United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
Carlsbad Fish and Wildlife Office
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Carlsbad, California 92008

In Reply Refer To:
FWS-KRN/SBD/INY/LA/IMP/RIV-16B0138-16F0200

August 16, 2016
Sent by Email

Memorandum

To: Deputy State Director, Division of Natural Resources, Bureau of Land Management, Sacramento, California

From: Field Supervisor, Carlsbad Fish and Wildlife Office, U.S. Fish and Wildlife Service, Carlsbad, California

Digitally signed by GEORGE STEWART
Date: 2016.08.16 16:39:01 -07'00'

Subject: Biological Opinion on the Proposed Land Use Plan Amendment under the Desert Renewable Energy Plan [1340 (CA 930) P, 1150 (CA 930) P]

This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion based on our review of the Bureau of Land Management's (Bureau) proposed land use plan amendment under the Desert Renewable Energy Conservation Plan and its effects on the federally listed California condor, southwestern willow flycatcher, least Bell's vireo, western yellow-billed cuckoo, Yuma Ridgway's rail, and desert tortoise and critical habitat of the desert tortoise in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq*.). Your request for formal consultation is dated July 13, 2015.

We have based this biological opinion on information in your biological assessment (Bureau 2015a), the final environmental impact statement for the proposed land use plan amendment (2015c), and other information in our files; we also coordinated closely with your staff during the development of the biological opinion. We can make a record of this consultation available at the Carlsbad Fish and Wildlife Office.

CONSULTATION HISTORY

Action Area

The implementing regulations for section 7(a)(2) of the Endangered Species Act describe the action area to be all areas affected directly or indirectly by the Federal action and not merely the immediate area affected by the proposed project [50 Code of Federal Regulations (CFR) 402.02]. The action area for this biological opinion comprises 10,869,000 acres of lands managed by the Bureau in the California Desert Conservation Area and portions of the areas managed by the Bakersfield and Bishop Field Offices (The Bureau's Ridgecrest, Barstow, Needles, Palm Springs, and El Centro Field Offices, in addition to the California Desert District Office, manage the California Desert Conservation Area). Unless otherwise noted, all acreages apply only to lands

managed by the Bureau; we have used the acreages provided by the Bureau in the biological assessment and final environmental impact statement, which include its rounding methods.

The proposed land use plan amendment is the Bureau's component of a larger effort to plan future renewable energy development throughout the desert and within portions of the Tehachapi Mountains and Owens Valley; this effort is entitled the Desert Renewable Energy Conservation Plan. In February 2015, the Service, California Energy Commission, and California Department of Fish and Wildlife, the other agencies leading the Desert Renewable Energy Conservation Plan, adjusted the planning process to provide additional time for the agencies to work with counties and other stakeholders on the aspects of that plan that addressed the development of renewable energy facilities on lands that were not managed by the Bureau.

In the final environmental impact statement (Bureau 2015c, page II3-286), the Bureau states that it will "encourage counties and other local governments to coordinate their planning efforts with the [Bureau] to better achieve the goals and objectives of the [Desert Renewable Energy Conservation Plan and the land use plan amendment]" and "will consider whether adjustments to the [land use plan amendment] are necessary based [on] future planning in the [Desert Renewable Energy Conservation Plan] area." If such adjustments to the land use plan amendment may affect federally listed species or critical habitat, the Bureau will re-initiate consultation with the Service, pursuant to section 7(a)(2) of the Endangered Species Act.

The action area for the Bureau's proposed action occurs entirely within the planning area for the Desert Renewable Energy Conservation Plan and California Desert Conservation Area. The species that we address in this biological opinion occur within both the action area and the planning area of the Desert Renewable Energy Conservation Plan. To provide clarity throughout the biological opinion, our references to the "action area" pertain only to lands managed by the Bureau within the boundaries of the Desert Renewable Energy Conservation Plan's larger area. We use "planning area" or "plan area" to refer to the overall boundaries of the Desert Renewable Energy Conservation Plan.

Previous Consultations regarding Land Use Plans within the Action Area

The Bureau and Service have previously consulted on the effects of the California Desert Conservation Area Plan and Bakersfield Resource Management Plan on several of the species included in this biological opinion. The following table lists those consultations.

Species	Conclusion	Plan and Citation
California condor and critical habitat California least tern Southwestern willow flycatcher and critical habitat Least Bell's vireo Western yellow-billed cuckoo	Not likely to jeopardize and not likely to adversely modify	Bakersfield Resource Management Plan Service 2014a

Desert tortoise and critical habitat Parish's daisy and critical habitat Cushenbury milk-vetch and critical habitat Lane Mountain milk-vetch	Not likely to jeopardize and not likely to adversely modify	West Mojave Plan Service 2006a
Desert tortoise and critical habitat	Not likely to jeopardize and not likely to adversely modify	Northern and Eastern Mojave Desert and Northern and Eastern Colorado Desert Management Plans Service 2005a
Coachella Valley fringe-toed lizard and critical habitat Coachella Valley milk-vetch Desert tortoise Triple-ribbed milk-vetch	Not likely to jeopardize and not likely to adversely modify Not likely to adversely affect (triple-ribbed milk-vetch)	California Desert Conservation Area Plan Service 2010c
Peirson's milk-vetch and critical habitat Desert tortoise	Not likely to jeopardize and not likely to adversely modify	Imperial Sand Dunes Recreation Area Management Plan Service 2012a
Amargosa vole and critical habitat	Not likely to jeopardize and not likely to adversely modify	California Desert Conservation Area Plan Service 2002b
Mohave tui chub Inyo California towhee and critical habitat Yuma Ridgway's rail	No effect (Mohave tui chub) Not likely to adversely affect and not likely to adversely modify	California Desert Conservation Area Plan Service 2003
Desert pupfish Yuma Ridgway's rail	"Unlikely to affect"	California Desert Conservation Area Plan Service 2002d
Least Bell's vireo Southwestern willow flycatcher Arroyo toad	Not likely to jeopardize	California Desert Conservation Area Plan Service 2002a

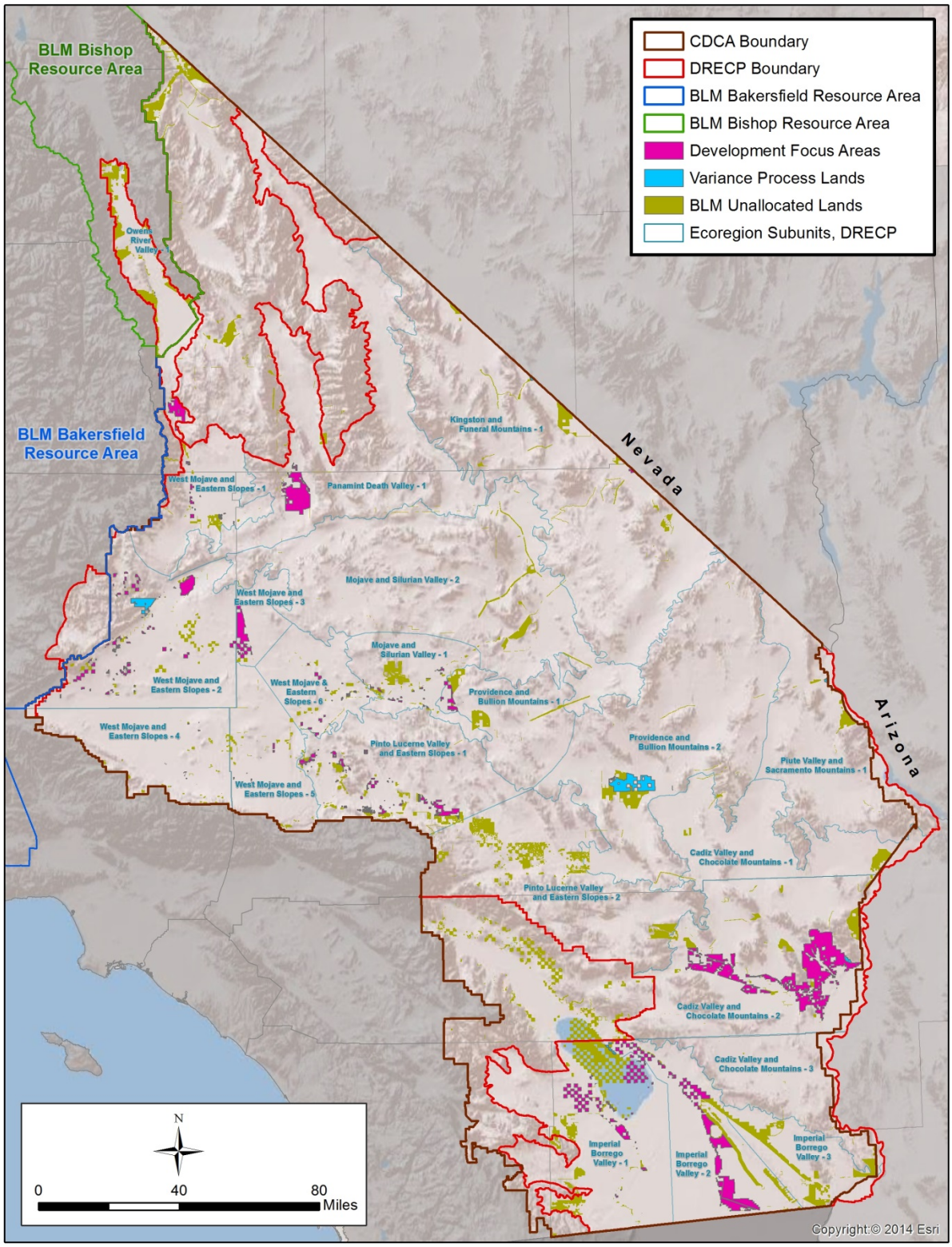
Peninsular bighorn sheep and critical habitat	Not likely to jeopardize and not likely to adversely modify	California Desert Conservation Area Plan Service 2010a
Lane Mountain milk-vetch Amargosa niterwort and critical habitat Ash Meadows gumplant and critical habitat	Not likely to jeopardize and not likely to adversely modify	California Desert Conservation Area Plan Service 2002c

The Bureau also amended the California Desert Conservation Area Plan when it approved the Western Solar Plan (Bureau 2012a) and various renewable energy facilities that are currently operating or under construction. We did not include those amendments in this table but we have summarized the results of the formal consultations on these facilities in Appendix 1.

Scope of the Current Consultation

The proposed land use plan amendment would amend the current land use plans within the planning area of the Desert Renewable Energy Conservation Plan and the California Desert Conservation Area. Because of its multiple-use mandate, the Bureau's land use plans address numerous land uses, such as biological resources, air resources, lands and realty, and livestock grazing, and the manner in which it manages these lands across various land use allocations.

The following maps depict the planning area for the Desert Renewable Energy Conservation Plan. The first map depicts the ecoregions and subunits within the planning area and the development focus areas, variance process lands, and general public lands proposed by the Bureau under the land use plan amendment.


CDCA Boundary
DRECP Boundary
BLM Bakersfield Resource Area
BLM Bishop Resource Area
Development Focus Areas
Variance Process Lands
BLM Unallocated Lands
Ecoregion Subunits, DRECP
BLM Bishop Resource Area
BLM Bakersfield Resource Area
Owens River Valley
Kingston and Funeral Mountains - 1
Nevada
Arizona
West Mojave and Eastern Slopes - 1
Panamint Death Valley - 1
Mojave and Silurian Valley - 2
West Mojave and Eastern Slopes - 3
Mojave and Silurian Valley - 1
West Mojave and Eastern Slopes - 2
West Mojave & Eastern Slopes - 6
Providence and Bullion Mountains - 1
West Mojave and Eastern Slopes - 4
Pinto Lucerne Valley and Eastern Slopes - 1
Providence and Bullion Mountains - 2
Piute Valley and Sacramento Mountains - 1
West Mojave and Eastern Slopes - 5
Cadiz Valley and Chocolate Mountains - 1
Pinto Lucerne Valley and Eastern Slopes - 2
Cadiz Valley and Chocolate Mountains - 2
Cadiz Valley and Chocolate Mountains - 3
Imperial Borrego Valley - 1
Imperial Borrego Valley - 2
Imperial Borrego Valley - 3
N
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40
80
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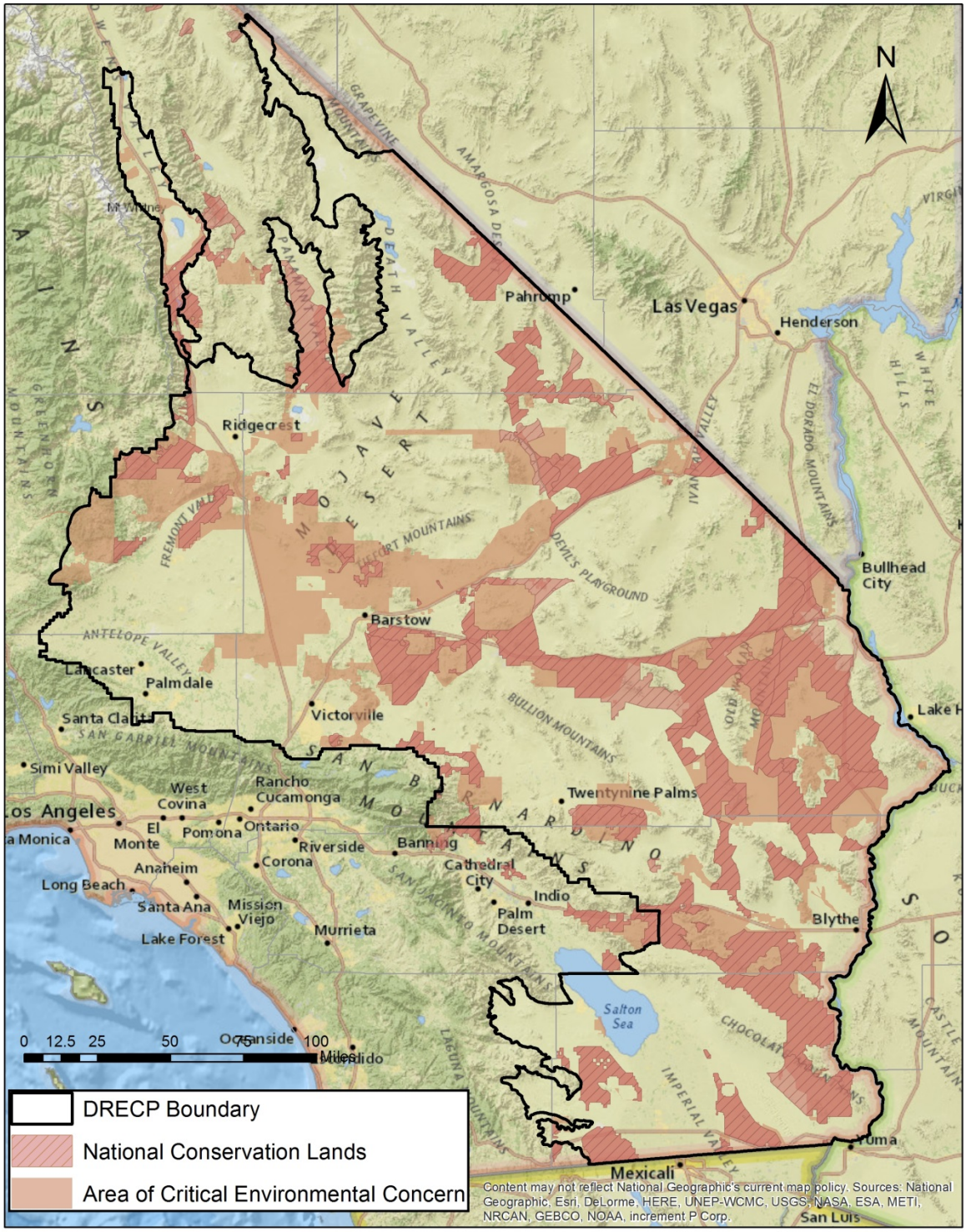
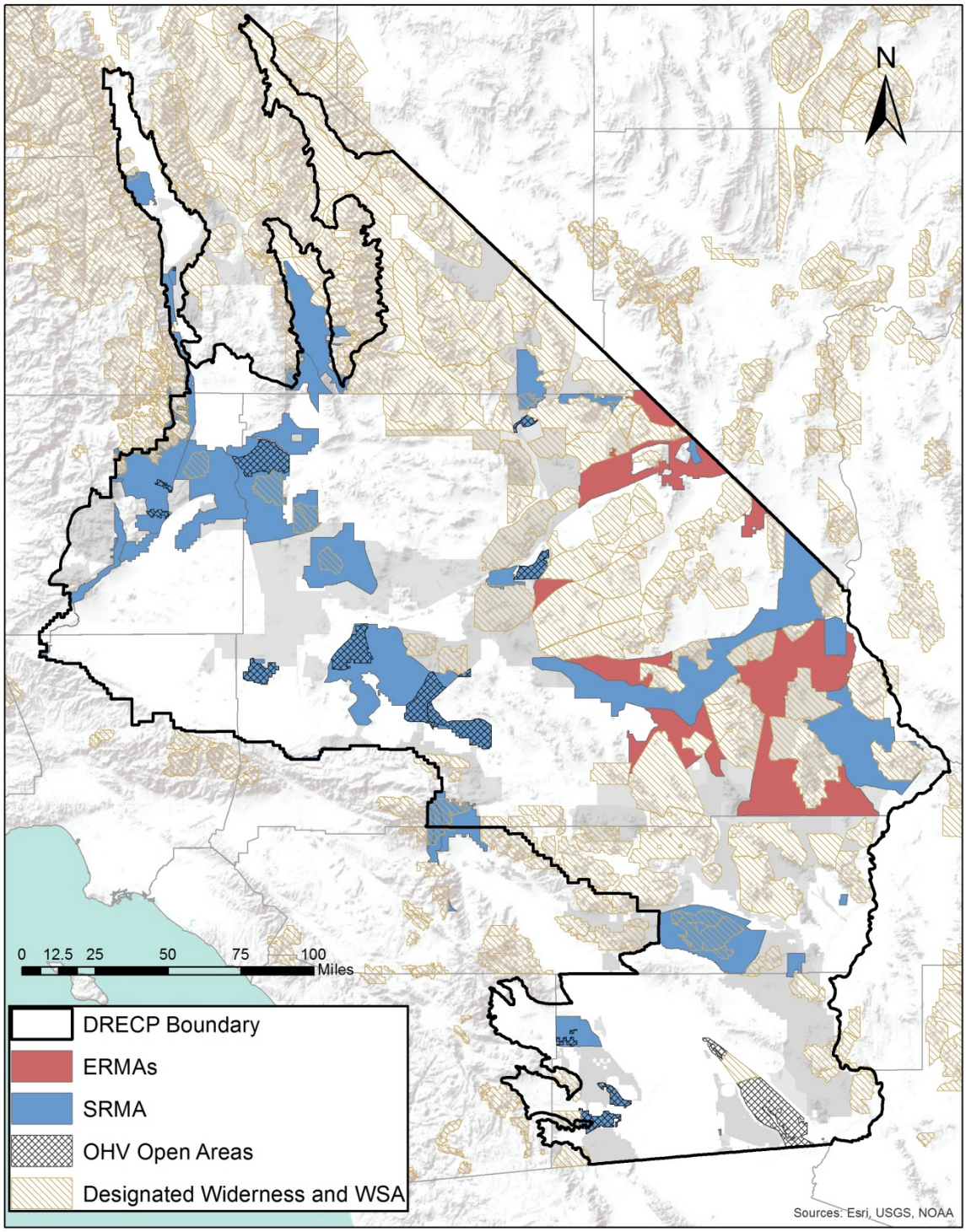
The following map depicts the proposed conservation lands within the planning area.



The following map depicts special and extensive recreation management areas, off-highway vehicle management areas, wilderness, and wilderness study areas within the planning area. The map depicts other conservation areas in light gray.



The proposed action would amend those portions of the land use plans that address renewable energy facilities and land use allocations; it would also amend the lands use plans to incorporate specific conservation and management actions by resource. Facilities that generate renewable energy comprise a land use that the Bureau manages; we will discuss land uses in more detail later in this section. The land use allocations guide how the Bureau manages land uses in various areas. For example, the Bureau may prohibit or limit a specific land use in an area with the specific objective of management for biological resources; it may allow that land use in an area with compatible management objectives. Land use allocations proposed in the plan amendment include, but are not limited to, development focus areas, variance process lands, and wildlife allocations; we will discuss these designations later in the biological opinion.

The Bureau approved the Bishop Resource Management Plan in 1993 (California Energy Commission *et al*. 2014, page I.2-4). The proposed land use plan amendment does not include any development focus areas, variance process lands, or wildlife allocations within the area managed by the Bishop Field Office. Therefore, the Bureau's management of renewable energy facilities within the area managed by the Bishop Field Office will not change under the proposed land use plan amendment; therefore, this aspect of the proposed action is not likely to adversely affect listed species or critical habitat in this area. The land use plan amendment includes the designation of four areas of critical environmental concern and one special recreation management area within this area. As discussed later in this biological opinion, these designations are not likely to adversely affect listed species or critical habitat.

