GCP is formulated by Service personnel without the need for the typical negotiation process of the traditional HCP. Additionally, once the GCP is finalized, the issuance of permits could become formulaic, thus eliminating the need for in-depth review of each application.

It is important to note that this approach will not do away with the traditional HCP program. Rather in developing this policy, our intention is to add an additional method for evaluating permit applications to be used when it is determined to be the best solution to specific circumstances. Though not restricted in its potential uses, this approach is recommended in cases where a large-scale HCP covering many similar actions is needed, but where such a plan is not available or feasible.

Background

The HCP development process can sometimes be cumbersome and can be burdensome in time and expense for small landowners and the Service.

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Under a traditional HCP, the small landowner applicant has had the responsibility of developing a HCP which must then be reviewed by the Service. At a minimum, this has meant that an applicant must hire a biological consultant to assist in developing the HCP. This may require biological studies to determine the range and distribution of the species to be covered by the HCP within its covered area, mapping of habitat and other pertinent information, expected impacts from the activities to be permitted, or any other data compilation, as needed. Additionally, these consultants often draft the documents required for compliance with NEPA. Often, attorneys and other parties, such as "facilitators" are employed to review these documents. Each of these components adds to the complexity, expense and time required to produce the draft documents. The documents are then submitted to the Service for review and comment. This process may then be repeated numerous times until the draft HCP and supporting documents contain the information required for permit issuance and is published in the Federal Register. Consequently, the process that culminates with the issuance of an ITP can take anywhere from a few months to several years and can cost large sums of money. While large-scale regional HCPs may be eligible for federal grants under section 6 of the Act to assist in development of their plan, small landowners typically must bear the costs themselves.

Policy

We propose the development and use of a "General Conservation Plan," which would be authorized under section 10(a)(1)(B) of the Act, and which could be issued under existing statutory and regulatory authorities. Consequently, there is no need to develop new regulations with the attendant NEPA review, Federal Register noticing, or any other statutory requirement. Additionally, there will be no "learning curve" or legal confusion while Service personnel learn to implement new regulations.

In the traditional HCP process, the applicant is required to develop the draft HCP which is then provided to the Service for review and comment. After the Service's review, our comments are returned to the applicant for incorporation into the subsequent draft HCP. This process continues until both parties are satisfied that the HCP meets issuance criteria as required in section 10(a)(2)(B) of the ESA. In some cases, this process can take years, at significant expense of both time and money to the applicant and the Service. As an alternative HCP process, the landowner/applicant is relieved of this burden through the GCP process, as described below. In short, the development of a GCP is undertaken by the Service, rather than an individual applicant, and is ideally based upon a conservation strategy for the species (see below) and addresses the needs of the local community. Landowners may then choose whether they wish to receive an Incidental Take Permit under this Plan, or conversely, whether they prefer to develop their own plan using the traditional HCP process. An applicant who chooses to participate would subsequently be granted an Incidental Take Permit under the Plan in an expeditious manner.

<u>Prior to GCP Development</u>

This approach will be most effective for both species and applicants/permittees if it is placed within a large-scale context. First, if they have not already done so, we recommend that the Regional Office and/or the Field Office(s) (RO/FO) develop a conservation strategy for the target species or suite of species. This would allow for long

term planning at a landscape level. Such a strategy is not envisioned as development of a full recovery plan, but rather, it should be a succinct summary of the threats and needs of the target species to address those threats with recommended avoidance, minimization and mitigation measures including Best Management Practices (BMPs), if applicable. This strategy can then be used to determine where and how the best conservation can be obtained for each target species, thus contributing to its recovery and removal from the Threatened and Endangered Species lists. Please note that development of the conservation strategy is not necessarily a part of the GCP process. Rather, it provides a biological basis upon which the GCP planning, as well as other planning efforts, can then be based.

Plan Development

Obtaining and using input from the local communities as needed, the RO/FO will determine which specific activities need to be covered by the GCP; e.g., homebuilding on small lots, specific agricultural practices, or other identified activity, as well as which listed species are likely to be affected by them, and the geographical area to be included. Then Service personnel from the RO/FO will formulate a GCP that is consistent with the conservation strategy referenced above. The GCP will specify the amount of take anticipated, avoidance and minimization measures, mitigation required, and any other measures necessary to meet the issuance criteria as required by section 10(a)(2)(B) of the Act. Basically, this GCP will include everything that a traditional HCP has EXCEPT the names of an applicant or the future permittees. The NEPA document, ITP and Implementing Agreement, if applicable, will also be drafted at this time.

It is particularly important to note that in developing the GCP and NEPA documents, special care should be given to ensure that all ITPs are severable, that is, that the conservation benefits of the GCP will not be dependant upon any one permittee.

NEPA Compliance

The Service will comply with NEPA by noticing the entire draft GCP (with no associated permit or applicant) with all appropriate draft NEPA documents and in the Federal Register and inviting public comment. It should be noted that the Service will prepare only one Set of Findings, one biological opinion and one NEPA decision document for all of the actions to be covered under the GCP. By completing the NEPA and public review in this manner, the public will be able to review and connect on the action as a whole rather than permit by permit. Subsequent to the completion of the NEPA review process and finalization of the GCP, the Service will issue ITPs to individuals who apply and demonstrate compliance with the terms and conditions of the GCP. The Service must also comply with all noticing requirements as specified by section 10(c) of the Act.

Discussion

We believe that this General Conservation Planning process will benefit the species, the landowner and the Service. For example, under the GCP, each landowner/applicant is not required to spend the time and money to develop a separate HCP. All he/she needs to do is to complete an application form, pay the application fee and demonstrate

compliance with the terms and conditions of the Plan. Having done so, he/she may then be granted an individual ITP, subject to determination of eligibility pursuant to 50 CFR 13.21(c) and completion of any administrative or noticing requirements.
We wish to make clear that this is not a new or novel idea. In fact, similar approaches have been used in the past (e.g., the Houston toad HCP in Texas and the pending Florida scrub jay HCP in Florida). These types of plans have been previously described by terms of art, such as "template HCPs," "umbrella HCPs" or "programmatic HCPs." In short, the GCP is a HCP and is required to meet all issuance criteria under section 10(a)(2)(B) of the Act, as well as all NEPA and other public noticing requirements that are requisite for traditional HCPs. We stress that the only difference between the GCP and a traditional HCP is that the Service develops the GCP under which individual ITPs can then be issued to landowners, instead of an applicant doing so.

It is also important to note that the GCP is not a substitute for a regional multiple action HCP. The use of the GCP will be limited to activities that the Service has the expertise and ability to analyze. Because of the complexities of fully analyzing all activities for which a county or other jurisdiction may require coverage under a 10(a)(1)(B) permit, the GCP would probably be ill-suited to needs of this scope and magnitude. Such a large-scale effort would be better developed using the traditional HCP approach. Rather, the GCP will be most useful in situations in which a smaller subset of activities, such as building single family homes, a specific type of agricultural practice, or similar activities of limited scope can be described and their impacts to listed species and their habitats can be adequately analyzed by the Service. It will be left to the discretion of the RO/FOs to determine when the use of a GCP will be most beneficial.

It should be noted that the development of the GCP may require an initial increase in workload for Service personnel, though such an increase would still be less than that required for the development of a traditional HCP. However, this increase would be alleviated by the subsequent reduction in overall workload upon completion of the GCP because once completed, there would be no need for analyzing and processing numerous individual HCPs.

For example, Region 4 has recently used this approach to develop a GCP for the Florida scrub jay (*Aphelocoma coerulescens*). This plan addressed the building of single-family homes on suburban infill lots of one acre or less in portions of 34 counties. The areas covered by the plan are experiencing rapid development and consist of poor quality, fragmented habitat for the scrub jay. Region 4 and the FOs had already devised a conservation strategy for the scrub jay and had developed a mitigation approach that consisted of land acquisition within identified conservation areas. With this framework prepared, the development of the plan required the use of three FTEs for a total of about four weeks in order to develop the draft Plan and draft NEPA documents ready for publication in the Federal Register. Note that these FTEs were a combination of RO and FO personnel, and the time was distributed over a period of several months, with one week of concentrated effort, so that there was relatively little disruption of routine obligations. This plan will allow individual landowners to receive an ITP without the expense and time constraints for themselves and for the Service of preparing numerous individual HCPs. Likewise, upon finalization, the RO/FO will be able to process individual applications and the ITPs can be issued expeditiously.

By contrast, a traditional regional HCP of this size and scope would have taken several FTEs in a Field Office, several FTEs in the Regional Office, plus periodic Solicitor's review over a period of several years to reach the same point. When viewed in this light, the GCP approach required far less time and personnel over all to develop a plan and issue Incidental Take Permits than the traditional HCP process.

FAQs

1. **Q: Why individual ITPs? Why not issue an ITP to ourselves and then enroll individuals through certificates of inclusion?**

A: The Service can legally hold an incidental take permit (ITP) and issue certificates of inclusion to individuals; however, in general we don't recommend this approach for two reasons. First, if the Service is the master permit holder, we incur the responsibility of implementation, including all monitoring and adaptive management, as required by the Five Points Policy. This could require substantial commitments of personnel, time and money which would off-set any perceived streamlining benefits. By contrast, the GCP approach would allow us to issue individual ITPs to landowners, alleviating the need to administer a master permit.