The Bureau (2014) approved the Bakersfield Resource Management Plan in 2014. The current proposed land use plan amendment does not include any development focus areas or variance process lands within the area managed by the Bakersfield Field Office. As with the Bishop Field Office, the Bureau's management of renewable energy facilities within the area of the Bakersfield Field Office will not change under the proposed land use plan amendment; therefore, this aspect of the proposed action would have no effect on listed species or critical habitat in this area. The proposed land use plan amendment includes the proposed designation of wildlife allocations in the area managed by the Bakersfield Field Office. As discussed later in this biological opinion, the proposed designation of wildlife allocations in these areas is not likely to adversely affect listed species.

Under the proposed land use plan amendment, the Bureau would manage public lands within the California Desert Conservation Area by replacing the existing multiple-use classes with land use allocations. The Bureau would also identify land uses that further refine the existing elements (e.g., cultural resources, Native American resources, wildlife, etc.). At the time of the previous consultations on the California Desert Conservation Area Plan, the Bureau managed public lands in the California Desert Conservation Area according to four multiple-use classes (controlled, limited, moderate, intensive) and a relatively small amount of unclassified land. The California Desert Conservation Area Plan stated that each "… classification was based on the sensitivity of resources and kinds of uses for each geographic area. The class designations govern the type and degree of land-use actions allowed within the areas defined by class boundaries. All land-use actions and resource-management activities on public lands within a multiple-use class must

meet the guidelines given for that class" (Bureau 1999). The Bureau (1999) then defined 12 elements to provide "a desert-wide perspective of the planning decisions for one major resource or issue of public concern. Each element also provides more specific application, or interpretation, of multiple-use class guidelines for a given resource and its associated activities."

The Bureau is proposing to replace the four multiple-use classes described in the California Desert Conservation Area Plan (Bureau 1999) with land use allocations; we describe these land use allocations in the Description of the Proposed Action section of this biological opinion. The Bureau also now considers the results of its decisions in terms of desired outcomes (goals and objectives) and allowable uses and actions anticipated to achieve desired outcomes with regard to the various resources that it manages; in the proposed land use plan amendment, conservation and management actions represent those management actions and allowable uses (Bureau 2015a, page 4). The following table, modified from Appendix R of the final environmental impact statement (Bureau 2015c, page R2.14-10), describes how the current multiple use classes would be allocated under the proposed land use plan amendment. The current multiple-use classes are at the left margin; the land use allocations as proposed under the land use plan amendment are indented. All units are in acres. The combined acreage of the multiple-use classes does not equal that of the allocations under the preferred alternative of the land use plan amendment because some areas may have more than one allocation; for example, special recreation management areas may overlap areas of critical environmental concern. Additionally, changes in land use designations since the implementation of the California Desert Conservation Area may not have resulted in updates to the multiple-use class designations. For example, Congress designated additional wilderness (which is reflected in the acreages in the "Preferred Alternative" column) since the Bureau calculated the acreage under multiple-use class C (Karuzas 2015c).

Multiple-Use Class	Existing	Proposed Land Designation or Allocation	Preferred Alternative
Controlled	2,772,000		
		Variance process lands	0
		Existing and proposed areas of critical environmental concern	754,500
		Existing and proposed special recreation management areas	315,650
		Wilderness	3,338,000
		Development focus areas	0
		Proposed National Conservation Lands	8,800
		General public lands	350
Intensive	554,000		
		Variance process lands	14,500
		Existing and proposed areas of critical environmental concern	41,000
		Existing and proposed special	

		recreation management areas	248,700
		Development focus areas	41,000
		Proposed National Conservation Lands	26,700
		General public lands	27,700
Limited	3,919,000		
		Variance process lands	20,500
		Existing and proposed areas of critical environmental concern	3,356,300
		Existing and proposed special recreation management areas	1,618,950
		Development focus areas	140,800
		Proposed National Conservation Lands	2,491,800
		General public lands	129,400
Moderate	2,284,000		
		Variance process lands	3,000
		Existing and proposed areas of critical environmental concern	1,76,250
		Existing and proposed special recreation management areas	360,900
		Development focus areas	126,350
		Proposed National Conservation Lands	1,347,250
		General public lands	107,200
Unclassified	244,000		
		Variance process lands	2,200
		Existing and proposed areas of critical environmental concern	60,100
		Existing and proposed special recreation management areas	40,000
		Development focus areas	79,500
		Proposed National Conservation Lands	30,100
		General public lands	90,900

The final environmental impact statement (Bureau 2015c, table II.3-29) presents an overview of how the California Desert Conservation Area's current multiple-use classes translate to the proposed land use allocations. Where the land use plan amendment is silent on a resource, activity, or use, the following table, slightly modified from the final environmental impact statement, provides guidance on which decisions in the California Desert Conservation Area Plan would apply. For example, if a future activity is proposed for an area of critical environmental concern but the land use plan amendment does not provide direction, the Bureau

would apply the California Desert Conservation Area Plan decisions that currently apply for Class L. Additionally, the plan-wide conservation and management actions would apply to the activity to achieve the management goals and objectives of the land use plan amendment.

Current Multiple-use Class	Proposed Allocation
C Controlled Use (Wilderness management. Class C identifies areas "preliminarily recommended" for wilderness designation by Congress).	Unchanged, no new allocation.
L Limited Use	National Conservation Lands (outside of wilderness and wilderness study areas) Areas of critical environmental concern Wildlife allocations
M Moderate Use	Special recreation management areas that do not overlap with areas of critical environmental concern, National Conservation Lands, or off-highway vehicle management areas General public lands Variance process lands
I Intensive Use	Off-highway vehicle management areas development focus areas

The Bureau is also proposing to replace the elements it used previously with land uses; see Table II.3-50 of the biological assessment (Bureau 2015a). These land uses are fundamentally the same as the elements that the Service analyzed previously in its biological opinions on the California Desert Conservation Area Plan. [For a list of the elements in the previous consultations on the California Desert Conservation Area Plan, see page 9 of the Service's (2006a) biological opinion on the West Mojave Plan]. Under the proposed land use plan amendment, the Bureau has subdivided a broader description of an element into a greater level of detail. For example, the Bureau has broken the element of "motorized-vehicle access" in the California Desert Conservation Area Plan into "motorized use, road maintenance, road construction, railroads, and aircraft." Table II.3-50 of the biological assessment (Bureau 2015a) lists the resources that the Bureau manages through its land use plans and how those resources would be managed under the proposed land use allocations. The table also demonstrates how the proposed land use allocations compare to the Bureau's previous multiple-use classes.

The Bureau has determined and the Service concurs that, with the exception of land use related to renewable energy facilities, the Bureau's proposed replacement of elements with land uses is not likely to adversely affect listed species or critical habitat. Our rationale for this conclusion is based on the following.

The Bureau proposes to increase the amount of land that will be subject to higher levels of protection for listed species and critical habitat under the proposed land use plan amendment.

The following table from page 215 of the biological assessment illustrates the increase in the amount of land that the Bureau would manage for conservation.

Recovery Unit	Existing conservation* (Acres)	Proposed conservation* (Acres)
Colorado Desert	2,663,240	3,698,724
Eastern Mojave	800,134	1,184,894
Northeastern Mojave	42,264	74,109
Western Mojave	2,612,497	3,731,942
Total	6,118,135	8,689,669

* These acreages may differ from those presented in the final environmental impact statement due to the calculations in the biological assessment including overlapping conservation areas and private lands within a conservation designation.

Although the Bureau will not preclude all activities that may affect listed species and critical habitat within lands managed for conservation, the conservation and management actions that are part of the proposed action will maintain or reduce the extent of any adverse effects of future actions to a level that is at or below what the Service anticipated in its previous biological opinions (Bureau 2015a). One of the proposed conservation and management actions is to apply caps on the amount of disturbance that allowed within conservation areas; the proposed disturbance caps would vary from 0.1 to 1.0 percent of the conservation lands, depending on the management goal for the area. The proposed caps would be as or more restrictive than those currently in place within the California Desert Conservation Area Plan. The current cap in the California Desert Conservation Area Plan applies only to desert wildlife management areas; it is 1 percent and only considers new disturbance authorized by the Bureau. The proposed caps would apply to all conservation lands and include existing disturbance, whether authorized by the Bureau or unauthorized. We will discuss the disturbance caps in more detail later in this biological opinion.

The Bureau determined that the proposed action would have no effect on several species and their critical habitat (See the request for formal consultation [Bureau 2015a] and the following table). In general, the ranges of these species and their critical habitat have little or no overlap with the action area for this consultation.

As we described in more detail previously in this section, the Bureau's proposed action would amend only those portions of the land use plans that address renewable energy facilities and land use allocations. The changes in land use allocations for most species and critical habitats increase the level of protection from that which these species and critical habitats currently experience under the existing land use plans. Increasing the level of protection to listed species and critical habitat is entirely beneficial; therefore, the Bureau has determined and the Service concurs that the proposed action is not likely to adversely affect most of the listed species and critical habitat areas that occur within the action area; this biological opinion addresses the remaining species that the development or operation of renewable energy facilities within development focus areas is likely to adversely affect. [See "Section 402.13 Informal Consultation" in 51 Federal Register (FR)

19926], which states that “those activities which are found to have beneficial, discountable, or insignificant effects upon listed species or their critical habitats could be deemed to be in compliance with section 7(a)(2) without formal consultation.”) Our conclusion that the proposed change in management direction is not likely to adversely affect these species and their critical habitat does not mean that the future activities that the Bureau undertakes or authorizes would never result in adverse effects; as under the current situation, the Bureau is required to consult with the Service pursuant to any action that it authorizes, implements, or funds that may affect listed species or critical habitat.

The following table, which is based on the table in the Bureau’s (2015a) request for consultation, identifies the listed species and critical habitat found within the California Desert Conservation Area and the areas managed by the Bakersfield and Bishop Field Offices. We then note the determinations that the Bureau made with regard to the effects of the proposed land use plan amendment on these species; the request for consultation (Bureau 2015a) describes the Bureau’s rationale for its decisions.

Species	**Determination**
Invertebrates	
Casey’s June beetle (E) *Dinacoma caseyi*	No effect
Critical Habitat	No effect
Quino checkerspot butterfly (E) *Euphydryas editha quino*	No effect
Critical Habitat	No effect
Fish	
Desert pupfish (E) *Cyprinodon macularius*	Not likely to adversely affect
Critical Habitat	Not likely to adversely affect
Owens pupfish (E) *Cyprinodon radiosus*	Not likely to adversely affect
Mohave tui chub (E) *Gila bicolor mohavensis*	Not likely to adversely affect
Owens tui chub (E) *Gila bicolor* subsp. *snyderi*	Not likely to adversely affect
Amphibians	
Arroyo toad (E) *Anaxyrus californicus*	No effect
Critical Habitat	No effect
Mountain yellow-legged frog, southern California DPS (E) *Rana muscosa*	Not likely to adversely affect

Reptiles	
Desert tortoise (T) *Gopherus agassizii*	Likely to adversely affect
Critical Habitat	Likely to adversely affect
Coachella Valley fringe-toed lizard (T) *Uma inornata*	Not likely to adversely affect
Critical Habitat	Not likely to adversely affect
Birds	
Yellow-billed cuckoo, western United States DPS (T) *Coccyzus americanus occidentalis*	Likely to adversely affect
Proposed Critical Habitat	No effect
Southwestern willow flycatcher (E) *Empidonax traillii extimus*	Likely to adversely affect
Critical Habitat	Not likely to adversely affect
California condor (E) *Gymnogyps californianus*	Likely to adversely affect
Ridgeway's [Yuma Ridgway's] rail (E) *Rallus obsoletus yumanensis* [*R. longirostris y*]	Likely to adversely affect
Inyo California towhee (T) *Melozone crissalis eremophilus* (*Pipilo crissalis eremophilus*)	Not likely to adversely affect
Critical Habitat	Not likely to adversely affect
California least tern (E) *Sternula antillarum browni*	Not likely to adversely affect[1]
Least Bell's vireo (E) *Vireo bellii pusillus*	Likely to adversely affect
Mammals	
Amargosa vole (E) *Microtus californicus scirpensis*	Not likely to adversely affect
Critical Habitat	Not likely to adversely affect
Peninsular bighorn sheep DPS (E) *Ovis canadensis nelsoni*	Not likely to adversely affect
Critical Habitat	Not likely to adversely affect
Plants	
Cushenbury oxytheca (E) *Acanthoscyphus parishii* var. *goodmaniana* (*Oxytheca p.* var. *g.*)	Not likely to adversely affect
Critical Habitat	Not likely to adversely affect
Cushenbury milk-vetch (E) *Astragalus albens*	Not likely to adversely affect
Critical Habitat	Not likely to adversely affect

Lane Mountain milk-vetch (E) *Astragalus jaegerianus*	Not likely to adversely affect
Critical Habitat	Not likely to adversely affect
Coachella Valley milk-vetch (E) *Astragalus lentiginosus* var. *coachellae*	Not likely to adversely affect
Critical Habitat	Not likely to adversely affect
Peirson's milk-vetch (T) *Astragalus magdalenae* var. *peirsonii*	No effect
Critical Habitat	No effect
Triple-ribbed milk-vetch (E) *Astragalus tricarinatus*	Not likely to adversely affect
Cushenbury buckwheat (E) *Eriogonum ovalifolium* var. *vineum*	Not likely to adversely affect
Critical Habitat	Not likely to adversely affect
Parish's daisy (T) *Erigeron parishii*	Not likely to adversely affect
Critical Habitat	Not likely to adversely affect
Ash Meadows gumplant (T) *Grindelia fraxinipratensis*	Not likely to adversely affect
Critical Habitat	Not likely to adversely affect
Amargosa niterwort (E) *Nitrophila mohavensis*	Not likely to adversely affect
Critical Habitat	Not likely to adversely affect
Bakersfield cactus (E) *Opuntia basilaris* var. *treleasei*	No effect

Key:
E – Endangered; T – Threatened; DPS – Distinct Population Segment
[1] The Bureau initially requested formal consultation with regard to the California least tern. California least terns are colonial nesters and have only recently begun to breed in low numbers at the Salton Sea; most individuals breed along the Pacific coast or the Gulf of California. After reviewing the current status of the California least tern in the action area (i.e., at the Salton Sea) and considering the likely behavior of California least terns in relation to proposed development focus areas near the sea, the Service concluded that activities related to renewable energy were unlikely to kill or injure individuals of this species or cause any other adverse effects. We discussed this issue with the Bureau and the agencies agreed that formal consultation was unnecessary at this time. If new information becomes available that indicates the proposed action may affect California least terns in a manner that we did not anticipate (see 50 CFR402.16.b), the Bureau will re-initiate consultation at that time.

Consultation Process

The draft environmental impact report and statement for the Desert Renewable Energy Conservation Plan (California Energy Commission *et al*. 2014) and the final environmental impact statement for the Bureau (2015c) land use plan amendment are complex documents that contain a large volume of information on numerous aspects of the proposed action. The biological assessment (Bureau 2015a) also contains extensive information on the proposed action. Given the volume of these documents, the Service often requested specific information

from the Bureau while developing this biological opinion. Some of the information we requested was already in these documents; we requested additional information to help us understand various aspects of the proposed action in light of the specific review necessary to complete our evaluation under section 7(a)(2) of the Endangered Species Act.

To ensure that we described the proposed land use plan amendment accurately, we provided a draft of the Consultation History and Description of the Proposed Action sections of this biological opinion to the Bureau for its review on September 15, 2015 (Service 2015a). The Bureau (2015b) reviewed the draft document and agreed that it accurately described, with some revisions, the proposed land use plan amendment on October 8, 2015. The Service (2015d) provided a final draft biological opinion to the Bureau on December 16, 2015; the Bureau (2016) provided comments on that draft on January 8, 2016.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

The Bureau proposes to adopt a land use plan amendment that covers two primary actions, the designation of lands suitable or potentially suitable for renewable energy development and the alteration of its land use allocations. These actions would occur within the areas it manages under the direction of the California Desert Conservation Area Plan, the Bakersfield Resource Management Plan, and the Bishop Resource Management Plan. As previously discussed, the actions with regard to the development of renewable energy within the Bakersfield and Bishop Resource Management Plan areas will not change as a result of the proposed land use plan amendment.

The proposed action represents the preferred alternative described in Chapter II.3 of the final environmental impact statement for the Desert Renewable Energy Conservation Plan (Bureau 2015c). We have summarized this description of the proposed action from the biological assessment (Bureau 2015a) and the final environmental impact statement (Bureau 2015c). We also incorporated information that resulted from exchanges between our staffs during consultation.

The proposed land use plan amendment includes plan decisions necessary to adopt a conservation strategy and a streamlined process for the permitting of renewable energy projects on Bureau-managed lands. The Bureau proposes to manage this process through the designation of land use allocations.

As part of the proposed action and to fulfill its obligations under the Endangered Species Act, the Bureau also proposed a streamlined process to provide future project-specific information for the Service’s comment and review. As proponents propose specific projects, the Bureau will coordinate with the Service and provide it with the results of species-specific surveys and the list of project-specific protective measures (based on the conservation and management actions described in the final environmental impact statement [Bureau 2015c] and summarized in this

biological opinion). The Service will evaluate the project-specific effects for consistency with the impacts addressed in this biological opinion, discuss with the Bureau whether additional protective measures would be prudent, and assess the anticipated level of incidental take of individuals of listed species for the specific project. The Service will assess the amount of incidental take we anticipate at the individual project level. If appropriate, the Service will then provide the Bureau with written documentation that it concurs with the list of project-specific protective measures (as proposed by the Bureau or subsequently modified through project-specific discussions) and an allocation of incidental take for the specific proposed action. The amount of allocated incidental take will be a subset of the total amount of incidental take anticipated for the land use plan amendment as a whole; the Service's written documentation will also describe the forms of that incidental take expected to occur. This process will also facilitate the Bureau's and Service's tracking of the impacts of activities that the Bureau authorizes. We describe the Bureau's proposed land use allocations in the following paragraphs.

Development Focus Areas

The Bureau (2015c, page II.3.3) has proposed to designate approximately 388,000 acres of development focus areas where it would apply a streamlined review process to applications for projects that generate renewable energy. The development focus areas are large enough to provide substantial flexibility for siting projects. To facilitate planning, the Bureau also partitioned the planning area in several ecoregions.

The following table depicts the acreages of the development focus areas and the amount of renewable energy development that the Bureau estimates would occur within each ecoregion; all units are in acres. We included the ecoregions and the development focus areas within them in the first map in this biological opinion; see Figure II.3-6 in the final environmental impact statement, Bureau 2015c, for the map and table II.3-4b for the acreages. We understand that the acreages in the record of decision may differ slightly from those presented here but not to the extent that would have a meaningful effect on the analysis in this biological opinion.

Ecoregion	Subunit	Development Focus Areas	Estimated Acreages of Development			
			Solar	Wind	Geothermal	Total
Cadiz Valley and Chocolate Mountains	1	-	-	-	-	-
	2	148,000	16,338	2,435	-	18,773
	3	-	-	-	-	-
Imperial Borrego Valley	1	36,000	2,687	28	1,649	4,363
	2	73,000	6,101	5	4,212	10,318
	3	-	-	-	-	-
Kingston and Funeral Mountains	1	600	104	-	-	104
Mojave and Silurian Valley	1	3,000	349	-	-	349
	2	-	-	-	-	-
Owens River Valley	1	12,000	526	-	952	1,479

Panamint Death Valley	1	37,000	2,440	-	-	2,440
Pinto Lucerne Valley and Eastern Slopes	1	22,000	1,675	505	-	2,180
	2	-	-	-	-	-
Piute Valley and Sacramento Mountains	1	-	-	-	-	-
Providence and Bullion Mountains	1	5,000	618	-	-	618
	2	-	-	-	-	-
West Mojave and Eastern Slopes	1	2,000	626	-	-	626
	2	28,000	4,444	264	-	4,707
	3	17,000	1,318	-	1	1,319
	4	200	29	-	-	29
	5	800	195	2	-	198
	6	4,000	916	-	-	916
Total		388,000	38,366	3,239	6,814	48,419

Generally, the development focus areas are technology neutral. That is, the Bureau has not specified the type of renewable energy technology that can be developed within the development focus areas. The Bureau has identified areas as suitable for wind, solar, and geothermal development but has not directed the specific technology (e.g., photovoltaic or thermal solar, the type of turbine) (Hereafter, we will use “renewable energy” to refer to any type of renewable energy [i.e., solar, wind, geothermal]; we will note the type of renewable energy when a specific discussion of the type of renewable energy is necessary). The Bureau has also proposed conservation and management actions that it will implement within development focus areas to avoid, minimize, and compensate for effects of preconstruction, construction, operation, and decommissioning of renewable energy projects.

Variance Process Lands

The Bureau has proposed to designate approximately 40,000 acres of variance process lands that would be open for applications to develop renewable energy under the land use plan amendment (Bureau 2015c). All applicants would follow a variance process before the Bureau would determine whether to process the application. The variance process lands comprise a subset of the variance process lands identified in the record of decision for the solar programmatic environmental impact statement (Bureau 2015a). They also include additional lands that, based on current information, have moderate to low ecological value and ambiguous value for renewable energy.

The biological assessment notes that the Bureau refined the screening criteria for variance process lands in the Western Solar Plan to include additional criteria specific to the resources in the planning area. This process reduced the acreage of variance process lands from that included in the record of decision for the Western Solar Plan. Table II.3-46 of the biological assessment contains a list of these screening criteria and notes that section B.5 of the record of decision for the Western Solar Plan (Bureau 2012a) describes the process that the Bureau would use to

consider a proposed solar project within variance process lands. The existing criteria for variance process lands apply only to solar facilities under the Western Solar Plan; the land use plan amendment would extend these criteria to all renewable energy technologies.

The process to develop a project on variance process lands includes public outreach, interagency coordination, and consideration of environmental factors prior to the onset of National Environmental Policy Act analysis. The Bureau would consider the factors listed in section B.5 of the record of decision for the Western Solar Plan (Bureau 2012a), which include but are not limited to specific consideration of the potential effects on desert tortoises and other listed species, the compatibility of the application with the land designation in which the variance process lands reside (for example, if the variance process lands overlap with a special recreation management area), the compatibility of the application with other high value resources (such as minerals), and the conservation and management actions for variance process lands identified in the final environmental impact statement (Bureau 2015c) in determining whether to reject the application or to continue processing it. If the Bureau decides to continue processing the application and begin the National Environmental Policy Act process, it retains its authority to approve, deny, or approve the application with modifications.

The Bureau's proposed action with regard to management of these lands would increase the level of environmental review from that currently required. Therefore, we will not discuss variance process lands further in this biological opinion. The Service would participate in the pre-National Environmental Policy Act variance process if our trust resources may be affected. If the Bureau proposes to authorize or undertake any activity on these lands in the future that may affect listed species or critical habitat, it will consult with the Service as appropriate, pursuant to section 7(a)(2) of the Endangered Species Act.

General Public Lands

The Bureau's proposed action includes approximately 420,000 acres of lands that do not have an existing or proposed land use allocation or designation (Karuzas 2015b). These areas would be open to renewable energy applications but would not benefit from the streamlining or incentives; the Bureau would require a plan amendment to develop renewable energy on these lands.

The final environmental impact statement (Bureau 2015c, page II.3-255; see also Appendix 2) describes the conservation and management actions the Bureau will use to guide management of these lands. Through LUPA-GPL-1, the Bureau will not allow "activities that may have an adverse effect on the biological and cultural conservation design," including individual National Conservation Lands, areas of critical environmental concern and wildlife allocation units. Through LUPA-GPL-5, the Bureau will not allow "activities that may have an adverse effect" on the structure and implementation of the land use plan amendment. These lands would also be subject to plan-wide conservation and management actions. The Bureau's goal with these conservation and management actions is to maintain the conservation framework of the land use plan amendment for the Desert Renewable Energy Conservation Plan as a whole (Karuzus 2015a).

The Service has consulted previously on the Bureau's current management direction for these lands (i.e., the multiple-use classes); the proposed change in management direction will not facilitate their development for renewable energy or any other type of activity. Because the Bureau's proposed management direction will not allow activities that could compromise the conservation framework of the land use plan amendment as a whole and the Bureau will consult with the Service on its site-specific activities within general public lands, as appropriate, pursuant to section 7(a)(2) of the Endangered Species Act, we will not discuss this aspect of the proposed action further in this biological opinion.

Special Recreation Management Areas

The designation of special recreation management areas in land use plans allows the bureau to direct recreation funding and personnel to fulfill commitments to provide specific structured recreation opportunities. These commitments apply to all forms of recreation, such as hiking, rock hounding, vehicle touring, camping, and off-road vehicle use, on appropriate lands as designated in land use plans. The Bureau would manage 31 special recreation management areas covering approximately 2,824,000 acres under the proposed land use plan amendment (Bureau 2015c, page II.3-5). The establishment of this land use allocation commits the Bureau to acknowledge the importance of existing recreational activities in the planning area and to maintain opportunities for such activities on appropriate lands as designated in its land use plans.

The designation of special recreation management areas relates to existing recreational uses already addressed in existing biological opinions and would not, in and of itself, focus additional recreational activity on an area nor authorize activities that may affect listed species or critical habitat. For this reason, we will not discuss special recreation management areas further in this biological opinion. If the Bureau proposes any specific activity with regard to a special recreation management area in the future, it will consult with the Service as appropriate, pursuant to section 7(a)(2) of the Endangered Species Act.

Extensive Recreation Management Areas

Extensive recreation management areas are administrative units that require specific management consideration to address recreation use, demand, or recreation and program investments in visitor services. The Bureau would limit its management actions with regard to recreation within extensive recreation management areas to those of a custodial nature (California Energy Commission *et al*. 2014; Glossary 8); that is, it would only undertake actions to maintain the existing recreational use in association with the management of other resources and the use of those resources. Non-compatible uses, including some recreation activities, may be restricted or constrained to achieve interdisciplinary objectives (California Energy Commission *et al*. 2014; Appendix L). As with special recreation management areas, extensive recreation management areas support various forms of recreation. The Bureau would manage approximately 946,000 acres of extensive recreation management areas under the proposed land use plan amendment (Bureau 2015c, page II.3-5); the extensive recreation management areas would lie entirely within the boundaries of the Needles Field Office.

The designation of extensive recreation management areas relates to existing recreational uses already addressed in existing biological opinions and would not, in and of itself, focus additional recreational activity on an area nor authorize activities that may affect listed species or critical habitat. Instead, the Bureau would manage these areas for ongoing uses, with the proviso that it could restrict or constrain non-compatible uses. For this reason, we will not discuss extensive recreation management areas further in this biological opinion. If the Bureau proposes any specific activity with regard to an extensive recreation management area in the future, it will consult with the Service as appropriate, pursuant to section 7(a)(2) of the Endangered Species Act.

Lands Managed to Protect Wilderness Characteristics

Under the proposed action, the Bureau would manage 546,000 acres that were inventoried and found to have wilderness characteristics to protect these characteristics. [See "Preferred Alternative LWC" Map from the final environmental impact statement (Bureau 2015c)]. The Bureau has not completed inventories of lands with wilderness characteristics for the area within the boundaries of its Palm Springs and Ridgecrest field offices. At the completion of these inventories, the Bureau will propose lands to be managed to protect wilderness characteristics through a plan amendment. The Bureau will manage these lands as detailed in the conservation and management actions, which are described in detail in the final environmental impact statement (Bureau 2015c) and summarized later in this section of the biological opinion.

National Conservation Lands

Public Law 111-11 formally established the National Landscape Conservation System, which comprises Bureau lands with nationally significant ecological, cultural, and scientific values; the goal is to manage these lands to conserve, protect, and restore these values (Bureau 2015a, page 6). Through the proposed land use plan amendment, the Bureau is identifying the areas to be administered for conservation purposes within the California Desert Conservation Area and is designating them as National Conservation Lands. The public law only applies to public lands within the boundary of the California Desert Conservation Area, which differs from that of the planning area for the Desert Renewable Energy Conservation Plan. Public Law 111-11 incorporates several types of Bureau lands into the National Landscape Conservation System, including wilderness areas, National Scenic Trails, National Historic Trails, wilderness study areas, Wild And Scenic Rivers, and any area administered by the Bureau for conservation purposes within the California Desert Conservation Area.

The Bureau is proposing to administer an additional 3,856,000 acres of the California Desert Conservation Area as components of the National Landscape Conservation System. The Bureau will manage these areas to accommodate a variety of uses as long as the management is compatible with protecting National Conservation Land values. The National Conservation Lands include existing transmission corridors.

Areas of Critical Environmental Concern

The Bureau designates areas of critical environmental concern to highlight areas where special management attention is needed to protect and prevent irreparable damage to important historic, cultural, and scenic values, fish, or wildlife resources, or other natural systems or processes or to protect human life and safety from natural hazards. The Bureau can establish special management measures to protect those values.

The Bureau's proposed land use plan amendment would include 127 areas of critical environmental concern (Bureau 2015c). This total includes existing and proposed areas of critical environmental concern covering approximately 6,021,000 acres, including 207,000 acres of areas of critical environmental concern outside of the planning area for the Desert Renewable Energy Conservation Plan but within the California Desert Conservation Area.

Wildlife Allocations

The proposed action would include approximately 18,400 acres of wildlife allocations on Bureau-managed lands. The wildlife allocation designation does not eliminate other existing land uses; however, it emphasizes the protection and enhancement of important plant and animal habitats. The Bureau will ensure that new activities or modifications of existing land uses within these areas are compatible with and not contrary to the wildlife values or the protection and enhancement of wildlife and plant habitat. The Bureau (2015a, page 162) will prohibit renewable energy activities and related ancillary facilities within wildlife allocations.

The proposed action includes two wildlife allocations; both are located within the area managed by the Bakersfield Field Office. The objective of the Caliente Creek Wildlife Allocation is to consolidate habitat through acquiring land and other interests within and at the edge of the allocation from willing sellers. The Bureau identified the Tehachapi Linkage Wildlife Allocation principally for its high habitat and watershed integrity and importance in connecting the Coast and Transverse Ranges with the southern Sierra Nevada; this area includes private, State, and Federal lands and mineral estate. The objective for managing this wildlife allocation is to retain public lands and acquire additional lands. The proposed actions with regard to listed species and critical habitat would be entirely beneficial; consequently, we will not discuss the designation of wildlife allocations further in this biological opinion.

Conservation and Management Actions

To achieve the goals and objectives for activities within its land use allocations, the Bureau identifies a specific set of avoidance, minimization, and compensation measures, and allowable and non-allowable actions for siting, design, pre-construction, construction, maintenance, implementation, operation, and decommissioning activities on Bureau land. Under the proposed action, the Bureau refers to these as conservation and management actions.

The Bureau has proposed 93 conservation and management actions specifically for biological resources that would apply to all authorized activities on public lands, regardless of the land use allocation; the Bureau will determine which conservation and management actions apply to any given activity on a case-by-case basis. The Bureau refers to these as "LUPA-wide conservation and management actions." These conservation and management actions are best management practices that the Bureau will require when any activity is implemented on public lands; the Bureau already employs many of these conservation and management actions in current activities.

Appendix 2 contains the full text of all of the Bureau's proposed conservation and management actions. The Service reviewed all of the conservation and management actions in the final environmental impact statement (Bureau 2015c) and incorporates them herein by reference.

The following table provides a brief summary of the conservation and management actions that will apply to all authorized activities in the action area; the numbers and abbreviations refer to numbering system in the final environmental impact statement (Bureau 2015c). In the following tables, we have included only those conservation and management actions that apply, directly or indirectly, to the listed species considered in this biological opinion.

LUPA-BIO	Plan-wide Conservation and Management Actions to be Implemented for All Activities
1	Determine whether suitable habitat and target species are present through habitat assessments and protocol or adequate surveys.
2	Employ designated biologists to conduct activity-specific biological monitoring during pre-construction, construction, and decommissioning to ensure that avoidance and minimization measures are appropriately implemented and are effective (We have retained our use of the phrase "authorized biologist" for this biological opinion but view authorized and designated biologists as having the same qualifications).
3	Implement setbacks to avoid and minimize the adverse effects to specific biological resources.
4	Implement all required species-specific seasonal restrictions on pre-construction, construction, operations, and decommissioning activities or install visual barriers.
5	Implement a worker education program during all phases of the project.
6	Implement measures to reduce subsidies that activities may provide to predators; provide compensatory mitigation to plan-wide management of common ravens.
7	Restore areas disturbed by project activities to the pre-disturbance plant community.
8	Implement project-specific closure and decommissioning actions.

9	Implement standard practices for construction sites to prevent toxic or hazardous materials from entering washes and other waters; avoid the use of evaporation ponds for water management when the water could harm birds or other terrestrial wildlife due to selenium, hypersalinity, etc.
10	Implement actions to manage weeds during all phases of activities.
11	Manage nuisance animals and invasive species such that treatment methods will not affect native species.
12	Implement avoidance or engineering controls to reduce noise levels on sensitive species.
13	Site and design projects to avoid impacts to vegetation types, unique plant assemblages, climate refugia, occupied and suitable habitat for sensitive species and to maintain the function of connectivity of sensitive species in identified areas.
14	Minimize the loss of wildlife through best management practices while implementing activities and the loss of vegetation through site- and project-specific measures.
15	Use state-of-the-art construction and installation techniques that minimize new site disturbance, soil erosion and deposition, soil compaction, disturbance to topography, and removal of vegetation.
16	Implement appropriate measures, including siting and project design, to avoid and minimize mortality of birds and bats from specific activities.
17	Implement a bird and bat conservation strategy to monitor impacts of an activity and direct adaptive management programs to reduce mortality during operations.

The Bureau also proposed numerous species-specific measures to reduce the effects of activities on listed species and critical habitat throughout the plan area. The following table provides a brief summary of the species-specific conservation and management actions that the Bureau will apply to an activity in the planning area; the abbreviations and the following numbers refer to the numbering system in the biological assessment.

LUPA-BIO	**Plan-wide conservation and management actions to be Implemented Specifically for Activities That May Affect Listed Species or Critical Habitat**
RIPWET	Least Bell's Vireo, Southwestern Willow Flycatcher, Yuma Ridgway's Rail, Western Yellow-Billed Cuckoo
1	Avoid riparian and wetland vegetation to the maximum extent practicable with the specified setbacks.
2	Maintain the hydrologic function of wetland areas.
3	Conduct a pre-activity survey for sensitive nesting bird species according to agency-approved protocols when within 0.25 mile of riparian or wetland vegetation and implement appropriate setbacks, based on the results of the survey.

IFS	Desert Tortoise
1	Ensure long-term viability within each linkage given the linkage's specific characteristics.
2	Avoid construction of new roads or routes within conservation areas or identified linkages.
3	Design all culverts to allow unrestricted access and to be large enough that desert tortoises are unlikely to use them as shelter sites.
4	Install and maintain exclusion fencing around the perimeter of the activity's footprint
5	Monitor initial clearing and grading activities to ensure that desert tortoises missed during the initial clearance survey are moved from harm's way.
6	Monitor geotechnical boring and associated vehicle movement to ensure desert tortoises are not killed or burrows crushed.
7	Inspect the ground under vehicles to ensure desert tortoises are not crushed.
8	Limit vehicle speeds to 15 miles per hour in areas where desert tortoises may be present.
IFS	California Condor
15	Design and site all activities in a manner to avoid or minimize the likelihood of contact, injury, and mortality of California condors.
16	Prohibit flight activity (e.g., surveys, construction, operation and maintenance) related to any activities in the airspace extending to 3,000 feet above nest sites.
17	Mark structures supported by guy wires with recommended bird deterrent devices at the appropriate spacing intervals.
18	Contain all equipment and work-related materials (including loose wires, open containers or other supplies or materials) in closed containers either in the work area or placed inside vehicles.
19	Avoid the use of ethylene glycol-based anti-freeze or other ethylene glycol-based liquid substances.
20	Implement the best detection, deterrence, and curtailment strategy available at the time of the activity to minimize adverse effects and avoid or minimize the likelihood of condor injury and mortality.
21	Implement additional measures to minimize potential impacts to California condors if they begin to visit the site of an activity.
22	Curtail operations or activities using best available techniques if an activity-specified trigger for injury or mortality of California condors, as determined by the Bureau and Service, is reached.
23	Develop and implement, on an activity-specific basis, a Condor Operations Strategy to avoid or reduce the likelihood of injury and mortality of California condors from an activity, if the activity may affect individuals of this species; the Bureau will approve the strategy in coordination with the Service and may include, but is not limited, to detailing specifics on the activity-specific detect, deter and curtailment strategy; monitoring approach to detect the California condor's use of the site; adaptive management approach if birds are found to

	visit the site; and activity-specific measures that assist in the recovery of the California condor.
TRANS	Transmission Activities
1	Bury electrical collector lines along roads or other previously disturbed paths to minimize new surface disturbance, restrict perching opportunities for common ravens, and reduce collision risks, where feasible.
2	Install flight diverters on all transmission activities spanning or within 1,000 feet of stream and wash channels, canals, ponds, and any other natural or artificial body of water in coordination with the Service, as appropriate, and based on the best available scientific and commercial data.
3	Avoid, to the maximum extent practicable, siting transmission lines across canyons or on ridgelines. Site and design transmission lines to prevent electrocution of California condors.

The conservation and management actions regarding transmission lines (LUPA-TRANS- BIO-1 through 3) also apply to generator-tie lines (See page 46 of the biological assessment [Bureau 2015a]).

The Bureau has also proposed conservation and management actions that will specifically apply to activities within National Conservation Lands, areas of critical environmental concern, and wildlife allocations; the Bureau refers to these measures as ecological and cultural conservation and management actions or "CONS." Depending on the situation, the LUPA-wide conservation and management actions may also apply to these areas. If an activity is subject to both CONS and LUPA-wide conservation and management actions and the measures conflict, the Bureau will implement the management direction provided by the more restrictive measure (i.e., the measure that most benefits the species or habitat), unless otherwise specified; the Bureau will follow this procedure whenever the direction provided by overlapping conservation and management actions conflicts.

The following table provides a brief summary of the species-specific conservation and management actions that the Bureau will apply within National Conservation Lands, areas of critical environmental concern, and wildlife allocations; the abbreviations and the following numbers refer to the numbering system in the biological assessment.

CONS-BIO-IFS	**Conservation and Management Actions for the Desert Tortoise to be Implemented for Activities within National Conservation Lands, Areas of Critical Environmental Concern, and Wildlife Allocations**
1	Prohibit all activities, except transmission, within National Conservation Lands and areas of critical environmental concern that would result in the long-term removal of habitat supporting more than 5 adult* desert tortoises per square mile or more than 35 adults total, as estimated through the formula in the Service's survey protocol.

2	Prohibit all activities, except transmission, in desert tortoise conservation areas or linkages, as identified in Appendix H, Figure H-5, that will result in long-term removal of habitat supporting more than 5 adults, as estimated through the formula in the Service's survey protocol.
3	Apply the following disturbance caps (see Desert Tortoise Conservation Areas Table below) in National Conservation Lands, areas of critical environmental concern, and linkages; all caps are measured by the percentage of land managed by the Bureau.

* "Adult" desert tortoise connotes reproductive maturity; not all desert tortoises that are 160 millimeters in length are reproductive. The Bureau's conservation and management action uses 160 millimeters as its threshold for "adult" desert tortoises; it based this size on the Service's 2010 survey protocol for the desert tortoise. The Service based its 2010 survey protocol on the methodology used in range-wide sampling but erred in citing 160 millimeters as the size below which surveyors' ability to detect desert tortoises decreases. In range-wide sampling, the Service uses 180 millimeters as its cut-off length for counting desert tortoises, at least in part because the Styrofoam models used for training are 180 millimeters in length. The Service intends to revise the survey protocol in the near future and will use 180 millimeters in the revised version. We have evaluated how the Bureau's use of 160 millimeters would affect desert tortoises. Specifically, Turner *et al*. (1987, which contains a life table that the Service generally uses to predict the number of desert tortoises that may occur in an area) found that individuals larger than 160 millimeters comprise approximately 15.4 percent of all desert tortoises; desert tortoises larger than 180 millimeters comprise 13.2 percent of all individuals. From that perspective, on average, we would expect that using 160 millimeters as the size threshold would make the Bureau's conservation and management action slightly more conservative for on-the-ground decisions. For the purposes of this biological opinion, we have used the terms "adult" and "large" desert tortoises synonymously.

Desert Tortoise ConservationAreas[1]	**Disturbance Cap[2]**
Desert Tortoise Research Natural Area	0.1
Fremont-Kramer	0.5
Superior-Cronese	0.5
Ord-Rodman	0.5
Pinto Mountains	0.5
Chuckwalla	0.5
Chemehuevi	0.5
Piute Valley	0.5
Shadow Valley Area of Critical Environmental Concern	0.5
Ivanpah Valley Area of Critical Environmental Concern	0.1

[1] Unless otherwise noted, all names refer to both the area of critical environmental concern and the critical habitat unit of the same name. Figure H-5 in Appendix H of the final environmental impact statement (Bureau 2015c) depicts the desert tortoise conservation areas.

[2] The Bureau (2015a) explains the disturbance cap on page 157 of the biological assessment. The Bureau will calculate the disturbance at the time of an activity. The disturbance will include past and present disturbance, in addition to the proposed action, all routes and trails (designated/authorized and undesignated/unauthorized), and any ground disturbance that can be seen from aerial imagery at 1:10,000 scale. The Bureau will exempt health and safety actions from the cap and disturbance mitigation; however, it will include any ground disturbance resulting from health and safety actions in future calculations. Actions for which the Bureau determines that a categorical exemption is the appropriate finding under the National Environmental Policy Act are also exempted from the disturbance cap.

Desert Tortoise Linkages[1]	Disturbance Cap
Ord-Rodman to Superior-Cronese to Mojave National Preserve	1.0
Superior-Cronese to Mojave National Preserve to Shadow Valley to Death Valley National Park	1.0
Joshua Tree National Park and Pinto Mountains Area of Critical Environmental Concern to Chemehuevi	1.0
Death Valley National Park to Nevada Test Site	1.0
Ivanpah Valley	0.1
Chemehuevi to Chuckwalla	0.1
Pinto Wash	0.1
Ord-Rodman to Joshua Tree	0.5
Fremont Kramer to Ord-Rodman	0.5
High-value Colorado Desert Habitat	1.0

[1] See Figures H-1, 2, and 5 in Appendix H of the final environmental impact statement (Bureau 2015c) for a map of the linkages.