Secondly, this approach is problematic with regard to No Surprises assurances to landowners. Both Washington and most regional solicitors agree that No Surprises assurances are attached to an ITP upon issuance. However, federal agencies, including the Service, are not allowed to have No Surprises assurances. A certificate of inclusion is not a permit; rather, it is merely a legal instrument by which a third party can be "covered" by someone else's ITP, and therefore, is limited to what is provided by the ITP. Consequently, although we can issue an ITP to ourselves, albeit without No Surprises assurances, there is no legal mechanism for conveying No Surprises assurances to a third party via certificate of inclusion. We suggest that the GCP concept would solve this problem because it involves essentially the same level of planning and processing workloads and would result in applicants receiving their own ITP complete with No Surprises assurances.

2. **Q: What are some limitations of GCPs?**

A: Because there is no applicant to assist with an analysis of the effects of covered activities and with drafting the NEPA documents, the scope of a GCP will be limited to what Service personnel can effectively analyze. Notwithstanding this fact, it is possible that under some circumstances a county or local jurisdiction may be willing to assist with some analysis or writing since they will not be required to hold and implement a master permit. RO/FOs will use their discretion in determining when the GCP approach will be most beneficial.

3. **Q: Why don't we always do HCPs this way?**

A: A GCP is not a substitute for a County- or State-wide regional HCP which would cover many activities differing in scope and type of impact. The Service does not have the personnel or expertise to adequately analyze all activities that would be

addressed in planning efforts of this scale. Additionally, some applicants will prefer to develop their own plan. In these cases, a traditional HCP will be the preferred approach.

4. **Q: We have so much work to do—do we have to drop everything and do this?**

A: No, the GCP is not mandatory. It is intended to be another "tool in the toolbox," to be used in cases where the RO or FO determines that it would be useful.

5. **Q: This looks like a lot of extra work for the Service.**

A: Remember that though there is likely to be an initial increase in workload because the work is "frontloaded," afterwards there will be a substantial reduction in workload associated with issuance of ITPs.

6. **Does the GCP meet the same standards as a traditional HCP?**

A: Yes. The GCP must meet all issuance criteria pursuant to 10(a)(1)(B) of the Act, as well as compliance with the Five Points Policy.

7. **Q: What type of documentation is needed to demonstrate compliance with Terms and Conditions (T&Cs) of the Plan?**

A: We envision a checklist or similar one-two page document that can be completed and placed in the file to demonstrate that all conditions have been met and that all processing has been completed. The specific documentation will depend upon what is required and is up to the discretion of the RO/FO. For example, if the T&Cs include placement of a conservation easement or payment of an in-lieu fee, the documentation should contain proof of recording of easements or receipt of payment of the fee. There should be a statement verifying the eligibility of the applicant to receive an ITP, pursuant to 50 CFR 13.21(c). There should also be a statement verifying that the take to be authorized was analyzed pursuant to NEPA and is consistent with the biological opinion which was prepared for the GCP. The RO/FO may also include any additional information deemed necessary.

Attachment 6: NGO DRECP Transmission comments (February 23, 2015)

RE: Transmission Aspects of the Desert Renewable Energy Conservation Plan

On behalf of Sierra Club, Defenders of Wildlife, Natural Resources Defense Council and [] we submit these comments on the transmission aspects of the Desert Renewable Energy Conservation Plan (DRECP, the "Plan"). Our groups each believe in landscape-level planning for conservation and energy, and the value of comprehensive energy and transmission planning to serve multiple objectives—such as providing reliability, integration or other grid benefits, and avoiding harm to natural resources. We have a history of coming together on comments related to conservation, transmission and energy planning and appreciate the chance to do so now. In addition to the significant on-the-ground conservation benefits of the Plan, we also believe this could be an important opportunity to implement transmission and energy planning that serves multiple values.

<u>Transmission Access to DFAs</u>

Our organizations are deeply committed to the success of the DRECP. Together with providing durable conservation in areas of high conservation value, guiding renewable energy development to areas of low conservation value (in this case development focus areas (DFAs)) is imperative for the success of the DRECP. Access to transmission with available capacity is a potential major benefit of development within a DFA. Conversely, failing to plan for transmission to DFAs could have significant impacts on guiding development to DFAs, and ultimately, the success of the Plan. For these reasons, DFAs should be designed with transmission access in mind--either near transmission with existing capacity, or with the potential to upgrade existing transmission or utilize existing rights-of-way with least environmental impacts.

Other sections of our comments recommend that the Plan's proposed DFAs be more finely analyzed to remove areas with important conservation and habitat value. Following this action to ensure that DFAs are, in fact, lower impact, if it is then determined that, in conformance with the loading order and California Utilities Code Section 454.5(b)(9)(c), transmission improvements within the DRECP area are

needed to address resource needs, these improvements should be planned to serve DFAs. Focusing any needed transmission on DFAs will both implement the Plan's energy objectives and avoid guiding development to areas of higher conservation value. Enhanced, early coordination among California's energy agencies is needed to accomplish this goal. We have included various suggestions for how to ensure new transmission serves low-impact DFAs, but key to each of these is coordinated planning that integrates land use, electricity generation and transmission planning.