The final environmental impact statement (Bureau 2015c, chapter II.3) provides a detailed description of the methodology that the Bureau will use to implement the cap. Briefly, the Bureau will use the best available aerial imagery at a 1:10,000 scale, its records of authorized ground-disturbing activities (built and not yet built), and all known routes (authorized and unauthorized) to establish the baseline for ground-disturbance within the unit (i.e., area of critical environmental concern, linkage, etc.) where the activity is proposed. If the calculated ground disturbance for the unit is under the cap, the Bureau will not require specific mitigation for ground disturbance. If the calculated ground disturbance is at or above the unit cap, the Bureau will require the proponent to mitigate for the disturbance at higher than the usual ratios for that unit by restoring previously disturbed public lands or acquisition of undisturbed lands. This mitigation must occur within the boundary of the specific unit being affected. The Bureau will monitor the overall general condition and disturbance trend of the National Conservation Lands and areas of critical environmental concern, one ecoregion per year, on a continual rotating basis; this monitoring and assessment will begin one year after the signing of the record of decision for the land use plan amendment. The Bureau will use the results of the trend monitoring and other pertinent ecological and cultural data, to trigger the adaptive management process of the disturbance caps, disturbance mitigation requirements, or disturbance mitigation ratios.

National Conservation Lands

The following table provides a brief summary of conservation and management actions that the Bureau will apply within National Conservation Lands. The abbreviations and the following numbers refer to numbering system in the biological assessment.

NLCS	Conservation and Management Actions to be Implemented for Activities within National Conservation Lands
DIST	Disturbance
1	Limit development to 1 percent of total authorized disturbance or to the level allowed by an overlapping area of critical environmental concern, whichever is more restrictive.
LANDS	Lands and Realty
1	Prohibit renewable energy activities and related ancillary facilities; allow new transmission lines in existing corridors only; avoid the issuance of all other rights-of-way unless accompanied by special stipulations (e.g., restore disturbed areas, etc.).
MIN	Minerals
5	Protect groundwater quality and quantity during geothermal and other leasing.

Areas of Critical Environmental Concern

The following table provides a brief summary of conservation and management actions that the Bureau will apply within areas of critical environmental concern. The abbreviations and the following numbers refer to numbering system in the biological assessment. The conservation and management actions in this section apply to all areas of critical environmental concern within the planning area.

ACEC	Conservation and management actions to be Implemented for Activities within Areas of Critical Environmental Concern
DIST	Disturbance
1	Implement the disturbance caps as defined in the Special Management Plan for each area of critical environmental concern (Appendix L of Bureau 2015c).
LANDS	Lands and Realty
1	Prohibit renewable energy activities; allow transmission lines within designated corridors.
MIN	Minerals
5	Protect groundwater quality and quantity during geothermal and other leasing.

Conservation and Management Actions for Species

The Bureau has proposed numerous other measures to assess and avoid potential impacts to species and habitat in development focus areas. The following table summarizes these measures.

DFA-VPL–BIO-IFS	Conservation and Management Actions for Individual Focus Species
1	Conduct protocol surveys in the desert tortoise habitat areas indicated in Figure H-6 of Appendix H.

2	Set back wind and transmission projects 5 miles from California condor nest sites; set back solar, geothermal, and other activities 1.5 miles from nest sites and out of the direct line of sight from nests.
3	Translocate desert tortoises from impact areas on activity sites when 35 or fewer adult desert tortoises are present according to the Service's protocols; if more than 35 adult desert tortoises or the density of desert tortoises exceeds 5 adults per square mile, redesign, re-site, or relocate the activity.
4	Site, to the maximum extent practicable, activities in areas that are previously disturbed, of low quality habitat, and with low habitat intactness in desert tortoise linkages and the Ord-Rodman Desert Tortoise Conservation Area, as identified in Appendix H

Compensation Requirements

The Bureau will include a condition in its right-of-way grants for specific projects that requires the proponents to compensate for the adverse effects of their proposed actions. The compensation may occur through the acquisition of a calculated acreage, a corresponding fee, eligible non-acquisition actions, or a combination of these measures to fulfill the requirements. The Bureau will also require specific compensation for the loss of certain species of birds and bats; the Bureau will use this compensation to restore habitat in offsite areas to augment populations that are affected by permitted activities or to remove other sources of mortality for these species. Compensation that is provided for bats and other species (including all willow flycatchers and not merely the federally listed southwestern taxon) that the Service has not listed under the Endangered Species Act may indirectly benefit listed species; however, we will not address those specific requirements or their indirect effects, which we expect would be entirely beneficial, in this biological opinion (Throughout this biological opinion, we use "willow flycatchers" to denote all here subspecies; we will use "southwestern willow flycatcher" only when referring to the federally listed taxon).

The potential exists that monitoring during construction or operation of a specific project would indicate that more birds are being killed than the Bureau anticipated and provided for in the compensation requirements. All of the Bureau's right-of-way grants state that "The Authorized Officer may change the terms and conditions of this instrument as a result of changes in legislation, regulations, or as otherwise necessary to protect public health or safety or the environment in accordance with 43 CFR2805.15(e)." The project proponent will need to comply with any amended right-of-way grant; if the proponent refuses, the Bureau can rescind the grant.

Terrestrial Activities

Appendix H of the draft environmental impact report and statement (California Energy Commission *et al*. 2014) describes the methodology the Bureau used to determine compensation ratios for terrestrial activities. The Bureau has proposed a standard compensation ratio of 1:1 and exceptions that would apply to activities that would affect specific resources or are in specific

geographic locations. The highest compensation ratio will apply to any area where more than one exception is present.

The Bureau would implement the following conservation and management actions to determine the compensation for biological resources.

LUPA-BIO-COMP	Conservation Management Actions for Compensation to Terrestrial Resources
1	Compensate for impacts to biological resources from activities in the action area using the standard compensation ratio of 1:1, except for the situations in this table and specific conservation and management actions. Proponents may fulfill compensation requirements through non-acquisition (i.e., restoration and enhancement), land acquisition, or a combination of these options, depending on the activity specifics and the Bureau approval or authorization. Compensation for the impacts to desert tortoise critical habitat will be in the same critical habitat unit as the impact. Compensation for impacts to desert tortoises will be in the same recovery unit as the impact.
	Desert tortoise critical habitat 5:1
	Ord-Rodman Critical Habitat Unit to Joshua Tree National Park linkage* 2:1
	Linkage between the Fremont-Kramer and Ord-Rodman Critical Habitat Units* 2:1
	Desert riparian woodland 5:1
	Wetlands 2:1
2	Compensate for mortality impacts to birds that are focus and Bureau special-status species based on initial estimates of anticipated mortality (if any) and on monitoring of bird mortality; see discussion that follows.

* These ratios are required by DFA-VPL-BIO-COMP-2.

Birds

To assess the potential mortality of focus and Bureau special status-species of birds and bats that is likely to occur during operations, the Bureau will require project proponents to conduct pre-construction monitoring of project sites to establish baseline conditions. Based on this monitoring and the mortality that has occurred at existing projects, the Bureau will estimate the amount of compensation it will require of the project proponent prior to the onset of construction; the estimate will cover the operational life of the project. The Bureau will require the proponent to monitor the initial operation of the activity for a minimum of 3 years in accordance with the project-specific monitoring plan and use the collected data and models developed by the U.S. Geological Survey to estimate the number of likely mortalities of listed birds; we describe the model later in this section. After this initial period of monitoring to assess the effects of that specific project on listed birds, the Bureau will require the proponent to monitor the operation of the activity for the life of the project; this long-term monitoring, which

may be of lesser intensity than the initial monitoring, will allow the Bureau to evaluate the results on an annual basis and apply adaptive management as appropriate.

The Bureau would then compare the amounts of mortality projected by pre-construction surveys and the amount that is observed (and estimated by the U.S. Geological Survey models; see below) during operations); if the Bureau's initial estimate is low, it will require the project proponent to implement additional compensatory measures. If compensation for one species will satisfy the requirements for another species, the Bureau will nest the compensation; conversely, the acquisition or restoration of, for example, desert scrub habitat would not be suitable compensation for species that require riparian habitat.

The U.S. Geological Survey has used Bayes' theorem to calculate a credible upper bound on the number of fatalities that have occurred as a result of the operation of wind turbines and solar facilities, even when no carcasses are observed during monitoring ('evidence of absence' model, Huso *et al*. 2015, Huso *et al*. 2016). These models will allow the Bureau to estimate the number of individuals of Yuma Ridgway's rails, western yellow-billed cuckoos, least Bell's vireos, and southwestern willow flycatchers that are likely to be killed each year. The U.S. Geological Survey will also assist in the development of the monitoring protocol to infer the level of mortality that may occur over the life of the project.

The Bureau would use the software for a specific site and time period to estimate mortalities using pre-established statistical parameters. These statistical parameters include the alpha level (i.e., the statistical probability that the predicted estimate is within the calculated range) and the probability that individuals of specific species of dead birds will be detected. The models become less variable and more accurate with a cumulative dataset; that is, more years of data collection will produce a larger dataset that will allow for a more robust and accurate estimation of mortalities each year.

The Bureau will use the evidence of absence software for any proposed wind or solar project at the time it is proposed. The monitoring of renewable energy facilities and use of the U.S. Geological Survey models will allow the Bureau and Service to evaluate the accuracy of the pre-development estimates and increase the level of compensation or re-initiate consultation, if necessary.

To implement this strategy, the Bureau and Service may need to make project-level decisions prior to the approval of specific projects. For example, the agencies would need to determine the threshold at which the probability of mortality will trigger a requirement to mitigate for the loss of listed birds. Although these decisions lay in the future, the Bureau's proposals of the fundamental strategy to monitor, mitigate, and adaptively manage its actions based on the results of monitoring provides the Service with a substantial basis from which to conduct our analysis.

The Bureau will use the resource equivalency analysis described in Appendix H of the draft environmental impact report and statement (California Energy Commission *et al*. 2014) to determine the amount of habitat that the project proponent would need to create or restore to

offset the loss of these individuals. For the loss of each individual, the Bureau will require the restoration or creation of the following acreages for the species:

Western yellow-billed cuckoo – minimum of 20 acres,

Southwestern willow flycatcher – 5 acres,

Least Bell's vireo – 2 acres, and

Yuma Ridgway's rail – 2 acres.

The Bureau proposes to allow compensation intended to offset mortality of these bird species to occur anywhere within the range of the species where it will be most beneficial for the affected population. When restoration of habitat for one species will also provide habitat for other species, the compensation will be nested. For example, the creation or restoration of habitat for a western yellow-billed cuckoo could also serve as compensation for least Bell's vireos, provided that the ranges of the species overlap in the target restoration area; for example, restoration of riparian habitat along the Colorado River could serve as compensation for southwestern willow flycatchers and western yellow-billed cuckoos but not for least Bell's vireos. The Bureau may also allow project proponents to compensate for mortality through actions that reduce risks to birds (e.g., control of predators and nest parasites and protection of habitat from human disturbance).

The Bureau will require project operators to collect mortality monitoring data as described in the conservation and management action regarding bird and bat conservation strategies (i.e., LUPA-BIO-17). It will also require each project to implement and evaluate appropriate avoidance measures and methods to determine if overall bird mortality (and thus the likely mortality of listed species also) can be reduced; the Bureau will coordinate these efforts with the Service. After the Bureau has collected several years of data, it should have a large amount of information regarding existing activities, which would allow it to better predict the likelihood of the mortalities of listed birds for new activities. These data would allow the Bureau to adjust the strategy for determining compensation for listed birds, if necessary.

The Bureau will not require project proponents to conduct systematic monitoring of bird mortalities during construction. The constantly changing conditions on a work site would introduce too many variables to use tools such as random selection of areas to monitor, determining the efficiency of observers, and the rate of the removal of carcasses. Instead, the Bureau will require all workers and monitors on site to report the carcasses of all birds found onsite during construction; the biological monitors will collect as much detail as possible to allow the Bureau and Service to evaluate the incidents and make appropriate changes in management. Compensation for the loss of individuals during construction may be nested within the initial requirement; if the initial compensation does not cover these individuals, the Bureau would require the proponent to provide further species-specific compensation.

As appropriate, the Bureau will monitor the created or restored habitat to determine if it is meeting the objectives of the compensation and periodically coordinate with the Service to assess realized impacts to listed birds and whether adaptive management is needed to further protect these species. At this time, the Bureau estimates that the agencies would coordinate every 3 to 5 years to assess the need to adapt management.

Monitoring and Adaptive Management

The Bureau will implement a monitoring program to assess the effects of the proposed land use plan amendment. The program will include activity-level monitoring for compliance with its approvals (i.e., project-specific) and monitoring of the effects of the land use plan. Both activity- and plan-level monitoring include provisions for effectiveness monitoring and adaptive management; the goal of these provisions is to ensure that monitoring is "an iterative process designed to continually improve the understanding of managed systems and inform their management over time" (Bureau 2015a). The biological assessment (Bureau 2015a) and final environmental impact statement for the land use plan amendment (Bureau 2015c, section II.3.6.1) include detailed discussions of the monitoring programs.

ANALYTICAL FRAMEWORK FOR THE SECTION 7(A)(2) DETERMINATIONS

Jeopardy Determination

Section 7(a)(2) of the Endangered Species Act requires that Federal agencies ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of listed species. "Jeopardize the continued existence of" means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR402.02).

The jeopardy analysis in this biological opinion relies on four components: (1) the Status of the Species, which describes the range-wide condition of the species, the factors responsible for that condition, and its survival and recovery needs; (2) the Environmental Baseline, which analyzes the condition of the species in the action area, the factors responsible for that condition, and the relationship of the action area to the survival and recovery of the species; (3) the Effects of the Action, which determine the direct and indirect impacts of the proposed Federal action and the effects of any interrelated or interdependent activities on the species; and (4) the Cumulative Effects, which evaluate the effects of future, non-Federal activities in the action area on the species.

In accordance with policy and regulation, the jeopardy determination is made by evaluating the effects of the proposed Federal action in the context of the current status of the species, taking into account any cumulative effects, to determine if implementation of the proposed action is likely to cause an appreciable reduction in the likelihood of both the survival and recovery of the species in the wild.

Adverse Modification Determination

Section 7(a)(2) of the Endangered Species Act requires that Federal agencies ensure that any action they authorize, fund, or carry out is not likely to result in the destruction or adverse modification of critical habitat of listed species. “Destruction or adverse modification” means a direct or indirect alteration that appreciably diminishes the value of critical habitat for the conservation of a listed species. Such alterations may include, but are not limited to, those that alter the physical or biological features essential to the conservation of a species or that preclude or significantly delay development of such features (50 CFR402.02). The Department of the Interior adopted this definition on January 29, 2016 (81 FR 7214). The change to the definition of “destruction or adverse modification” in 50 CFR 402 became effective on March 14, 2016.

In accordance with policy and regulation, the adverse modification analysis in this biological opinion relies on four components: (1) the Status of Critical Habitat, which evaluates the range-wide condition of designated critical habitat for the desert tortoise in terms of physical and biological features, the factors responsible for that condition, and the intended recovery function of the critical habitat overall; (2) the Environmental Baseline, which evaluates the condition of the critical habitat in the action area, the factors responsible for that condition, and the recovery role of the critical habitat in the action area; (3) the Effects of the Action, which determines the direct and indirect impacts of the proposed Federal action and the effects of any interrelated and interdependent activities on the physical and biological features and how that will influence the recovery role of the affected critical habitat units; and (4) Cumulative Effects, which evaluates the effects of future non-Federal activities in the action area on the physical and biological features and how that will influence the recovery role of affected critical habitat units.

For purposes of the adverse modification determination, the effects of the proposed Federal action on the critical habitat of the desert tortoise are evaluated in the context of the range-wide condition of the critical habitat, taking into account any cumulative effects, to determine if the critical habitat range-wide would remain functional (or would retain the current ability for the physical and biological features to be functionally established in areas of currently unsuitable but capable habitat) to serve its intended recovery role for the desert tortoise.

The analysis in this biological opinion places an emphasis on using the intended range-wide recovery function of critical habitat for the desert tortoise and the role of the action area relative to that intended function as the context for evaluating the significance of the effects of the proposed Federal action, taken together with cumulative effects, for purposes of making the adverse modification determination.

METHODOLOGY

In most consultations, the Service and Bureau are aware of detailed information regarding the proposed action. For example, we know the project’s specific location and its precise type; we often have a general idea of the timing of development. Because of surveys that the applicant or Bureau have conducted, we can frequently estimate the numbers of individuals of listed species

that the proposed action may affect. We will also know the precise measures that the Bureau will require the applicant to undertake to mitigate the effects of the proposed action on the listed species and its critical habitat.

In this formal consultation, the Bureau and Service are considering the broader, more general effects of a proposed land use plan amendment on listed species and critical habitat of the desert tortoise. After extensive planning efforts and public input, the Bureau is currently proposing to adopt a land use plan amendment that would streamline the development of renewable energy facilities within development focus areas. Consequently, although we know the location of the development focus areas, we do not know the specific types or locations of renewable energy facilities that applicants may propose in these areas; we also do not know the specific timing of proposed development or the specific number of individuals that each project may affect. The Bureau has also proposed numerous measures to guide construction, operation, and decommissioning of renewable energy in the development focus areas; these conservation and management actions are intended to mitigate adverse effects of future development that may occur under this land use plan amendment.

Given the nature of the proposed action, we will focus our analysis on the Bureau's large-scale proposal. We will evaluate the general effects of wind, solar, and geothermal facilities on the listed species within the development focus areas, assess how the conservation and management actions are likely to mitigate these effects, and determine if the residual effects are likely to appreciably affect the likelihood of the survival and recovery of the listed species.

First, we will provide information on the range-wide status of the desert tortoise and its critical habitat; we will follow that discussion with information on the status of the desert tortoise and its critical habitat within the action area. We will conduct our analysis of the effects of the proposed action on the desert tortoise and its critical habitat, provide our conclusions with regard to whether the proposed action is likely to jeopardize the continued existence of the species or result in the destruction or adverse modification of critical habitat. If appropriate, an incidental take statement will follow the conclusion. We will then repeat this procedure to conduct our analysis of the effects of the proposed action on the California condor, western yellow-billed cuckoo, southwestern willow flycatcher, least Bell's vireo, and Yuma Ridgway's rail.
The Bureau used 25 years as a planning horizon for its analysis during the development of the land use plan amendment; the amendments to land use plans resulting from this planning effort will not necessarily expire in 25 years. The Bureau's adoption of the land use plan amendment itself will not affect listed species or critical habitat; however, it would facilitate the development that would occur as a result of right-of-way grants issued for renewable energy facilities within development focus areas that may result in adverse effects. Most right-of-way grants are for 30 years; the Bureau is unlikely to issue most right-of-way grants for renewable energy facilities in development focus areas within the first year of the adoption of the land use plan amendment. Consequently, we have based our analysis on the likely 30-year life of right-of-way grants.

STATUS OF THE DESERT TORTOISE AND ITS CRITICAL HABITAT

Status of the Desert Tortoise

The Service listed the desert tortoise as threatened in 1990 (55 FR 12178). The threats described in the listing rule and both recovery plans continue to affect the species. The most apparent threats to the desert tortoise are those that result in mortality and permanent habitat loss across large areas, such as urbanization and large-scale renewable energy projects, and those that fragment and degrade habitats, such as proliferation of roads and highways, off-highway vehicle activity, and habitat invasion by non-native invasive plant species.