Transmission should be sustainably sited

We strongly support the Garimendi principles. Existing transmission should be upgraded where technically and economically justifiable, and if construction of new transmission lines is required, expansion of existing rights-of-way should be encouraged when technically and economically feasible.[1] We also support full consideration of the availability of cost-effective alternatives to transmission, such as energy efficiency measures and distributed generation, [2] and California's Loading Order for prioritizing electricity source. The Loading Order sets a priority list for electricity sources. California's utilities must first employ energy efficiency and conservation to meet customer demand; then energy from renewable sources such as wind, solar and geothermal. Only after all those supplies are exhausted may the utilities purchase power from fossil fuel plants. Avoiding harm to sensitive lands and plant and animal species must also be a key feature of transmission planning, siting and construction.

1. DFAs Must Have Transmission Access.

Transmission access is often the single biggest indicator of a generation project's ability to be competitively priced, be attractive to off-takers, obtain a power purchase agreement and ultimately be constructed. The success of two contrasting solar energy zone competitive leasing processes in the BLM's Solar Energy Program illustrates the importance of developing and refining DFAs with transmission access in mind. Where there was significant commercial interest in developing Nevada's Dry Lake SEZ,

[1] SB 2431 (Garamendi, Chapter 1457, Statutes of 1988) , also included in California Public Utilities Code §.1005.1

[2] California Public Utilities Code. §.1005.1 requires the California Public Utilities Commission to consider the availability of cost-effective alternatives to transmission, such as energy efficiency measures and distributed generation, when making a decision on a Certificate of Public Convenience and Necessity.

which had excellent access to available transmission, there was no commercial interest expressed for the San Luis Valley SEZ in Colorado, which was transmission-constrained.

However, this most basic of information on availability of transmission access to DFAs is not provided in the Draft Plan. Without knowing which DFAs have access to transmission with capacity (and how much), which DFAs have access to transmission that could be upgraded with minimal environmental impacts, or what it would take to build new transmission to a DFA, it is not possible to identify the suitability of the DFAs to fulfill the energy objectives of the Plan or to identify the environmental impacts of transmission infrastructure on the conservation objectives of the Plan.

There is also strong commercial development of renewable energy around the California state boundary and this information from other states and regional transmission planning entities should also be interwoven into the DRECP. Transmission rights-of-way do not stop at the border in many areas of the DRECP, and this information should be incorporated into the analysis of DFAs.

Recommendation:

We recommend the DRECP use SCE's publicly available Generation Interconnection Availability Maps to determine where upgrades can build off existing capacity; and obtain maps from LADWP, IID and SDG&E to identify which DFAs have available transmission or could be updated with minimal environmental impacts, and provide this information.

We recommend the DRECP collaborate with WestConnect on their regional plans and review and consider the projects planned to connect to utilities within the DRECP footprint.

We further recommend that a complete transmission analysis be conducted for each DFA to determine what existing transmission lines and poles are available to provide new transmission to each; and what additional new transmission lines and other infrastructure (such as substations) would be required to fully build out each DFA, utilizing all information cited above. Then an effects analysis for each DFA should also be undertaken.

2. The DRECP requires a coordinated Transmission Plan.

Although the Technical Transmission Group (TTG) report included as Appendix K, provides an excellent high-level look at how much acreage might be needed to bring generation from DFAs to load centers, this is not sufficient analysis for the purpose of a programmatic document or for planning or recommending individual upgrades. The TTG compiled the transmission-system additions by defining transmission components to match the renewable generation capacity for each DFA. The transmission additions described herein include connector transmission lines and substations, as well as the collector lines (also known as radial generation tie lines, or gen-tie lines) and delivery lines that would connect and facilitate delivery of renewable energy projects to load centers. We support this effort, but as discussed in greater detail below, there are major errors with the report and it should not be considered a substitute for a transmission plan.

Appendix K specifically did not look at the environmental constraints or impacts of developing in particular areas. Indeed, the TTG Report uses total acreage as the only factor for determining transmission impacts, and did not include information on existing biological or land use constraints, which is strange given the uniquely large amount of land use and biological information obtained as part of the DRECP. We are concerned that by focusing on acreage only, the full extent of transmission impacts for each alternative was not considered in determining a preferred alternative. These factors have great impact, not only on the conservation objectives of the DRECP, but also on price, which can be a determining factor in transmission planning. Further, the TTG report did not analyze the transmission impacts of Alternative 4 or the No Action Alternative. Failure to consider the impacts of an alternative calls into question the process of determining a proposed alternative.