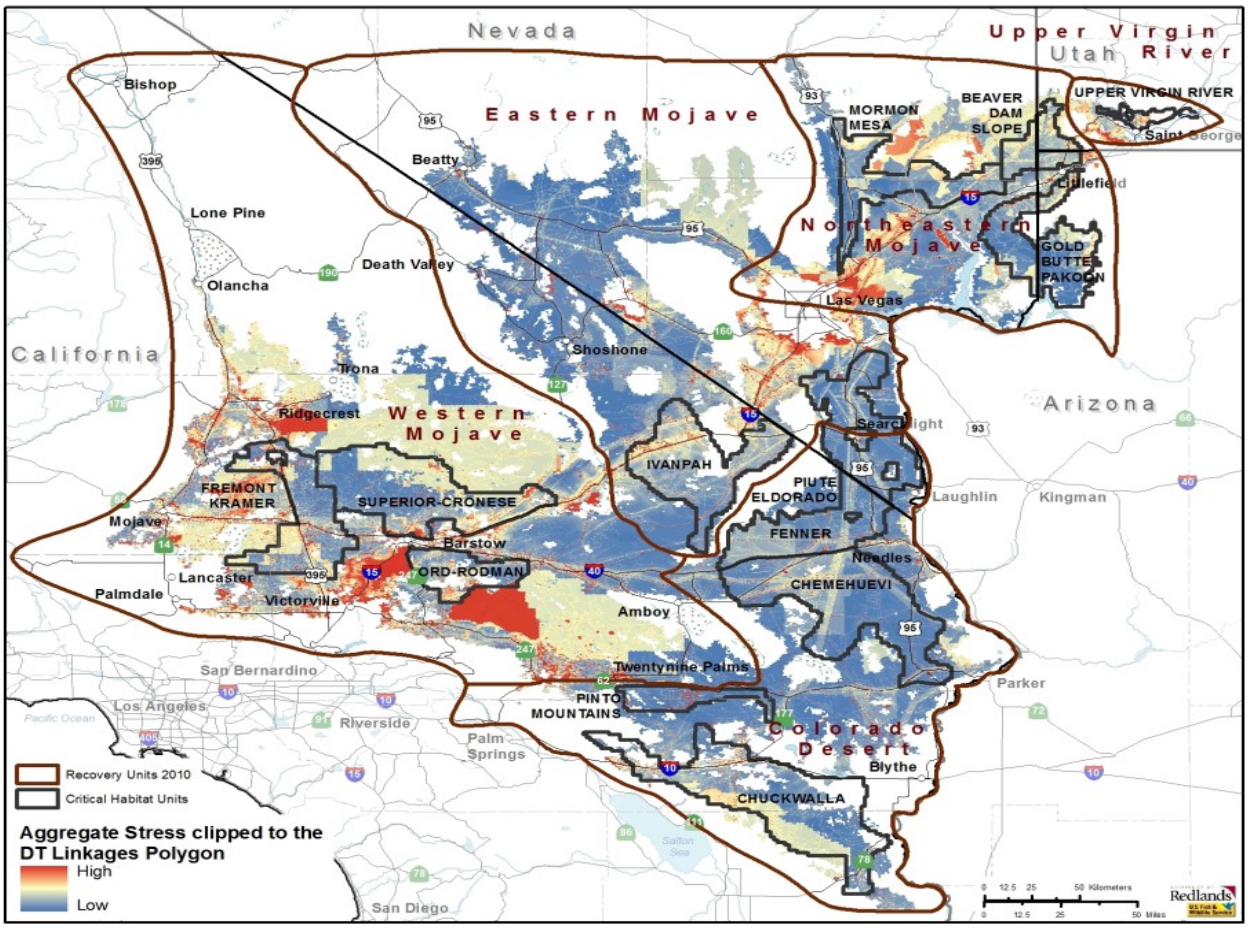
We remain unable to quantify how threats affect desert tortoise populations. The assessment of the original recovery plan emphasized the need for a better understanding of the implications of multiple, simultaneous threats facing desert tortoise populations and of the relative contribution of multiple threats on demographic factors (i.e., birth rate, survivorship, fecundity, and death rate; Tracy *et al*. 2004).

In recognition of the absence of specific and recent information on the location of habitable areas of the Mojave Desert, especially at the outer edges of this area, Nussear *et al*. (2009) developed a quantitative, spatial habitat model for the desert tortoise north and west of the Colorado River. The model incorporates environmental variables such as precipitation, geology, vegetation, and slope and is based on occurrence data of desert tortoises from sources spanning more than 80 years, including data from the 2001 to 2008 range-wide monitoring surveys. The model predicts the relative potential for desert tortoises to be present in any given location, given the combination of habitat variables at that location in relation to areas of known occupancy throughout the range; calculations of the amount of desert tortoise habitat in the 5-year review (Service 2010b) and in this biological opinion use a threshold of 0.5 or greater predicted value for potential desert tortoise habitat. The model does not account for anthropogenic effects to habitat and represents the potential for occupancy by desert tortoises absent these effects.

To understand better the relationship of threats to populations of desert tortoises and the most effective manner to implement recovery actions, the Desert Tortoise Recovery Office developed a spatial decision support system that models the interrelationships of threats to desert tortoises and how those threats affect population change. The spatial decision support system describes the numerous threats that desert tortoises face, explains how these threats interact to affect individual animals and habitat, and how these effects in turn bring about changes in populations. For example, we have long known that the construction of a transmission line can result in the death of desert tortoises and loss of habitat. We have also known that common ravens, known predators of desert tortoises, use the transmission line's pylons for nesting, roosting, and perching and that the access routes associated with transmission lines provide a vector for the introduction and spread of invasive weeds and facilitate increased human access into an area. Increased human access can accelerate illegal collection and release of desert tortoises and their deliberate maiming and killing, as well as facilitate the spread of other threats associated with human presence, such as vehicle use, garbage and dumping, and invasive plants (Service 2011b).

Changes in the abundance of native plants because of invasive weeds can compromise the physiological health of desert tortoises, making them more vulnerable to drought, disease, and predation. The spatial decision support system allows us to map threats across the range of the desert tortoise and model the intensity of stresses that these multiple and combined threats place on desert tortoise populations.

The following map depicts the 12 critical habitat units of the desert tortoise, linkages between conservation areas for the desert tortoise and the aggregate stress that multiple, synergistic threats place on desert tortoise populations, as modeled by the spatial decision support system. Conservation areas include designated critical habitat and other lands managed for the long-term conservation of the desert tortoise (e.g., the Desert Tortoise Natural Area, Joshua Tree National Park, and the Desert National Wildlife Refuge).



Recovery Plan

The Service (1994, 2011b) has issued an initial recovery plan and a revised recovery plan for the desert tortoise. The revised recovery plan for the desert tortoise (Service 2011b) lists three objectives and associated criteria to achieve delisting. The first objective is to maintain self-

sustaining populations of desert tortoises within each recovery unit into the future; the criterion is that the rates of population change (λ) for desert tortoises are increasing (i.e., $\lambda > 1$) over at least 25 years (i.e., a single generation), as measured by extensive, range-wide monitoring across conservation areas within each recovery unit, and by direct monitoring and estimation of vital rates (recruitment, survival) from demographic study areas within each recovery unit.

The second objective addresses the distribution of desert tortoises. The goal is to maintain well-distributed populations of desert tortoises throughout each recovery unit; the criterion is that the distribution of desert tortoises throughout each conservation area increase over at least 25 years. The final objective is to ensure that habitat within each recovery unit is protected and managed to support long-term viability of desert tortoise populations. The criterion is that the quantity of desert tortoise habitat within each conservation area be maintained with no net loss until population viability is ensured.

The revised recovery plan (Service 2011b) also recommends connecting blocks of desert tortoise habitat, such as critical habitat units and other important areas to maintain gene flow between populations. Linkages defined using least-cost path analysis (Averill-Murray *et al*. 2013) illustrate a minimum connection of habitat for desert tortoises between blocks of habitat and represent priority areas for conservation of population connectivity. The previous map in this biological opinion illustrates that, across the range, desert tortoises in areas under the highest level of conservation management remain subject to numerous threats, stresses, and mortality sources.

Five-Year Review

Section 4(c)(2) of the Endangered Species Act requires the Service to conduct a status review of each listed species at least once every 5 years. The purpose of a 5-year review is to evaluate whether the species' status has changed since it was listed (or since the most recent 5-year review); these reviews, at the time of their completion, provide the most up-to-date information on the range-wide status of the species. For this reason, we are appending the 5-year review of the status of the desert tortoise (Appendix 3; Service 2010b) to this biological opinion and are incorporating it by reference to provide most of the information needed for this section of the biological opinion (We are also appending the 5-year reviews of the other species addressed in this biological opinion and are incorporating them by reference). The following paragraphs provide a summary of the relevant information in the 5-year review.

In the 5-year review, the Service discusses the status of the desert tortoise as a single distinct population segment and provides information on the Federal Register notices that resulted in its listing and the designation of critical habitat. The Service also describes the desert tortoise's ecology, life history, spatial distribution, abundance, habitats, and the threats that led to its listing (i.e., the five-factor analysis required by section 4(a)(1) of the Endangered Species Act). In the 5-year review, the Service concluded by recommending that the status of the desert tortoise as a threatened species be maintained.

With regard to the status of the desert tortoise as a distinct population segment, the Service concluded in the 5-year review that the recovery units recognized in the original and revised recovery plans (Service 1994 and 2011b, respectively) do not qualify as distinct population segments under the Service's distinct population segment policy (61 FR 4722; February 7, 1996). We reached this conclusion because individuals of the listed taxon occupy habitat that is relatively continuously distributed, exhibit genetic differentiation that is consistent with isolation-by-distance in a continuous-distribution model of gene flow, and likely vary in behavioral and physiological characteristics across the area they occupy as a result of the transitional nature of, or environmental gradations between, the described subdivisions of the Mojave and Colorado deserts.

In the 5-year review, the Service summarizes information with regard to the desert tortoise's ecology and life history. Of key importance to assessing threats to the species and to developing and implementing a strategy for recovery is that desert tortoises are long lived, require up to 20 years to reach sexual maturity, and have low reproductive rates during a long period of reproductive potential. The number of eggs that a female desert tortoise can produce in a season is dependent on a variety of factors including environment, habitat, availability of forage and drinking water, and physiological condition. Predation seems to play an important role in clutch failure. Predation and environmental factors also affect the survival of hatchlings. The Service notes in the 5-year review that the combination of the desert tortoise's late breeding age and a low reproductive rate challenges our ability to achieve recovery.

Since the completion of the 5-year review, the Service has issued several biological opinions that effect large areas of desert tortoise habitat because of numerous proposals to develop renewable energy within its range. These biological opinions concluded that proposed solar plants were not likely to jeopardize the continued existence of the desert tortoise primarily because they were located outside of critical habitat and desert wildlife management areas that contain most of the land base required for the recovery of the species. The proposed actions also included numerous measures intended to protect desert tortoise during the construction of the projects, such as translocation of affected individuals. In aggregate, these projects would result in an overall loss of approximately 43,920 acres of habitat of the desert tortoise. We also predicted that the project areas supported up to 3,721 desert tortoises; we concluded that most of these individuals were small desert tortoises, that most large individuals would likely be translocated from project sites, and that most mortalities would be small desert tortoises that were not detected during clearance surveys. To date, 583 desert tortoises have been observed during construction of projects; most of these individuals were translocated from work areas, although some desert tortoises have been killed (see Appendix 1). The mitigation required by the Bureau and California Energy Commission, the agencies permitting these facilities, resulted in the acquisition of private land and funding for the implementation of various actions that are intended to promote the recovery of the desert tortoise. These mitigation measures are consistent with recommendations in the recovery plans for the desert tortoise; many of the measures have been derived directly from the recovery plans and the Service supports their implementation. We expect, based on the best available scientific information, that they will result in conservation benefits to the desert

tortoise; however, it is difficult to assess how desert tortoise populations will respond because of the long generation time of the species.

In addition to the biological opinions issued for solar development within the range of the desert tortoise, the Service (2012b) also issued a biological opinion to the Department of the Army for the use of additional training lands at Fort Irwin. As part of this proposed action, the Department of the Army removed approximately 650 desert tortoises from 18,197 acres of the southern area of Fort Irwin, which had been off-limits to training. The Department of the Army would also use an additional 48,629 acres that lie east of the former boundaries of Fort Irwin; much of this parcel is either too mountainous or too rocky and low in elevation to support numerous desert tortoises.

The Service also issued a biological opinion to the Marine Corps that considered the effects of the expansion of the Marine Corps Air Ground Combat Center at Twentynine Palms (Service 2012c). We concluded that the Marine Corps' proposed action, the use of approximately 167,971 acres for training, was not likely to jeopardize the continued existence of the desert tortoise. Most of the expansion area lies within the Johnson Valley Off-highway Vehicle Management Area.

The incremental effect of the larger actions (i.e., solar development, the expansions of Fort Irwin, and the Marine Corps Air Ground Combat Center) on the desert tortoise is unlikely to be positive, despite the numerous conservation measures that have been (or will be) implemented as part of the actions. The acquisition of private lands as mitigation for most of these actions increases the level of protection afforded these lands; however, these acquisitions do not create new habitat and Federal, State, and privately managed lands remain subject to most of the threats and stresses we discussed previously in this section. Although land managers have been implementing measures to manage these threats and we expect, based on the best available scientific information, that such measures provide conservation benefits to the desert tortoise, we have been unable, to date, to determine whether the expected benefits of the measures have yet been realized, at least in part because of the low reproductive capacity of the desert tortoise. Therefore, the conversion of habitat into areas that are unsuitable for this species continues the trend of constricting the desert tortoise into a smaller portion of its range.

As the Service notes in the 5-year review (Service 2010b), "(t)he threats identified in the original listing rule continue to affect the (desert tortoise) today, with invasive species, wildfire, and renewable energy development coming to the forefront as important factors in habitat loss and conversion. The vast majority of threats to the desert tortoise or its habitat are associated with human land uses." Oftedal's work (2002 in Service 2010b) suggests that invasive weeds may adversely affect the physiological health of desert tortoises. Current information indicates that invasive species likely affect a large portion of the desert tortoise's range. Furthermore, high densities of weedy species increase the likelihood of wildfires; wildfires, in turn, destroy native species and further the spread of invasive weeds.

Drake *et al*. (2015) "… compared movement patterns, home-range size, behavior, microhabitat use, reproduction, and survival for adult desert tortoises located in, and adjacent to, burned habitat" in Nevada. They noted that the fires killed many desert tortoises but found that individuals moved deeper into burned habitat on a seasonal basis and foraged more frequently in burned areas (corresponding with greater production of annual plants and herbaceous perennials in these areas). Drake *et al*. (2015) did not find any differences in health or survivorship for desert tortoises occupying either habitat (burned or unburned) during this study or in reproduction during 2012.

Global climate change is likely to affect the prospects for the long-term conservation of the desert tortoise. For example, predictions for climate change within the range of the desert tortoise suggest more frequent and/or prolonged droughts with an increase of the annual mean temperature by 3.5 to 4.0 degrees Celsius. The greatest increases will likely occur in summer (June-July-August mean increase of as much as 5 degrees Celsius [Christensen *et al*. 2007 in Service 2010b]). Precipitation will likely decrease by 5 to 15 percent annually in the region with winter precipitation decreasing by up to 20 percent and summer precipitation increasing by up to 5 percent. Because germination of the desert tortoise's food plants is highly dependent on cool-season rains, the forage base could be reduced due to increasing temperatures and decreasing precipitation in winter. Although drought occurs routinely in the Mojave Desert, extended periods of drought have the potential to affect desert tortoises and their habitats through physiological effects to individuals (i.e., stress) and limited forage availability. To place the consequences of long-term drought in perspective, Longshore *et al*. (2003) demonstrated that even short-term drought could result in elevated levels of mortality of desert tortoises. Therefore, long-term drought is likely to have even greater effects, particularly given that the current fragmented nature of desert tortoise habitat (e.g., urban and agricultural development, highways, freeways, military training areas, etc.) will make recolonization of extirpated areas difficult, if not impossible.

Core Criteria for the Jeopardy Determination

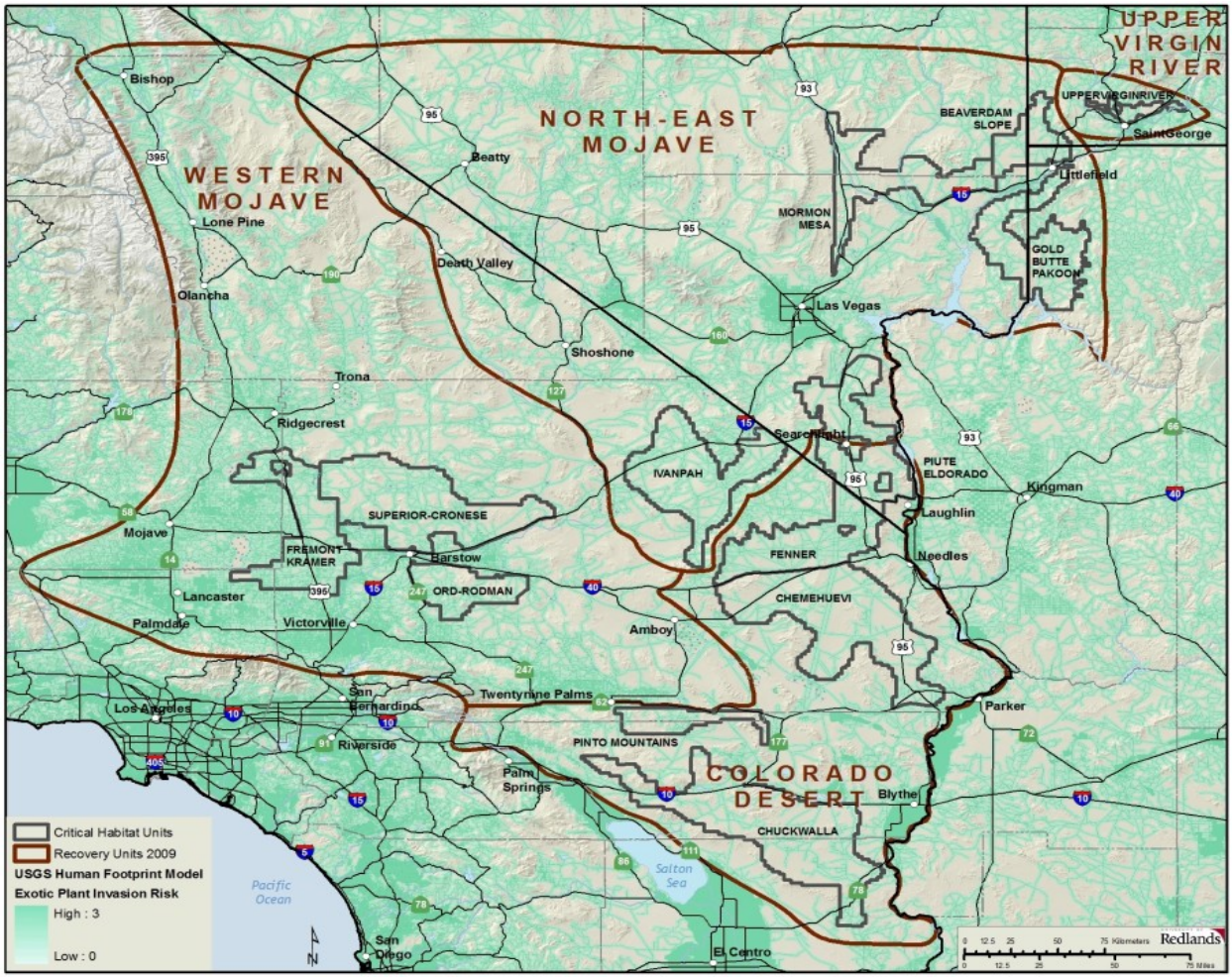
When determining whether a proposed action is likely to jeopardize the continued existence of a species, we are required to consider whether the action would "reasonably be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR 402.02). Although the Service does not explicitly address these metrics in the 5-year review, we have used the information in that document and more recent information to summarize the status of the desert tortoise with respect to its reproduction, numbers, and distribution.

<u>Reproduction</u>

In the 5-year review, the Service notes that desert tortoises increase their reproduction in high rainfall years; more rain provides desert tortoises with more high quality food (i.e., plants that are higher in water and protein), which, in turn, allows them to lay more eggs. Conversely, the physiological stress associated with foraging on food plants with insufficient water and nitrogen

may leave desert tortoises vulnerable to disease (Oftedal 2002 in Service 2010b), and the reproductive rate of diseased desert tortoises is likely lower than that of healthy animals. Young desert tortoises also rely upon high-quality, low-fiber plants (e.g., native annual plants) with nutrient levels not found in the invasive weeds that have increased in abundance across its range (Oftedal *et al*. 2002; Tracy *et al*. 2004). Compromised nutrition of young desert tortoises likely represents an effective reduction in reproduction by reducing the number of animals that reaches adulthood. Consequently, although we do not have quantitative data that show a direct relationship, the abundance of weedy species within the range of the desert tortoise has the potential to affect the reproduction of desert tortoises and recruitment into the adult population in a negative manner.

Various human activities have introduced numerous species of non-native invasive plants into the California desert. Routes that humans use to travel through the desert (paved and unpaved roads, railroads, motorcycle trials, etc.) serve as pathways for new species to enter habitat of the desert tortoise and for species that currently occur there to spread. Other disturbances of the desert substrate also provide invasive species with entry points into the desert. The following map depicts the potential for these species to invade habitat of the desert tortoise. The reproductive capacity of the desert tortoise may be compromised to some degree by the abundance and distribution of invasive weeds across its range; the continued increase in human access across the desert likely continues to facilitate the spread of weeds and further affect the reproductive capacity of the species.



Numbers

In the 5-year review, the Service discusses various means by which researchers have attempted to determine the abundance of desert tortoises and the strengths and weaknesses of those methods. Due to differences in area covered and especially to the non-representative nature of earlier sample sites, data gathered by the Service's current range-wide monitoring program cannot be reliably compared to information gathered through other means at this time.