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Most of the issues addressed in our last comments on the TTG report have not been addressed, as the report has only been updated to address minor changes in the DFAs.[3] The TTG Report assumes new transmission will be needed to serve 14,000 MW (assuming lines serving 7,500 MW are either approved, operational or under construction). This assumes that the total MW out of the DRECP area will be 21,500—over the high end of the current energy assumption of 20,000- 22,000 MW. As Sierra Club notes in their Acreage Calculator analysis, the amount of MW proposed for the Plan Area is artificially high for a variety of reasons, including projections regarding energy efficiency and customer side generation that are significantly more regressive than reflected in the state's Climate Plan and historical trends, while projections that increase need for large-scale renewables from the Plan Area are extremely aggressive. Moreover, the Energy Calculator does not account for a large number of existing, planned and permitted

[3] We incorporate by reference our specific comments on the last TTG report.

projects. Additionally, the TTG Report assumes 1,500 MW from DOD lands *added* to the high end of the DRECP number. This 1,500 MW should not be additive to the total MW assumed out of the Plan Area, which is based on demand.

Moreover, the TTG Report continues to ignore non-wire alternatives despite recent FERC orders and other drivers requiring these to be a key element of current and future transmission planning, including CAISO policies. These options will certainly improve within the term of the Plan. The TTG Report likewise didn't consider high-voltage direct current transmission, which could minimize infrastructure, nor did it consider maximizing the size of transmission lines to allow for adding capacity later.

We are additionally concerned that not all transmission under consideration that can serve the DFAs is accounted for, including existing and proposed infrastructure under both CAISO and non-CAISO balancing authorities. This analysis also did not evaluate the system flows in light of transmission we reasonably expect will be developed in the next 5-10 years—a necessary step to understand the effect this transmission has on transfer capacity from the DFAs-, indeed the report itself included a disclaimer that it is not a substitute for a transmission analysis.[4] Additionally, we are concerned about potential ownership-of-line issues.

The TTG Report continues to use outdated data and forecasts, retains the assumption that renewable power in the California desert to displace out-of- Plan and out-of-state state fossil fuel resources but does not assume any out-of-state renewable resources will serve the Plan Area. The TTG Report's equal split of displaced fossil generation within the four regions continues to seems highly unlikely, particularly as recent events in Southern California, such as the San Onofre Nuclear Generating Station retirement and replacing proceeding, shows that retirements of major baseload power sources tend to lead to a need for local, rather than remote resources. The TTG Report continues to looks *only* at the 2020 pre-renewable cases prepared by the California Transmission Planning Group (CTPG) to determine the availability of existing transmission capacity. As we noted previously, this report is no longer used by the CAISO and is outdated, yet the TTG did not use more recent reports used by the WECC in its analysis.

4

We bring these issues up, not to criticize the TTG's work[5] but to emphasize the need for a more robust transmission plan. Coordinated and comprehensive energy planning processes that integrate land use, electricity generation and transmission planning is key to landscape planning efforts such as the DRECP. In recent years, significant public and private investments have been made in landscape-scale planning for energy at the local, state, and federal levels–including the DRECP, but also the BLM Solar Energy Program and multi-state planning efforts. BLM's Solar Energy Program and the DRECP each generated significant data on the conservation values of specific areas, but this information has not been used to inform energy planning-level decisions at the California Public Utilities Commission (CPUC) or project-level decisions by California utilities. Likewise, this information has not been incorporated into the California Independent System Operator (CAISO)'s transmission planning process, which relies on portfolios prepared by the CPUC in its transmission planning. This process heavily weights whether projects have power purchase agreements in approving specific upgrades, leading to reactive transmission planning which is fundamentally misaligned with landscape-level planning.

It is critical that this coordinated planning process begin soon. The CAISO's annual transmission planning process (TPP) addresses energy and reliability needs ten years into the future and analyzes "policy driven," "economic," and "reliability" improvements to address future needs. The CAISO's most recent draft TPP, released after the Draft DRECP, yet again does not mention the DRECP, despite enormous state and federal agency investments in the Plan. In accordance with the CAISO's tariff requirements to consider only final, statutory policy, the only "policy" the CAISO considers is California's 33% RPS requirement. To develop a major new line, it must be first studied in the TPP process, then approved by the CAISO Board of Governors, and then undergo a full CEQA analysis in connection with obtaining a Certificate of Public Convenience and Necessity (CPCN) from the CPUC in a proceeding which by no means guarantees success. All of this must transpire *prior* to actually building the new line, which could itself take multiple years. **Given the long lead -time and high costs of developing new transmission projects, it is therefore critical that the CAISO begin studying transmission access to all the DRECP DFAs now.** This must be done in a comprehensive, comparative way in order to inform the public which upgrades are most cost-effective, most protective of the desert environment, and maximize resources and locations which can avoid fossil fuel development or provide grid benefits, first taking into account and fully analyzing non-wires alternatives such as demand

[5] Appendix K itself states: The information presented in this report has been developed solely for the purpose of defining approximate impact acreage for transmission that could be associated with the alternatives considered in the Draft DRECP and Draft EIR/EIS. This effort is not intended to identify specific new transmission lines, identify specific routes, or to replace the utilities' transmission planning processes (Appendix K, page 8).

response, energy efficiency and storage. [6] Without such a thorough transmission analysis, we are concerned that a continued disconnect between the DRECP and California's energy and transmission planning processes will lead to finite customer resources being spent on transmission upgrades or lines which could prioritize other areas within the DRECP (such as conservation areas), or fail to serve areas with the locational or technological benefits most valuable for avoiding dependence on fossil fuels, such as areas nearer load or areas with the potential for solar trough with storage or geothermal. A market-based approach to transmission development in the DRECP area will neither serve the conservation objectives of the DRECP nor prioritize the development of those resources and locations most pivotal for meeting our climate goals and creating a resilient, renewable grid. We have included below a menu of possible approaches for closing this gap. Pivotal to the success of any of these recommendations will be full engagement and cooperation by the CPUC, CAISO and the state's utilities along with the DRECP management team, and appropriate engagement with the public at all steps in the process.

Recommendations:

- **CAISO:**
    - The CAISO should catalyze a special study plan for the DRECP[7] or incorporate information on DFAs into the current TPP. After needed system improvements have been identified through a comprehensive, multi-value process, which looks at energy efficiency, storage and distributed solutions to address resource needs, any improvements to serve the DFAs should be classified as "policy lines" by the CAISO.
    - Alternately, transmission to the DFAs could also be considered as part of a 50% renewables trajectory study based on Governor Brown's recent announcement.

- **Focused community-based efforts**
    - Transmission lines are often stymied by the "chicken and egg" paradigm of responsive transmission planning, where it is difficult to rationalize a new line without specific generation projects, yet utilities are unwilling to enter into power purchase agreements with generation projects without transmission access. A recent departure from this approach was the Tehachapi Study Group. In response to the desire from multiple parties to access high-quality wind resource in the Tehachapis, CPUC, CAISO, SCE and local agencies and interests worked together to form the Tehachapi Study Group, ultimately getting the

[6] http://www.caiso.com/documents/paper-non-conventionalalternatives-2013-2014transmissionplanningprocess.pdf
[7] Any studies should not assume full-build out of the DFAs.

Tehachapi Renewable Transmission project built. We recommend that the CAISO, CPUC, environmental groups, DRECP management and local communities form a similar study group to develop least-regrets transmission projects to bring power from low-impact DFAs or portions of a DFAs with local support, which could engender the support of the local community.

- **Prioritized transmission to DFAs that serve multiple values.**
    - It is important to plan now for a mix of renewable technologies throughout the state, along with demand-side resources that can together address our varying seasonal and daily energy needs, without over-procuring natural gas. The DRECP area has numerous renewable resources (solar PV and thermal, wind and geothermal) available. A number of these resources are unique to the DRECP area, while others, such as PV, are locatable elsewhere in the state, or in the built environment. A more comprehensive analysis by all the energy agencies[8] could better evaluate which are most important to fulfill our statewide energy goals, and when. Once these low-impact, high renewable value locations are identified, transmission should be prioritized to these locations.
    - In particular, we recommend that the DRECP work with Imperial County, Imperial Irrigation District, CPUC and CAISO to study and work to facilitate transmission to develop the extensive geothermal resources in Imperial County, including identifying ways this development and the DRECP as a whole, could facilitate much-needed Salton Sea restoration.

- **WECC Case studies**
    - We recommend the DRECP propose a "DRECP DFA transmission" case for analysis by the WECC and CAISO, to evaluate system flows in light of transmission reasonably expected to be developed in the next 5-10 years, and to understand the effect this transmission has on transfer capacity from the DFAs. WECC should analyze broader interconnection-wide impacts, while CAISO should study power flow effects solely influencing the California transmission system. The CAISO should then study the transmission available and planned for these areas and evaluate how much additional capacity is needed. We could understand how the power flows change in response to transmission additions and where congestion either occurs or could be alleviated.

[8] See, Sierra Club's comments on DRECP planning processes.