Data from small-scale study plots (e.g., 1 square mile) established as early as 1976 and surveyed primarily through the mid-1990s indicate that localized population declines occurred at many sites across the desert tortoise's range, especially in the western Mojave Desert; spatial analyses of more widespread surveys also found evidence of relatively high mortality in some parts of the range (Tracy *et al*. 2004). Although population densities from the local study plots cannot be extrapolated to provide an estimate of the number of desert tortoises on a range wide basis, historical densities in some parts of the desert exceeded 100 adults in a square mile (Tracy *et al*. 2004). The Service (2010b) concluded that "appreciable declines at the

local level in many areas, which coupled with other survey results, suggest that declines may have occurred more broadly."

The range-wide monitoring that the Service initiated in 2001 is the first comprehensive attempt to determine the densities of desert tortoises in conservation areas across their range. The Desert Tortoise Recovery Office (Service 2015c) used annual density estimates obtained from this sampling effort to evaluate range-wide trends in the density of desert tortoises over time (All references to the density of desert tortoises are averages. Some areas support higher densities and some lower; desert tortoises are not distributed in uniform densities across large areas). This analysis indicates that densities in the Northeastern Mojave Recovery Unit have increased since 2004, with the increase apparently resulting from increased survival of adults and sub-adults moving into the adult size class. The analysis also indicates that the populations in the other four recovery units are declining; the following table depicts the estimated numbers of desert tortoises within conservation areas in each recovery unit and the rates of population change. Surveys did not include the steepest slopes in these desert tortoise conservation areas; however, the model developed by Nussear *et al*. (2009) generally rates steep slopes as less likely to support desert tortoises. Densities in the Joshua Tree and Piute Valley conservation areas within the Colorado Desert Recovery Unit seem to be increasing, although densities in the recovery unit as a whole continue to decline.

Recovery Units	**2004**	**2014**	**Change**	**Percentage of Change**
Western Mojave	35,777	17,644	-18,133	-51
Colorado Desert	67,087	42,770	-24,317	-36
Northeastern Mojave	4,920	18,220	+13,300	+270
Eastern Mojave	16,165	5,292	-10,873	-67
Upper Virgin River	2,397	1,760	-637	-27
Total	126,346	85,686	-40,660	-32

In the previous summary of the results of range-wide sampling (Service 2014c), we extrapolated the densities obtained within conservation areas (e.g., desert wildlife management area, Desert Tortoise Research Natural Area, Joshua Tree National Park) to all modeled habitat of the desert tortoise. This extrapolation may have exaggerated the number of desert tortoises because we applied the values for areas where densities are generally highest (i.e., the conservation areas) to areas where desert tortoises exist in very low densities (e.g., the Antelope Valley). We are also aware of a few areas where the density of desert tortoises outside of conservation areas is higher than inside.

To further examine the status of the desert tortoise over time with regard to numbers, we compared the density of desert tortoises in the Western Mojave Recovery Unit in 2014 (Service 2015c), which had historical densities that, in some parts of the desert, exceeded 100 adults in a square mile (Tracy *et al*. 2004). In 2014, desert tortoise conservation areas in the Western Mojave Recovery Unit supported 2.8 adult desert tortoises per square kilometer. We then converted this value to the density per square mile to allow for a direct comparison with historical densities

(1 square mile = ~2.6 square kilometers; 2.8/square kilometer = x/2.6 square kilometers; x = 2.6 x 2.8; x = 7.28). Therefore, the density of desert tortoises has declined to approximately 7.3 adults per square mile within conservation areas in the Western Mojave Recovery Unit as compared with historical densities in some parts of the desert of more than 100 per square mile. We are unaware of any areas where the density of large desert tortoises is close to 100 per square mile at this time.

Allison (2014) evaluated changes in size distribution of desert tortoises since 2001. In the Western Mojave and Colorado Desert recovery units, the relative number of juveniles to adults indicates that juvenile numbers are declining faster than adults. In the Eastern Mojave, the number of juvenile desert tortoises is also declining, but not as rapidly as the number of adults. In the Upper Virgin River Recovery Unit, trends in juvenile numbers are similar to those of adults; in the Northeastern Mojave Recovery Unit, the number of juveniles is increasing, but not as rapidly as are adult numbers in that recovery unit. Juvenile numbers, like adult densities, are responding in a directional way, with increasing, stable, or decreasing trends, depending on the recovery unit where they are found.

In this context, we consider "juvenile" desert tortoises to be animals smaller than 180 millimeters in length. The Service does not include juveniles detected during range-wide sampling in density estimations because they are more difficult to detect and surveyors frequently do not observe them during sampling. However, this systematic range-wide sampling provides us with an opportunity to compare the proportion of juveniles to adults observed between years.

Distribution

Prior to 1994, desert tortoises were extirpated from large areas within their distributional limits by urban and agricultural development (e.g., the cities of Barstow and Lancaster, California; Las Vegas, Nevada; and St. George, Utah; etc.; agricultural areas south of Edwards Air Force Base and east of Barstow), military training (e.g., Fort Irwin, Leach Lake Gunnery Range), and off-road vehicle use (e.g., portions of off-road management areas managed by the Bureau and unauthorized use in areas such as east of California City, California).

Since 1994, urban development around Las Vegas has likely been the largest contributor to habitat loss throughout the range. Desert tortoises have essentially been removed from the 18,197-acre southern expansion area at Fort Irwin (Service 2012b). The development of large solar facilities has also reduced the amount of habitat available to desert tortoises. No solar facilities have been developed within desert tortoise conservation areas, such as desert wildlife management areas, although such projects have occurred in areas that the Service considers important linkages between conservation areas (e.g., Silver State South Project in Nevada).

The following table depicts acreages of habitat (as modeled by Nussear *et al*. 2009, using only areas with a probability of occupancy by desert tortoises greater than 0.5 as potential habitat) within the recovery units of the desert tortoise and of impervious surfaces as of 2006 (Fry *et al*. 2011); calculations are by Darst (2014). Impervious surfaces include paved and developed

areas and other disturbed areas that have zero probability of supporting desert tortoises. All units are in acres.

Recovery Units	Modeled Habitat	Impervious Surfaces (percentage)	Remaining Modeled Habitat
Western Mojave	7,585,312	1,989,843 (26)	5,595,469
Colorado Desert	4,950,225	510,862 (10)	4,439,363
Northeastern Mojave	3,012,293	386,182 (13)	2,626,111
Eastern Mojave	4,763,123	825,274 (17)	3,937,849
Upper Virgin River	231,460	84,404 (36)	147,056
Total	20,542,413	3,796,565 (18)	16,745,848

The Service (2010b) concluded, in its 5-year review, that the distribution of the desert tortoise has not changed substantially since the publication of the original recovery plan in 1994 in terms of the overall extent of its range. Since 2010, we again conclude that the species' distribution has not changed substantially in terms of the overall extent of its range, although desert tortoises have been removed from several thousand acres because of solar development and military activities.

Status of Critical Habitat of the Desert Tortoise

The Service designated critical habitat for the desert tortoise in portions of California, Nevada, Arizona, and Utah in a final rule published February 8, 1994 (59 FR 5820). The Service designates critical habitat to identify the key biological and physical needs of the species and key areas for recovery and to focus conservation actions on those areas. Critical habitat is composed of specific geographic areas that contain the biological and physical features essential to the species' conservation and that may require special management considerations or protection. These features, which include space, food, water, nutrition, cover, shelter, reproductive sites, and special habitats, are called the physical and biological features of critical habitat. The specific physical and biological features of desert tortoise critical habitat are: sufficient space to support viable populations within each of the six recovery units and to provide for movement, dispersal, and gene flow; sufficient quality and quantity of forage species and the proper soil conditions to provide for the growth of these species; suitable substrates for burrowing, nesting, and overwintering; burrows, caliche caves, and other shelter sites; sufficient vegetation for shelter from temperature extremes and predators; and habitat protected from disturbance and human-caused mortality.

Critical habitat of the desert tortoise would not be able to fulfill its conservation role without each of the physical and biological features being functional. As examples, critical habitat would not function properly if a sufficient amount of forage species were present but human-caused mortality was excessive; an area with sufficient space to support viable populations within each of the six recovery units and to provide for movement, dispersal, and gene flow would not function properly without adequate forage species.

The final rule for designation of critical habitat did not explicitly ascribe specific conservation roles or functions to the various critical habitat units. Rather, it refers to the strategy of establishing recovery units and desert wildlife management areas recommended by the recovery plan for the desert tortoise, which had been published as a draft at the time of the designation of critical habitat, to capture the "biotic and abiotic variability found in desert tortoise habitat" (59 FR 5820, see page 5823). Specifically, we designated the critical habitat units to follow the direction provided by the draft recovery plan (Service 1993) for the establishment of desert wildlife management areas. The critical habitat units in aggregate are intended to protect the variability that occurs across the large range of the desert tortoise; the loss of any specific unit would compromise the ability of critical habitat as a whole to serve its intended function and conservation role.

Despite the fact that desert tortoises do not necessarily need to move between critical habitat units to complete their life histories, both the original and revised recovery plans discuss the importance of these critical habitat units and connectivity between them for the recovery of the species. Although it determined that linkages between critical habitat units did not meet the definition of critical habitat, the Service (1994) recommended the identification of buffer zones and linkages for smaller desert tortoise conservation areas to aid in overall recovery efforts; however, land management agencies have generally not established such areas.

We did not designate the Desert Tortoise Natural Area and Joshua Tree National Park in California and the Desert National Wildlife Refuge in Nevada as critical habitat because they are "primarily managed as natural ecosystems" (59 FR 5820, see page 5825) and provide adequate protection to desert tortoises. Since the designation of critical habitat, Congress increased the size of Joshua Tree National Park and created the Mojave National Preserve. A portion of the expanded boundary of Joshua Tree National Park lies within critical habitat of the desert tortoise; portions of other critical habitat units lie within the boundaries of the Mojave National Preserve.

Within each critical habitat unit, both natural and anthropogenic factors affect the function of the physical and biological features of critical habitat. As an example of a natural factor, in some specific areas within the boundaries of critical habitat, such as within and adjacent to dry lakes, some of the physical and biological features are naturally absent because the substrate is extremely salty; desert tortoises do not normally reside in such areas. Comparing the acreage of desert tortoise habitat as depicted by Nussear *et al*.'s (2009) model to the gross acreage of the critical habitat units demonstrates quantitatively that the entire area within the boundaries of critical habitat likely does not support the physical and biological features. In the following table, the acreage for modeled habitat is for the area in which the probability that desert tortoises are present is greater than 0.5. The acreages of modeled habitat do not include loss of habitat due to human-caused impacts. The difference between gross acreage and modeled habitat is 653,214 acres; that is, approximately 10 percent of the gross acreage of the designated critical habitat is not considered modeled habitat. All units are acres.

Critical Habitat Unit	Gross Acreage	Modeled Habitat
Superior-Cronese	766,900	724,967
Fremont-Kramer	518,000	501,095
Ord-Rodman	253,200	184,155
Pinto Mountain	171,700	144,056
Piute-Eldorado	970,600	930,008
Ivanpah Valley	632,400	510,711
Chuckwalla	1,020,600	809,319
Chemehuevi	937,400	914,505
Gold Butte-Pakoon	488,300	418,189
Mormon Mesa	427,900	407,041
Beaver Dam Slope	204,600	202,499
Upper Virgin River	54,600	46,441
Totals	6,446,200	5,792,986

Human activities can have obvious or more subtle effects on the physical and biological features. The grading of an area and subsequent construction of a building removes the physical and biological features of critical habitat; this action has an obvious effect on critical habitat. The revised recovery plan identifies human activities such as urbanization and the proliferation of roads and highways as threats to the desert tortoise and its habitat; these threats are examples of activities that have a clear effect on the physical and biological features of critical habitat.

Condition of the Physical and Biological Features of Critical Habitat

We have included the following paragraphs from the revised recovery plan for the desert tortoise (Service 2011b) to demonstrate that other anthropogenic factors affect the physical and biological features of critical habitat in more subtle ways. All references are in the revised recovery plan (i.e., in Service 2011b); we have omitted some information from the revised recovery plan where the level of detail was unnecessary for the current discussion.

> Surface disturbance from [off-highway vehicle] activity can cause erosion and large amounts of dust to be discharged into the air. Recent studies on surface dust impacts on gas exchanges in Mojave Desert shrubs showed that plants encrusted by dust have reduced photosynthesis and decreased water-use efficiency, which may decrease primary production during seasons when photosynthesis occurs (Sharifi *et al*. 1997). Sharifi *et al*. (1997) also showed reduction in maximum leaf conductance, transpiration, and water-use efficiency due to dust. Leaf and stem temperatures were also shown to be higher in plants with leaf-surface dust. These effects may also impact desert annuals, an important food source for [desert] tortoises.
>
> [Off-highway vehicle] activity can also disturb fragile cyanobacterial-lichen soil crusts, a dominant source of nitrogen in desert ecosystems (Belnap 1996). Belnap (1996) showed that anthropogenic surface disturbances may have serious implications for nitrogen budgets in cold desert ecosystems, and this may also hold true for the hot deserts that [desert] tortoises

> occupy. Soil crusts also appear to be an important source of water for plants, as crusts were shown to have 53 percent greater volumetric water content than bare soils during the late fall when winter annuals are becoming established (DeFalco *et al*. 2001). DeFalco *et al*. (2001) found that non-native plant species comprised greater shoot biomass on crusted soils than native species, which demonstrates their ability to exploit available nutrient and water resources. Once the soil crusts are disturbed, non-native plants may colonize, become established, and out-compete native perennial and annual plant species (D'Antonio and Vitousek 1992; DeFalco *et al*. 2001). Invasion of non-native plants can affect the quality and quantity of plant foods available to desert tortoises. Increased presence of invasive plants can also contribute to increased fire frequency.
>
> Proliferation of invasive plants is increasing in the Mojave and Sonoran deserts and is recognized as a substantial threat to desert tortoise habitat. Many species of non-native plants from Europe and Asia have become common to abundant in some areas, particularly where disturbance has occurred and is ongoing. As non-native plant species become established, native perennial and annual plant species may decrease, diminish, or die out (D'Antonio and Vitousek 1992). Land managers and field scientists identified 116 species of non-native plants in the Mojave and Colorado deserts (Brooks and Esque 2002).
>
> Increased levels of atmospheric pollution and nitrogen deposition related to increased human presence and combustion of fossil fuels can cause increased levels of soil nitrogen, which in turn may result in significant changes in plant communities (Aber *et al*. 1989). Many of the non-native annual plant taxa in the Mojave region evolved in more fertile Mediterranean regions and benefit from increased levels of soil nitrogen, which gives them a competitive edge over native annuals. Studies at three sites within the central, southern, and western Mojave Desert indicated that increased levels of soil nitrogen can increase the dominance of non-native annual plants and promote the invasion of new species in desert regions. Furthermore, increased dominance by non-native annuals may decrease the diversity of native annual plants, and increased biomass of non-native annual grasses may increase fire frequency (Brooks 2003).

This summary from the revised recovery plan (Service 2011b) demonstrates how the effects of human activities on habitat of the desert tortoise are interconnected. In general, surface disturbance causes increased rates of erosion and generation of dust. Increased erosion alters additional habitat outside of the area directly affected by altering the nature of the substrate, removing shrubs, and possibly destroying burrows and other shelter sites. Increased dust affects photosynthesis in the plants that provide cover and forage to desert tortoises. Disturbed substrates and increased atmospheric nitrogen enhance the likelihood that invasive species will become established and out-compete native species; the proliferation of weedy species increases the risk of large-scale fires, which further move habitat conditions away from those that are favorable to desert tortoises.

The following paragraphs generally describe how the threats described in the revised recovery plan affect the physical and biological features of critical habitat of the desert tortoise.

Sufficient space to support viable populations within each of the six recovery units and to provide for movement, dispersal, and gene flow.

Urban and agricultural development, concentrated use by off-road vehicles, and other activities such as development of transmission lines and pipelines completely remove habitat. Although we are aware of local areas within the boundaries of critical habitat that have been heavily disturbed, we do not know of any areas that have been disturbed to the intensity and extent that the function of this physical and biological feature has been compromised. To date, the largest single loss of critical habitat is the use of 18,197 acres of additional training land in the southern portion of Fort Irwin.

The widening of existing freeways likely caused the second largest loss of critical habitat. Despite these losses of critical habitat, which occur in a linear manner, the critical habitat units continue to support sufficient space to support viable populations within each of the six recovery units.

In some cases, major roads likely disrupt the movement, dispersal, and gene flow of desert tortoises. State Route 58 and Highway 395 in the Fremont-Kramer Critical Habitat Unit, Fort Irwin Road in the Superior-Cronese Critical Habitat Unit, and Interstate 10 in the Chuckwalla Critical Habitat Unit are examples of large and heavily travelled roads that likely disrupt movement, dispersal, and gene flow. Roads that have been fenced and provided with underpasses may alleviate this fragmentation to some degree; however, such facilities have not been in place for sufficient time to determine whether they will eliminate fragmentation.

The threats of invasive plant species described in the revised recovery plan generally do not result in the removal of this physical and biological feature because they do not convert habitat into impervious surfaces, as would urban development.

Sufficient quality and quantity of forage species and the proper soil conditions to provide for the growth of these species.

This physical and biological feature addresses the ability of critical habitat to provide adequate nutrition to desert tortoises. As described in the revised recovery plan and 5-year review, grazing, historical fire, invasive plants, altered hydrology, drought, wildfire potential, fugitive dust, and climate change/temperature extremes contribute to the stress of “nutritional compromise.” Paved and unpaved roads through critical habitat of the desert tortoise provide avenues by which invasive native species disperse; these legal routes also provide the means by which unauthorized use occurs over large areas of critical habitat. Nitrogen deposition from atmospheric pollution likely occurs throughout all the critical habitat units and exacerbates the effects of the disturbance of substrates. Because paved and unpaved roads are so widespread through critical habitat, this threat has compromised the conservation value and function of critical habitat throughout the range of the desert tortoise, to some degree. See the Status of the Desert Tortoise section of this biological opinion for a map that depicts the routes by which

invasive weeds have access to critical habitat; the routes shown on the map are a subset of the actual number of routes that actually cross critical habitat of the desert tortoise.

Suitable substrates for burrowing, nesting, and overwintering.

Surface disturbance, motor vehicles traveling off route, use of off-highway vehicles management areas, off-highway vehicles events, unpaved roads, grazing, historical fire, wildfire potential, altered hydrology, and climate change leading to shifts in habitat composition and location, storms, and flooding can alter substrates to the extent that they are no longer suitable for burrowing, nesting, and overwintering. Erosion caused by these activities can alter washes to the extent that desert tortoise burrows placed along the edge of a wash, which is a preferred location for burrows, could be destroyed. We expect that the area within critical habitat that is affected by off-road vehicle use to the extent that substrates are no longer suitable is relatively small in relation to the area that desert tortoises have available for burrowing, nesting, and overwintering; consequently, off-road vehicle use has not had a substantial effect on this physical and biological feature.

Most livestock allotments have been eliminated from within the boundaries of critical habitat. Of those that remain, livestock would compact substrates to the extent that they would become unsuitable for burrowing, nesting, and overwintering only in areas of concentrated use, such as around watering areas and corrals. Because livestock grazing occurs over a relatively small portion of critical habitat and the substrates in most areas within livestock allotments would not be substantially affected, suitable substrates for burrowing, nesting, and overwintering remain throughout most of the critical habitat units.

Burrows, caliche caves, and other shelter sites.

Human-caused effects to burrows, caliche caves, and other shelter sites likely occur at a similar rate as effects to substrates for burrowing, nesting, and overwintering for the same general reasons. Consequently, sufficient burrows, caliche caves, and other shelter sites remain in the critical habitat units.

Sufficient vegetation for shelter from temperature extremes and predators.

In general, sufficient vegetation for shelter from temperature extremes and predators remains throughout critical habitat. In areas where large fires have occurred in critical habitat, many of the shrubs that provide shelter from temperature extremes and predators have been destroyed; in such areas, cover sites may be a limiting factor. The proliferation of invasive plants poses a threat to shrub cover throughout critical habitat as the potential for larger and more frequent wildfires increases.

In 2005, wildfires in Nevada, Utah, and Arizona burned extensive areas of critical habitat (Service 2010b). Although different agencies report slightly different acreages, the following table provides an indication of the scale of the fires.

Critical Habitat Unit	Total Area Burned (acres)	Percent of the Critical Habitat Unit Burned
Beaver Dam Slope	53,528	26
Gold-Butte Pakoon	65,339	13
Mormon Mesa	12,952	3
Upper Virgin River	10,557	19

The revised recovery plan notes that the fires caused statistically significant losses of perennial plant cover, although patches of unburned shrubs remained. Drake *et al*. (2015) noted that the production of annual plants was 10 times greater in burned areas compared to unburned areas; however, non-native plants, such as red brome (*Bromus madritensis* subsp. *rubens*), dominated the burned areas. Desert tortoises continued to use the dead branches of shrubs, such as creosote (*Larrea tridentata*) and white bursage (*Ambrosia dumosa*). Their use of burrows was similar in burned and unburned areas (Drake *et al*. 2015). We cannot quantify precisely the extent to which these fires disrupted the function and value of the critical habitat, given the patchiness with which the physical and biological features of critical habitat are distributed across the critical habitat units and the varying intensity of the wildfires. The work by Drake *et al*. (2015) demonstrates that the physical and biological features within burned areas retain at least some of their value for the conservation of desert tortoises but conclude that "burned habitat may take years to recover sufficiently to fully support (desert) tortoise populations."