- **CPUC prioritization of lines serving low-impact DFAs in CPCN process**
  - We recommend CPUC should give Certificate of Public Convenience and Necessity (CPCN) approval priority to transmission identified in the DRECP as needed to serve DFAs, as required by California Public Utilities Code. §.1005.1. The CPCN process appears to already value zone-based development but it is not clear how this been implemented. Specifically,[9]California Public Utilities Code. §.1005.1. states: (*a) The commission shall issue a decision on an application for a certificate within 18 months of the date of filing of the completed application, when all of the following are true:(1) The application is for a certificate for building or upgrading an electrical transmission line that the commission finds necessary to provide transmission to load centers for electricity generated in a* ***high priority renewable energy zone or*** *is reasonably necessary to facilitate achievement of the renewables portfolio standard."* In our experience, whether a line would serve a renewable energy zone is generally not adequately considered, but this process could be used in the future to prioritize lines serving DFAs, if a line is found necessary.

3. Transmission incentives to DFAs should be clarified and public engaged in planning

Transmission permitting incentives are vague within the document. One public land incentive was BLM's integration of planned transmission corridor improvements developed by the TTG. This group has not been convened in several years, and to our knowledge does not have a role in DRECP implementation doing forward. Moreover, we are concerned that the TTG process was not as open and transparent as it could have been.

Additional public land incentives include the assertion that BLM will commit staff and prioritize projects that provide needed transmission to the DFAs, and will tier transmission NEPA to DRECP documents to the greatest extent practicable, and that these actions will take place through future BLM regulations, rather than the DRECP. [10] Tiering seems particularly concerning, given statements otherwise in the document that the transmission analysis was solely to calculate acreage, and in no way was to be considered a CEQA/NEPA analysis, and the complete lack of on-the-ground environmental impacts analysis of transmission within the Plan. In addition, the plan provides incidental take coverage for long-term operations and maintenance of transmission infrastructure, which provides efficiencies and benefits

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to transmission owners and operators. Benefits include: improved customer service by avoiding schedule delays associated with acquiring individual, project-by-project permits for threatened and endangered species, ensuring the long-term protection of sensitive species through a process that allows the owner/operator to access and maintain its facilities in a timely manner, a more turnkey process for acquiring mitigation that promotes a holistic view of habitat conservation, since mitigation to compensate for impacts is done on a landscape, rather than parcel-by-parcel, basis., which can be important, as transmission mitigation can often be quite small and having a mechanism to contribute this mitigation to a broader landscape vision is potentially meaningful. Finally, greater certainty that regulatory requirements could be fulfilled in a more expeditious way could be expected to more easily attract project financing for DFA-related transmission and generation projects. This is a very significant benefit.

Recommendation:

- Our recommendation is that the TTG process be replaced by a more robust transmission planning processes recommended above.
- Given the lack of environmental analysis of transmission improvements in the draft DRECP, draft DRECP will need to be significantly amended to allow for any tiering as there is no site-specific analysis included at this time. Failing that, each transmission improvement will require full CEQA/NEPA analysis.
- We recommend the utilities or other parties developing transmission improvements fund BLM staff time.

4. Existing Corridors must be defined.

The Plan should define "existing corridors." The DRECP repeatedly uses the term, [11] yet "existing corridors" is not defined within the Plan. Thus it is difficult to understand the universe of corridors that can be considered, and to properly identify and analyze the environmental impacts of developing transmission infrastructure. This is essential to both assess any potential transmission impacts on the conservation lands to fulfill the Plan's conservation objectives, and to determine whether the DFAs provide access to transmission with available capacity or to transmission which can be upgraded with

[11] 11.3-317

minimal environmental impacts. The Plan must tie the term "existing" to the date of release of the draft EIR/EIS to remove an ambiguity regarding whether future utility and BLM planning processes could create additional "existing corridors." Again, not understanding this universe makes it difficult to identify and analyze the impacts of developing transmission on both the energy and biological goals and objectives of the Plan.

Recommendation:

- We recommend that the term "existing corridors" be defined as "valid and existing transmission right-of-way as of the date of the release of the DRECP draft EIR/EIS (e.g., September 21, 2014)."

5. Westwide Energy Corridors (WWEC) should be addressed more fully.

The Plan must explain whether the Section 368 corridors currently under review will be considered "existing corridors." As background, as directed by Section 368 of the Energy Policy Act of 2005, BLM and the US Forest Service (USFS) undertook a programmatic environmental impact statement (PEIS) designating right-of-way (ROW) corridors across public lands in eleven Western states in order to streamline and facilitate the siting of linear energy infrastructure (pipelines and transmission lines). However, the original corridor designations, proposed in 2009, did not do enough to connect renewable energy to load centers, did not provide enough opportunity for public input on their construction, and did not adequately analyze potential impacts on wildlife and the environment.

In response, conservation organizations challenged the designation of the originally proposed corridors. The litigation resulted in a settlement agreement, in which the agencies agreed to review the corridors to address these issues. A number of corridor segments are located in the California desert. There are a number of natural resource and wildlife concerns with specific corridor segments within the Plan area, including impacts to previously undeveloped areas within designated critical habitat, designated conservation areas and priority linkages for the Mojave desert tortoise, priority Mojave ground squirrel habitat and connectivity linkages for Desert bighorn sheep and other wildlife. We incorporate by reference the GIS *Risk Analysis of the West Wide Energy Corridors (WWEC),* prepared by Defenders of Wildlife, May 2014*"* (DOW WWEC Report) which identifies concerns with specific corridor sections in the California desert and includes recommendations for corridor refinements. We support the refinements recommended in this report, and support finding alternatives to these segments recommended

for removal.

The BLM should use this opportunity to modify, delete and, if necessary, add additional corridors where suitable. We strongly encourage CA BLM to work with NV BLM on this process, to ensure effective and responsible corridor designation. This will establish an important foundation for the Regional Periodic Review of corridor designations.

The DRECP must explain whether the Westwide Energy Corridors will be considered "existing corridors."

Recommendation:

- We recommend that the BLM LUPA modify the Section 368 Corridors of Concern consistent with BLM's wildlife policies, the DRECP's biological goals and objectives and the goal of serving DFAs by refining the WWEC Corridors as outlined in the DOW WWEC Report.

6. Transmission must be sustainably sited and impacts properly mitigated.

The DRECP preferred alternative allows transmission within existing corridors within all categories of BLM managed land other than wilderness or wilderness study areas[12] including Areas of Critical Environmental Concern (ACECs) and NLCS units. Most of these designations were created to conserve specific natural resource values which are key to achieving the biological goals and objectives and conservation strategy of the Plan. It is not clear if any attention has been paid to how potential transmission within existing corridors intersects and potentially conflicts with the conservation values and biological goals and objectives of the Plan. Further analysis of impacts of potential transmission is an essential element that must be included in the EIR/EIS.

Transmission within NLCS units raises additional concerns regarding consistency with the NLCS designating Act. As specified in the Omnibus Public Land Management Act of 2009,[13] the NLCS was established to "*conserve, protect, and restore nationally significant landscapes that have outstanding cultural, ecological, and scientific values for the benefit of current and future generations*." The Act goes on to require that NLCS units be managed "*in a manner that protects the values for which the*

[12] 11.3-317
[13] 16 U.S.C. 7202

*components of the system were designate*d".[14] It is not clear that any analysis was conducted to determine whether development in specific energy corridors would protect the values for which any specific NLCS unit was designated.

Additionally, BLM's own policy guidance states: "(*T)o the greatest extent possible, subject to applicable law, the BLM should through land use planning and project-level processes and decisions, avoid designating or* ***authorizing use*** *of transportation or utility corridors within Monuments and NCAs. To that end, and consistent with applicable law, when developing or revising land use plans for Monuments and NCAs, the BLM will consider: designating the Monument or NCA as an exclusion or avoidance area;…."*[15] We support consistency across NLCS units and with BLM policy, meaning in this case that these lands should not include transmission as a default measure.

Recommendations:

- We recommend that the DRECP adopt the approach in Alternative 1 which "*excludes all existing transmission corridors from National Conservation Lands."* [16] Within NLCS units, "*only site authorizations that protect or enhance conservation values, such as those granted as compensatory mitigation for Covered Activities within DFAs or for habitat restoration, would be allowed. National Conservation Lands would be avoidance areas for all other linear ROWs unless the use is clearly compatible with the protection of National Conservation Lands values."*[17] Unlike Alternative 4, this approach would not completely foreclose development of new transmission within NLCS units, but would require any future linear ROW to be compatible with NLCS values, consistent with BLM policy.
- We recommend the DRECP follow the recommendations included in the Defenders of Wildlife et al comments regarding what additional classes of lands should be considered "managed for conservation" under the 2009 Omnibus Act and hence part of the NLCS system.

[14] BLM Manual 6100-National Landscape Conservation System

[15] BLM Manual 6100-National Landscape Conservation System
[16] II.4-33
[17] II.4-34

6. Transmission conservation management actions (CMAs) should be enhanced based on conservation values impacted.

Conservation management actions do not appear to vary based on the designation of the lands impacted; rather, mitigation ratios are constant regardless of the type of lands impacted. This amounts to a failure to take a "hard look" at impacts in any kind of site-specific (or even generic, based on designation) way. Additionally, each of the action alternatives in the DRECP includes identical transmission Avoidance and Minimization CMAs to those listed in the Preferred Alternative, making it difficult to compare the impacts between alternatives.

> **Recommendation:** We recommend the DRECP provide a range of conservation and management actions, including increased compensation ratios for impacts within NLCS and other units with protective designations, based on BLM policies, for transmission impacts.

Sincerely,

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