Habitat protected from disturbance and human-caused mortality.

In general, the Federal agencies that manage lands within the boundaries of critical habitat have adopted land management plans that include implementation of some or all of the recommendations contained in the original recovery plan for the desert tortoise (see pages 70 to 72 of Service 2010b). To at least some degree, the adoption of these plans has resulted in the implementation of management actions that are likely to reduce the disturbance and human-caused mortality of desert tortoises. For example, these plans resulted in the designation of open routes of travel and the closure (and, in some cases, physical closure) of unauthorized routes. Numerous livestock allotments have been relinquished by the permittees and cattle no longer graze these allotments. Because of these planning efforts, the Bureau has proposed the withdrawal of some areas of critical habitat from mineral entry (79 FR 51190; the withdrawal of 10,094.03 acres of public lands within the Superior-Cronese Critical Habitat Unit). Because of actions on the part of various agencies, many miles of highways and other paved roads have been fenced to prevent desert tortoises from wandering into traffic and being killed. The Service and other agencies of the Desert Managers Group in California are implementing a plan to remove common ravens that prey on desert tortoises and to undertake other actions that would reduce subsidies (i.e., food, water, sites for nesting, roosting, and perching, etc.) that facilitate their abundance in the California Desert (Service 2008).

Despite the implementation of these actions, disturbance and human-caused mortality continue to occur in many areas of critical habitat (which overlap the desert wildlife management areas for the most part and are the management units for which most data are collected) to the extent that

the conservation value and function of critical habitat is, to some degree, compromised. For example, many highways and other paved roads in California remain unfenced. Hughson and Darby (2011) noted that as many as 10 desert tortoises are reported killed annually on paved roads within Mojave National Preserve. Because carcasses on roads are quickly removed by scavengers or destroyed by other vehicles, we expect that far more desert tortoises are killed on roads than are reported.

Unauthorized off-road vehicle use continues to disturb habitat and result in loss of vegetation within the boundaries of critical habitat (e.g., Coolgardie Mesa in the Western Mojave Recovery Unit); although we have not documented the death of desert tortoises as a direct result of this activity, it likely occurs. Additionally, the habitat disturbance caused by this unauthorized activity exacerbates the spread of invasive plants, which displace native plants that are important forage for the desert tortoise, thereby increasing the physiological stress faced by desert tortoises.

Finally, the Bureau has not allowed the development of solar power plants on public lands within the boundaries of its desert wildlife management areas (which largely correspond to the boundaries of critical habitat). Conversely, the County of San Bernardino is considering the approval of the construction and operation of at least two such facilities within the boundaries of the Superior-Cronese Critical Habitat Unit north of Interstate 15 near the Minneola Road exit.

Summary of the Status of Critical Habitat of the Desert Tortoise

As noted in the 5-year review and revised recovery plan for the desert tortoise (Service 2010b, 2011b), critical habitat of the desert tortoise is subject to landscape-level impacts in addition to the site-specific effects of individual human activities. On the landscape level, atmospheric pollution is increasing the level of nitrogen in desert substrates; the increased nitrogen exacerbates the spread of invasive plants, which outcompete the native plants necessary for desert tortoises to survive. As invasive plants increase in abundance, the threat of large wildfires increases; wildfires have the potential to convert the shrubland-native annual plant communities upon which desert tortoises depend to a community with fewer shrubs and more invasive plants. In such a community, shelter and forage would be more difficult for desert tortoises to find.

Invasive plants have already compromised the conservation value and function of critical habitat to some degree with regard to the second physical and biological feature (i.e., sufficient quality and quantity of forage species and the proper soil conditions to provide for the growth of these species). These effects likely extend to the entirety of critical habitat; given the numerous routes by which invasive plants can access critical habitat and the large spatial extent that is subject to nitrogen from atmospheric pollution.

Critical habitat has been compromised to some degree with regard to the last physical and biological feature (i.e., habitat protected from disturbance and human-caused mortality) as a result of the wide variety of human activities that continues to occur within its boundaries. These effects result from the implementation of discrete human activities and are thus more site-specific in nature.

Although the remaining physical and biological features have been affected to some degree by human activities, these impacts have not, to date, substantially compromised the conservation value and function of the critical habitat units. We have reached this conclusion primarily because the effects are localized and thus do not affect the conservation value and function of large areas of critical habitat.

Land managers have undertaken actions to improve the status of critical habitat. For example, as part of its efforts to offset the effects of the use of additional training maneuver lands at Fort Irwin (Service 2004), the Department of the Army acquired the private interests in the Harper Lake and Cronese Lakes allotments, which are located within critical habitat in the Western Mojave Recovery Unit; as a result, cattle have been removed from these allotments. Livestock have been removed from numerous other allotments through various means throughout the range of the desert tortoise. The retirement of allotments assists in the recovery of the species by eliminating disturbance to the physical and biological features of critical habitat by cattle and range improvements.

ENVIROMENTAL BASELINE FOR THE DESERT TORTOISE AND ITS CRITICAL HABITAT

The implementing regulations for section 7(a)(2) of the Endangered Species Act define the environmental baseline as “the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process’ (50 CFR402.02). The environmental baseline comprises the existing conditions of the species and its critical habitat to which we add the effects of the proposed action to assess whether the proposed action is likely to jeopardize the continued existence of the species or result in the destruction or adverse modification of its critical habitat (50 CFR402).

The Status of the Desert Tortoise and its Critical Habitat section of this biological opinion provided an overview of the status of the species and its critical habitat range-wide. Although the action area for this biological opinion includes all desert tortoise habitat on lands managed by the Bureau in the plan area, this environmental baseline section will focus on the status of the desert tortoise and its critical habitat within the development focus areas. We have limited our discussion of the environmental baseline for the desert tortoise and its critical habitat to the development focus areas because the proposed land use plan amendment would streamline the development of renewable energy facilities only in these areas. Also, as we discussed previously in this biological opinion, the proposed land use plan amendment would result in beneficial or neutral effects to listed species with regard to all of the Bureau’s other activities.

Previous Consultations in the Action Area

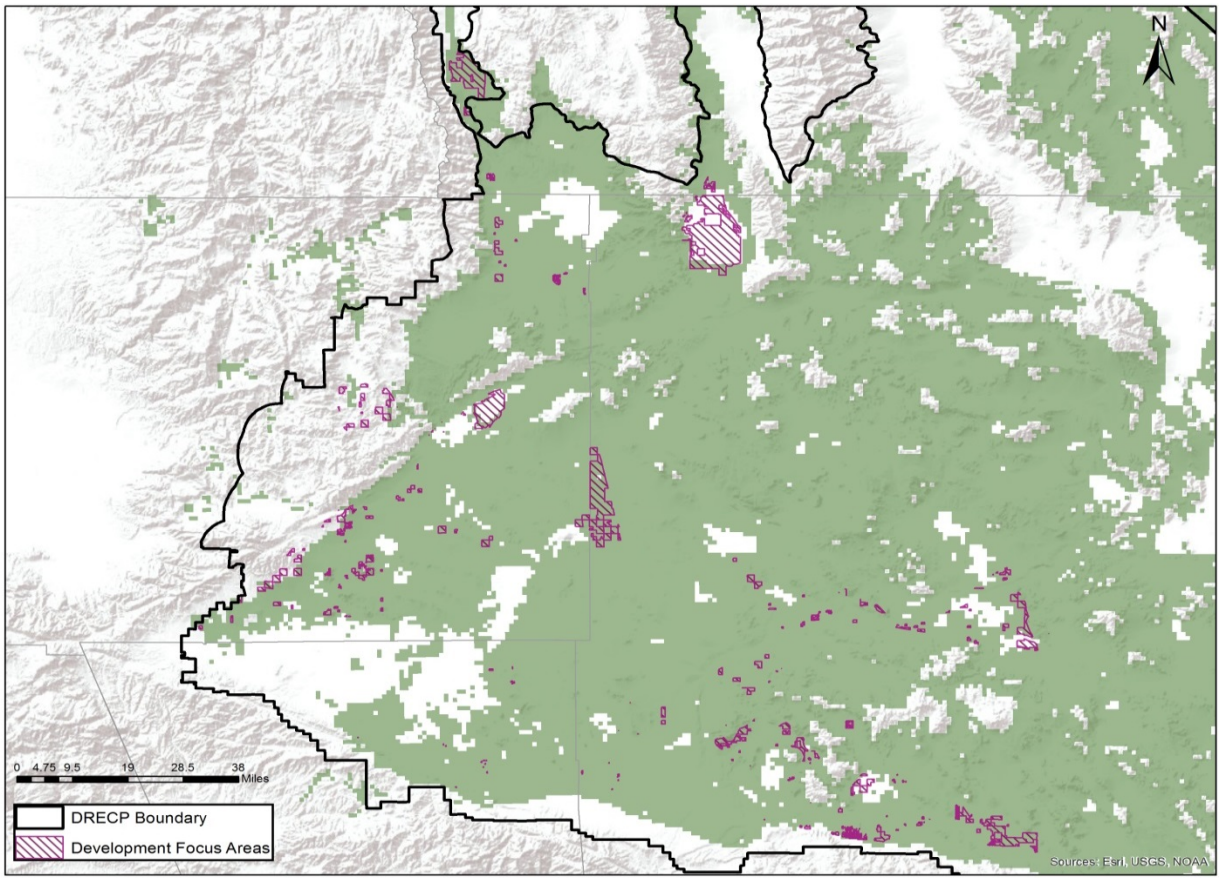
The biological opinions for the Bureau’s previous land use plan amendments are the most pertinent consultations regarding the desert tortoise that we have conducted within the action

area. We have described those biological opinions in the Consultation History section of this biological opinion.

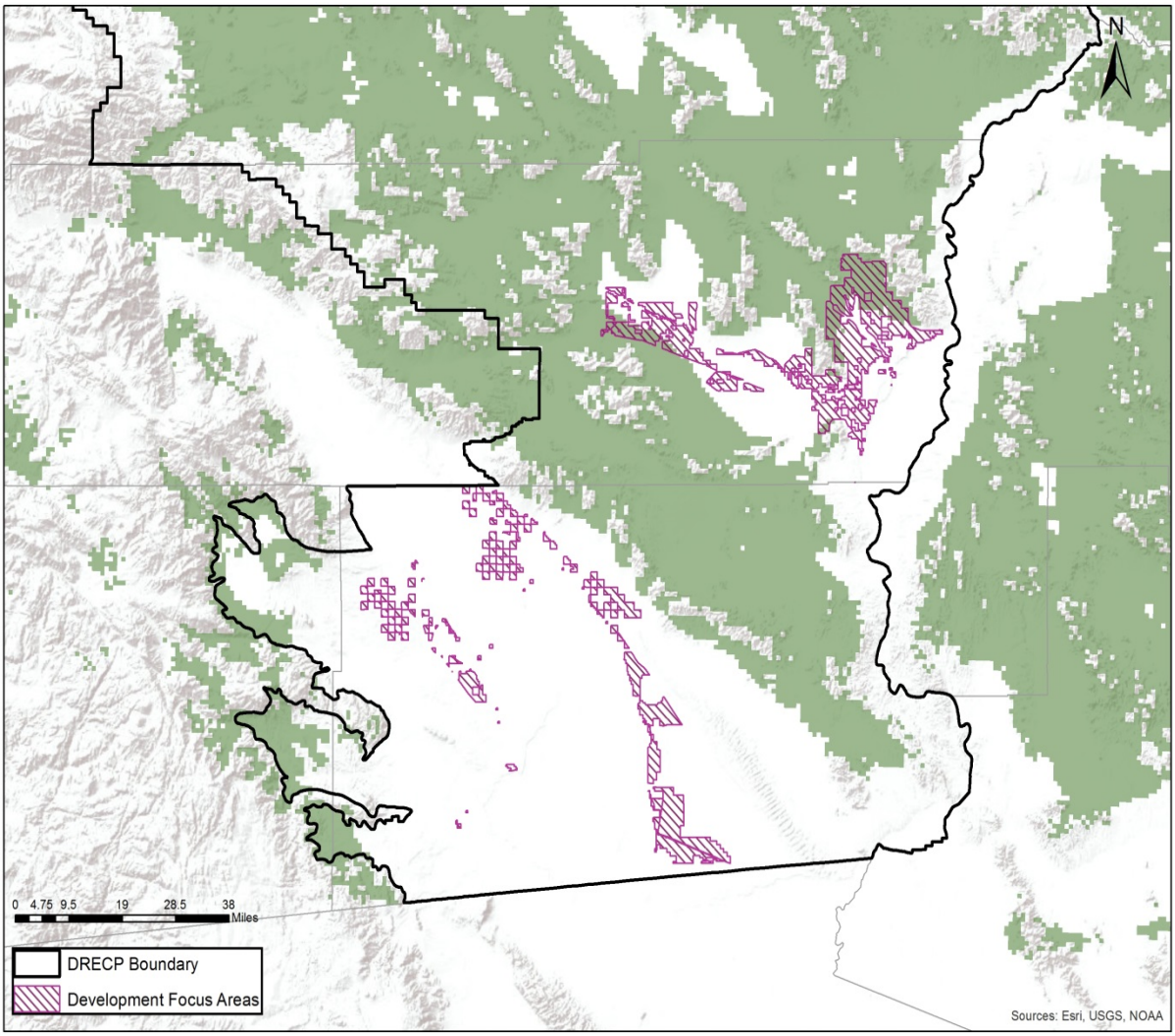
We have also issued several biological opinions for renewable energy facilities in the action area. The Status of the Desert Tortoise section of this biological opinion contains some discussion of those facilities; Appendix 1 contains summary information regarding the solar facilities on which the Service has consulted.

Status of the Desert Tortoise in the Action Area

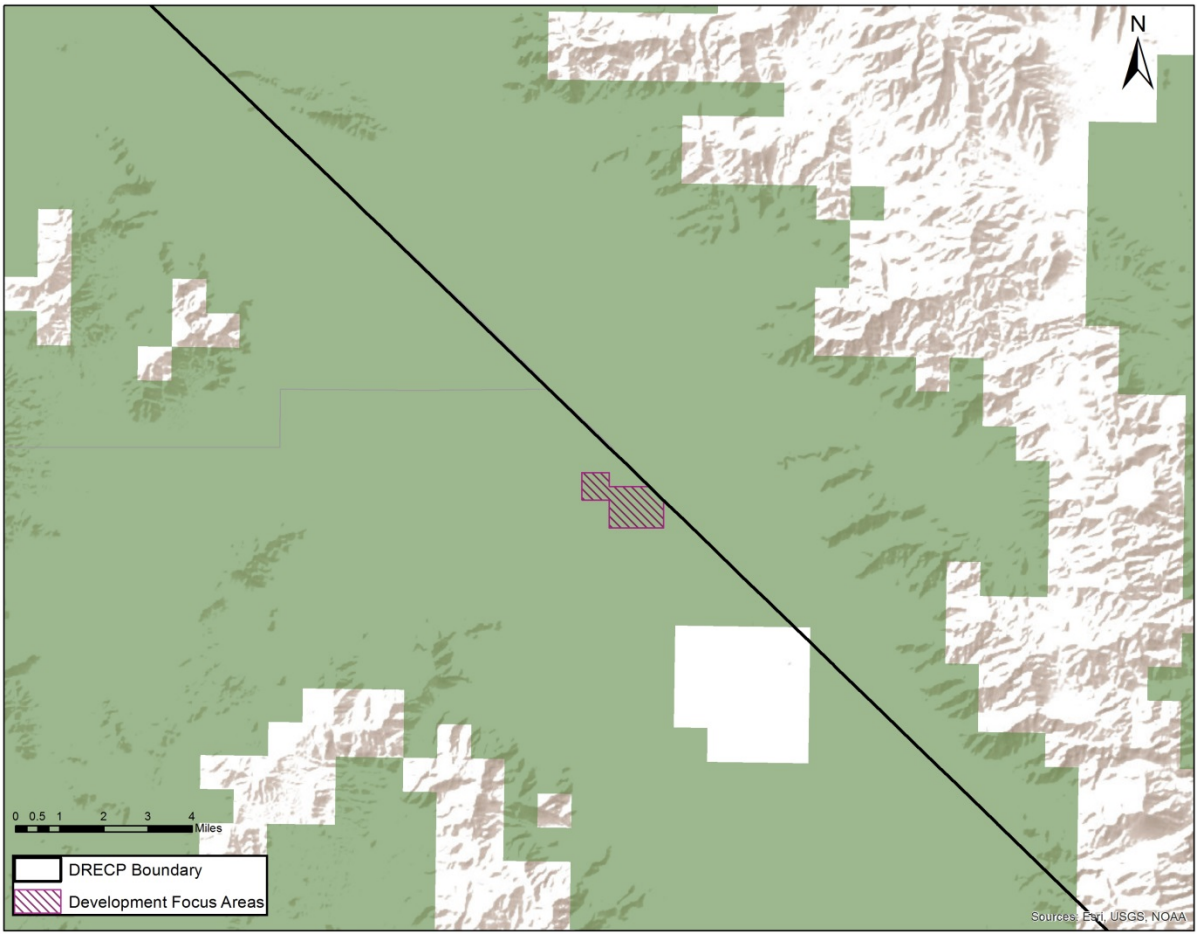
In the following paragraphs, we have provided a brief summary of the status of the desert tortoise in the development focus areas in each ecoregion. The Service has not conducted range-wide sampling within the development focus areas because none of them are within conservation areas for the desert tortoise. Applying densities from conservation areas to nearby development focus areas would greatly overestimate the abundance of desert tortoises in those areas. Instead, we have relied on information from a variety of sources, including our own experience, in the following discussion. We also overlaid the development focus areas on a map that predicts potential habitat for the desert tortoise with a threshold of 0.5 or greater value. See the Status of the Desert Tortoise section of this biological opinion for a description of the habitat model developed by Nussear *et al*. (2009). We will refer to this model as the "habitat model" hereafter in this section. Table R.IV.7 in Appendix R of the final environmental impact statement (Bureau 2015c), which we summarize in the Effects of the Action on the Desert Tortoise and Its Critical Habitat – Loss and Degradation of Habitat section of this biological opinion, depicts the acreage of desert tortoise habitat (using a slightly different model than Nussear *et al*. 2009).
The following maps depict all of the development focus areas overlaid on potential habitat for the desert tortoise with a threshold of 0.5 or greater value (as modeled by Nussear *et al*. 2009). We include only the portions of the action area where development focus areas are located to increase their visibility. The first map depicts development focus areas in the western portion of the planning area.


N
0 4.75 9.5 19 28.5 38
Miles
DRECP Boundary
Development Focus Areas
Sources: Esri, USGS, NOAA

The following map depicts development focus areas in the southern portion of the planning area.



The following map depicts development focus areas in the northeastern portion of the planning area.



Cadiz Valley and Chocolate Mountains

The Bureau has proposed development focus areas only in subunit 2 of the Cadiz Valley and Chocolate Mountains Ecoregion. We expect that few desert tortoises occur in this subunit because of the results of surveys conducted nearby. For example, to date, approximately 19,937 acres have been cleared of desert tortoises in preparation for the development of solar facilities in or adjacent to subunit 2. Eight desert tortoises were found during the surveys. In comparison, surveyors found 152 desert tortoises on the 2,427-acre site of the Silver State South Project. The table in Appendix 1 lists the number of desert tortoises found within the boundaries of numerous solar projects and the sources of that information. Additionally, the habitat model predicts that most of this subunit is unlikely to support desert tortoises.

Imperial and Borrego Valley

The Bureau has proposed development focus areas in subunits 1 and 2 of the Imperial and Borrego Valley Ecoregion. The development focus areas in subunit 1 are west of the Salton Sea. The habitat model predicts that relatively small areas of subunit 1 have a low potential to support desert tortoises. The Service (2010b) did not include this area within the range of the desert tortoise in its 5-year review; see Figure 2 in the 5-year review. We are aware that desert tortoises are occasionally found in the canyons to the west of Palm Springs and that desert tortoises were released in an area between the Salton Sea and Anza Borrego Desert State Park many years ago. We expect that few desert tortoises occur in subunit 1.

The development focus areas in subunit 2 extend from the vicinity of Interstate 8 in the south to the Riverside-Imperial County line in the north. Service staff have conducted numerous surveys for sensitive wildlife and plants along the All American and East Highline Canals in the southern portion of this subunit, which lies to the east of the Salton Sea and farmland in Imperial County; we did not detect any evidence of desert tortoises. The habitat model depicts the probability of detecting desert tortoises in this area as zero. We expect few, if any, desert tortoises in this portion of subunit 2.

Desert tortoises are more likely to be present in the more northerly development focus areas, closer to Riverside County. We do not expect that desert tortoises would occupy development focus areas near the Salton Sea; we expect that they reside in the foothills of the Chocolate Mountains to the east of the Salton Sea. The predictions of the habitat model match our expectations. We expect few desert tortoises in the development focus areas of subunit 2.

Kingston and Funeral Mountains

The development focus area in the Kingston and Funeral Mountains Ecoregion would cover approximately 104 acres; it is located on the border between California and Nevada. The development focus area is adjacent to the community of Sandy Valley, Nevada. It is a rural community; the remaining intact habitat is dominated by the dry lake and salt brush (Ahrens 2015). The habitat model depicts the probability of detecting desert tortoises in this area as zero. We expect few, if any, desert tortoises in this development focus area.

Mojave and Silurian Valley

The Bureau has proposed development focus areas in subunit 1 of the Mojave and Silurian Valley Ecoregion that comprise several scattered, small parcels. The parcels in the western portion of this subunit may support a few desert tortoises because of the presence of suitable habitat. We have also received anecdotal reports of desert tortoises from this area and observed a few individuals; although desert tortoises persist here, its proximity to the City of Barstow and neighboring communities likely has reduced their abundance. The habitat model predicts that desert tortoises are likely to be found in this area. Overall, we expect that few desert tortoises occur in subunit 1.

Owens River Valley

This development focus area straddles Highway 395 south of Olancha. To the best of our knowledge, desert tortoises have not been detected in the Owens River Valley Ecoregion during protocol surveys. However, workers in the area occasionally report observations of desert tortoises. The habitat model predicts that desert tortoises are likely to be found in this area, which is at or near the northern limit of the range of the species in this portion of the desert. We expect that the development focus area in this ecoregion supports desert tortoises in low densities.

Panamint Death Valley

The development focus area within the Panamint Death Valley Ecoregion lies primarily on Searles Dry Lake. Generally, desert tortoises may occasionally cross dry lake beds but do not reside within them; however, Searles Dry Lake is highly developed for the extraction of minerals. We do not expect desert tortoises to occur on Searles Dry Lake. Nussear *et al*. (2009) seem to have excluded the lake bed from their modeling.

The development focus area extends slightly into habitat surrounding the lake bed. Desert tortoises are generally less abundant adjacent to dry lake beds, probably because of the silty substrate and a greater potential for flooding. Desert tortoises may occur at the outer edges of this development focus area in very low numbers.

Pinto Lucerne Valley and Eastern Slopes

Only subunit 1 of the Pinto Lucerne Valley and Eastern Slopes Ecoregion contains development focus areas. They comprise scattered, small parcels. Several are located near the cities of Victorville and Adelanto; most of the others are within or adjacent to the community of Lucerne Valley. The proximity of these development focus areas to urban localities has exposed them to numerous indirect effects (e.g., feral dogs, subsidized native predators, unauthorized off-highway vehicle activity). These effects have greatly reduced the density of desert tortoises (Boarman 2002). Additionally, areas adjacent to Lucerne Dry Lake likely do not provide suitable habitat. We occasionally receive reports of desert tortoises in this area. The habitat model predicts that desert tortoises are likely to occur in this subunit; however, the model does not account for anthropogenic effects. We expect few desert tortoises to occur in this subunit.

Piute Valley and Sacramento Mountains

The Piute Valley and Sacramento Mountains Ecoregion does not include a development focus area.

Providence and Bullion Mountains

The development focus areas in subunit 1 of the Providence and Bullion Mountains Ecoregion comprise several scattered, small parcels, generally located at the east edge of the Mojave River

Valley. We expect that the flatter, more western parcels are too sandy to support desert tortoises; the eastern parcels, which border the foothills of the adjacent mountains, likely provide habitat. The habitat model predicts this area is likely to support desert tortoises. We are unaware of reports of desert tortoises from these parcels or the vicinity.

West Mojave and Eastern Slopes

Subunit 1 of the West Mojave and Eastern Slopes Ecoregion encompasses the area east of Searles Dry Lake to the eastern slopes of the southern Sierra Nevada and includes several scattered, small parcels. Several of the parcels are located adjacent to the city Ridgecrest; the indirect effects of the urban area have likely extirpated desert tortoises from these parcels. Additionally, we have reviewed several reports regarding surveys for desert tortoises that were conducted for local activities; none have indicated that desert tortoises are present.

The habitat model predicts that desert tortoises are likely to occur in this subunit; however, the model does not account for anthropogenic effects. We expect that the development focus areas in subunit 1 support few desert tortoises.

Subunit 2 is generally bordered by the southern slopes of the Tehachapi Mountains, the Kern/San Bernardino County line, and the Kern/Los Angeles County line. The development focus areas proposed by the Bureau in this subunit are scattered through this area and are of various sizes. The largest development focus area is centered on Koehn Dry Lake, which lies to the north of the Desert Tortoise Research Natural Area. As we have discussed previously, dry lake beds do not support desert tortoises; few, if any, individuals reside at their margins. We are aware of at least one survey in this area (for the Fremont Valley Preservation Project; Service 2013d); one desert tortoise was detected on approximately 4,800 acres on several parcels in the vicinity of this development focus area. Nussear *et al*. (2009) seem to have excluded the lake bed from their modeling; the habitat model predicted that areas surrounding the dry lake bed are likely to support desert tortoises.

The development focus areas to the west of Koehn Dry Lake are located within the Tehachapi Mountains and are not within the range of the desert tortoise.

Numerous parcels that the Bureau has proposed as development focus areas lie south of State Route 58 and west of Highway 14. Based on numerous surveys that project proponents have conducted in the past 10 years, we are aware that the westernmost areas along the Tehachapi Mountains do not support desert tortoises; desert tortoises are present in low numbers in the eastern foothills of the Tehachapi Mountains. They seem to be less abundant in the flatter terrain between the foothills and the town of Mojave and in the vicinity of the town of Rosamond, probably as a result of sheep grazing, unauthorized off-highway vehicle use, and other indirect effects of urbanized areas.

Numerous small, scattered parcels that the Bureau has proposed as development focus areas also lie east of Highway 14 and north of State Route 58. We expect that these parcels also support

few desert tortoises because of sheep grazing and unauthorized off-highway vehicle use; we have received several survey reports from the City of California City and the County of Kern regarding the absence of desert tortoises in this area.

Subunit 3 of the West Mojave and Eastern Slopes Ecoregion roughly straddles Highway 395. The development focus area proposed by the Bureau in this subunit lies between Highway 395 and the Kern/San Bernardino County line; it parallels the highway and contains electrical transmission lines. Portions of this development focus area are highly disturbed (e.g., sheep grazing, off-highway vehicle use); other areas support suitable habitat. The presence of Highway 395 likely suppresses desert tortoise densities across at least portions of the development focus area (Boarman 2002). Common ravens use the transmission lines for perching and nesting; we expect that the transmission lines serve as a center of their activity, with additional depression of the number of desert tortoises around their nests and perches (Boarman 2002). To the west of the development focus area, approximately 144 square miles of private lands within the boundaries of California City support sheep grazing and extensive off-highway vehicle use. These private lands formerly supported large numbers of desert tortoises; currently, we expect that relatively few individuals reside there.

In subunit 4, the Bureau has proposed a single small development focus area south of Edwards Air Force Base. We are unaware of any information regarding desert tortoises for this specific portion of the action area. Generally, desert tortoises are absent from areas to the west of the development focus area, largely as a result of urban and agricultural development; they tend to increase to low densities roughly midway between Lancaster to the west and Victorville to the east. Generally, we expect the density of desert tortoises to increase to the north because that area supports less human activity. Given the size and overall location of the development focus area, we expect that it supports few desert tortoises.

In subunit 5, the Bureau has proposed a few scattered development focus areas that are adjacent to Highway 395 and close to transmission lines. Therefore, we expect that the number of desert tortoises on these parcels has been depressed for the same reasons we described for subunit 3. Additionally, the proximity of these development focus area to the city of Adelanto has likely exerted negative pressure on the population of desert tortoises. We expect few desert tortoises reside in this subunit.

Subunit 6 lies north of Interstate 15 between Barstow and Victorville. The development focus areas in this subunit include a cluster of parcels near Victorville, scattered parcels in the Brisbane Valley just to the northwest of Interstate 15, and a few parcels north of State Route 58 in the general vicinity of Harper Dry Lake.

The California Department of Transportation has been conducting numerous surveys for desert tortoises near the cluster of parcels near Victorville. The surveys were conducted as part of the environmental review process for the High Desert Transportation Corridor, which would have its western terminus near Palmdale and its eastern terminus in Apple Valley. The California Department of Transportation found a single desert tortoise to the south of this cluster, in the

foothills north of Victorville (ECORP Consulting 2015). The less-rugged terrain in this subunit has been severely degraded by unauthorized off-road vehicle activity.

The Brisbane Valley formerly supported high densities of desert tortoises. Sheep grazing traditionally occurred in this area; currently, it is heavily used for unauthorized off-highway vehicle activity. We expect that these scattered parcels support few desert tortoises.

We are unaware of any information regarding desert tortoises for the parcels north of State Route 58. The parcels are adjacent to the Superior-Cronese Critical Habitat Unit, where the Service (2014d) estimated the density of desert tortoises to be 4.4 large individuals per square kilometer in 2012 through range-wide sampling. That density equates to approximately 11 desert tortoises per square mile (4.4 / square kilometer = x / square mile). Based on this density and the 916 acres of the proposed development focus area, we estimate that approximately 16 large desert tortoises may occur on these parcels (One square mile = 640 acres; therefore, x / 916 = 11 / 640).

The habitat model predicts that desert tortoises are likely to occur throughout the development focus areas in the West Mojave and Eastern Slopes Ecoregion, with the exception of the scattered parcels in the Tehachapi Mountains. However, the model does not account for anthropogenic effects. We expect that relatively few desert tortoises occur within the development focus areas in this ecoregion, despite their relatively large acreage.

Status of Critical Habitat in the Action Area

Chuckwalla Critical Habitat Unit

Approximately 4,498 acres of Chuckwalla Critical Habitat Unit overlap the East Riverside Development Focus Area within subunit 2 of the Cadiz Valley and Chocolate Mountains Ecoregion. The first areas of overlap lies adjacent to and immediately north of Interstate 10 in three or four parcels to the east of State Route 177; the second area lies to the east of the first area and between Interstate 10 and Chuckwalla Valley Road, which is south of Interstate 10. These parcels form a portion of the northern edge of the Chuckwalla Critical Habitat Unit; the main body of the critical habitat unit lies to the south.

Fremont-Kramer Critical Habitat Unit

Approximately 236 acres of the Fremont-Kramer Critical Habitat Unit overlap the Koehn Dry Lake Development Focus Area within subunit 2 of the Western Mojave and Eastern Slopes Ecoregion. The critical habitat comprises two parcels that extend into the development focus area. These parcels lie along the northwestern edge of the Fremont-Kramer Critical Habitat Unit; the main body of the critical habitat unit lies to the southwest. Koehn Dry Lake borders these parcels to their northwest.

EFFECTS OF THE ACTION ON THE DESERT TORTOISE AND ITS CRITICAL HABITAT

Effects of the Action on the Desert Tortoise

The proposed action may affect desert tortoises in several ways. Desert tortoises would be captured, handled, and moved from harm's way or translocated; they may also be killed by heavy equipment and vehicles. Common ravens may obtain subsidies from activities associated with renewable energy, increase in abundance, and prey more heavily on desert tortoises. The construction of renewable energy facilities would result in the loss, degradation, and fragmentation of habitat; it also has the potential to alter the climate of local areas.

First, we will analyze how these various aspects of the proposed action may affect desert tortoises in a qualitative manner. In the Conclusions section, we will integrate this general analysis with the best available information with regard to the numbers of desert tortoises in the action area and recovery unit to determine whether the proposed action is likely to jeopardize the continued existence of the species.

Capture and Translocation of Desert Tortoises

Although the Bureau has sited the development focus areas to avoid areas that support the greatest densities of desert tortoises, individuals are likely to be found within the boundaries of at least some proposed projects. The Bureau will require that the project proponent move these desert tortoises to safe habitat, using the Service's translocation protocol; alternatively, the proponent may redesign the proposed action to avoid areas with more desert tortoises (Bureau 2015c; DFA-VPL-BIO-IFS-3).

The alternatives to translocating desert tortoises from project sites are to leave them in place to be killed or to remove them from the wild. Because of their long generation times and reproduction ecology, protecting individual desert tortoises (particularly reproductive adults) is important for the recovery of the species; removing them from the wild also serves no conservation purpose. Translocating desert tortoises using appropriate techniques, such as described in the Service's protocol, can be done successfully; we will discuss translocation in more detailed later in this section. Consequently, the Service views translocation as a reasonable protective measure when the project site is otherwise appropriate.

The first step in the translocation of desert tortoises involves their capture. In some cases, the authorized biologists may find the animals above ground or near the mouth of their burrow. The Bureau will require that "designated biologists" conduct activity-specific biological monitoring during pre-construction, construction, and decommissioning to ensure that avoidance and minimization measures are appropriately implemented and are effective (See Appendix 2; LUPA-BIO-2). We have retained our use of the phrase "authorized biologist" for this biological opinion but view these individuals as having the same qualifications). In such cases, authorized biologists can easily pick up the desert tortoise and transfer it to a container for transport. If desert tortoises are deeper in their burrows, the authorized biologists would excavate the burrow;

we expect that excavating desert tortoises from deep in their burrows is likely more stressful for them than being captured on the surface of the ground.

The capture and holding of desert tortoises can subject them to stress; stressed desert tortoises occasionally void their bladders. Desert tortoises store water in their bladders; this water is important to desert tortoises, particularly during times of low rainfall, in maintaining their life functions. Consequently, desert tortoises that void their bladders are at an increased risk of dying after their release; Averill-Murray (2002) found that desert tortoises that urinated during handling had lower survival rates than those that did not. Because the Bureau will require project proponents to follow the Service's translocation protocol, the authorized biologist will hydrate desert tortoises prior to their release and otherwise employ the methods described in the protocol to reduce the likelihood that they are killed or injured during translocation.

We acknowledge that, in every phase of implementation of the proposed action, including during translocation, desert tortoises are at risk of being killed or injured when workers (including authorized biologists and biological monitors) drive outside of areas that have been fenced and cleared of desert tortoises. As in many cases, small desert tortoises are at greater risk than larger animals. We are aware of desert tortoises that have been crushed by the vehicles of biologists working on translocations; both resident and translocated animals are vulnerable.

Boarman (2002), in a review of literature on threats to the desert tortoise, stated that the adverse effects of translocation include increased risk of mortality, spread of disease, and reduced reproductive success. The tendency for translocated desert tortoises to spend more time above ground, moving through their environment, than animals within their home ranges exacerbates at least some of these threats. Recent research, using comparisons among resident desert tortoises (animals within their home ranges with translocated individuals nearby) and control desert tortoises (animals within their home ranges with no translocated individuals nearby), has provided substantial information on this issue. We will evaluate the potential effects of translocation on desert tortoises in the following paragraphs.

Field *et al*. (2007), Nussear (2004), and Nussear *et al*. (2012) have found that translocated animals seem to reduce movement distances following their first post-translocation hibernation to a level that is not significantly different from resident populations. As time increases from the date of translocation, most desert tortoises change their movement patterns from dispersed, random patterns to more constrained patterns, which indicate an adoption of a new home range (Nussear 2004).

Walde and Boarman (2013) monitored desert tortoises that the Army translocated from Fort Irwin in 2008. In 2009 and 2010, translocated desert tortoises moved farther in cumulative distance than either resident or control animals (Cumulative distance is a measure of the distance between successive locations; in this study, Walde and Boarman (2013) generally located animals every 3 or 4 days). In 2011, the cumulative distances moved by translocated, resident, and control desert tortoises were equal. Desert tortoises that were translocated had larger home ranges than controls and residents; the home ranges of resident and control animals were similar

in size. Translocated desert tortoises did not exhibit a tendency to move from the point of release towards the point of capture.

In general, desert tortoises moved shorter distances (especially within their home ranges) exhibit more limited movement patterns after translocation. Desert tortoises that spend less time above ground are less vulnerable to predation and environmental extremes. Regardless of the distance desert tortoises would be moved, we expect that translocated animals would spend more time moving, at least during the first year, which means they would be more vulnerable to predators, adverse interactions with other desert tortoises, and weather conditions than resident animals. For example, in spring 2013, biologists translocated 108 large and 49 small desert tortoises from approximately 2,000 acres of the KRoad Moapa Solar Project on the Moapa River Indian Reservation northeast of Las Vegas; they also monitored 18 large desert tortoises as controls or residents. Extremely high temperatures during the summer may have killed two or more large translocated desert tortoises. Predators likely killed eight small translocated desert tortoises. No resident or control desert tortoises have died during monitoring (Burroughs 2013). During the first year of increased movement, desert tortoises would also be more likely to engage in fence-pacing behavior, which can lead to hyperthermia and death.

As we previously discussed, we expect that translocated desert tortoises would spend more time moving around. Because translocated desert tortoises spend more time moving, individuals that are moved during the summer months outside of their active season (i.e., from June to August) could be overexposed to heat and die from hyperthermia. Cook *et al*. 1978 (in Nussear *et al*. 2012) stated summer releases have previously been reported to be potentially lethal to translocated desert tortoises, often with high mortality within days of release. The Bureau will require project proponents to follow the Service's most recent translocation protocol (DFA-VPL–BIO-IFS-3). The Service recommends in its current guidance that translocation not occur in the summer; therefore, desert tortoises will not be exposed to this threat. Absent new information that indicates translocation in the summer does not pose a threat to desert tortoises, the Service is unlikely to alter this protocol.

As with other translocations (Nussear 2004, Field *et al*. 2007), we anticipate that predation is likely to be the primary source of post-translocation mortality. The level of winter rainfall may dictate the amount of predation observed in desert tortoises (Drake *et al*. 2010, Esque *et al*. 2010). Drake *et al*. (2010) documented a statistically significant relationship between decreased precipitation and increased predation of translocated desert tortoises at Fort Irwin. We are aware of two instances where monitoring of large numbers of control and resident desert tortoises accompanied the translocation of desert tortoises (Fort Irwin and Ivanpah Solar Electric Generating System). At Fort Irwin, Esque *et al*. (2010) found that "translocation did not affect the probability of predation: translocated, resident, and control tortoises all had similar levels of predation." At the Ivanpah Solar Electric Generating System, the numbers of translocated, resident, and control desert tortoises that have died since the onset of work at the Ivanpah Solar Electric Generating System are roughly equal (controls – 17, residents – 15, translocated – 16; Davis 2015), which seems to indicate that translocation is not a factor in these mortalities;

among translocated, resident, and control animals, predation by canids is the greatest source of mortality.

Drought conditions seem to affect translocated and resident desert tortoises similarly. Field *et al*. (2007) noted that studies from various sites "suggest that all (desert) tortoises at the (Large-scale Translocation Site) site, regardless of translocated or resident status, likely were negatively impacted by drought conditions at the site in 1997. Field *et al*. (2007) noted that most of the translocated desert tortoises "quickly became adept at life in the wild," despite the harsh conditions. Consequently, we have concluded that the amount of rainfall preceding translocation is not likely to decrease the survival rate of desert tortoises that would be moved from within the area of a proposed renewable energy facility.

Nussear *et al*. (2012) investigated the effects of translocation on reproduction in 120 desert tortoises. They found that, in the first year since translocation, the mean reproductive effort for translocated desert tortoises was slightly less than that of residents. Nussear *et al*. (2012) noted that the translocated animals may have benefited from being fed while in the pre-translocation holding facility; the food provided in the facility may have increased their production of eggs in the first year after translocation. In the second and third years after translocation, the mean number of eggs was not different between resident and translocated desert tortoises (That is, absent the food the desert tortoises received in the holding facility, the first year's reproduction may have been lower; the lack of difference in egg production between resident and translocated animals in subsequent years indicates that translocation did not have a long-term effect on reproductive output).

Walde and Boarman (2013) reported on microsatellite analysis of 72 hatchlings found in the area to which desert tortoises had been translocated from Fort Irwin. They found that, 4 years after translocation, most (if not all) of the hatchlings had been fathered by resident male desert tortoises, even though translocated males were well represented in the population. We do not know the reason for difference; additional research into this situation is warranted. We do not view this lack of representation of the translocated males as being appreciably negative, at least in the near term, because minimal differentiation among subpopulations of desert tortoises occurs even at low levels of gene flow such as less than one migrant per year or even one migrant every few decades (see Latch *et al*. 2011). We expect that translocated males will ultimately begin siring offspring within the population during their lifespan.

Translocating desert tortoises may also adversely affect resident desert tortoises within the action area due to local increases in density. Increased densities may result in increased incidence of aggressive interactions between individuals, increased competition for available resources, increased incidence of predation that may not have occurred in the absence of translocation, and increased spread of upper respiratory tract disease or other diseases.

We anticipate that density-dependent effects on resident populations are likely to be minor because the Bureau will require translocations to occur according to the Service's protocol, which establishes the maximum recipient and translocated density for each recovery unit.

Additionally, during the translocation work at Fort Irwin, researchers tested over 200 desert tortoises for differences in the levels of corticosterone, which is a hormone commonly associated with stress responses in reptiles; Drake *et al*. (2012) "did not observe a measurable physiological stress response (as measured by [corticosterone]) within the first 2 years after translocation." The researchers found no difference in stress hormone levels among resident, control, and translocated desert tortoises. For these reasons, we conclude that the addition of translocated desert tortoises to the recipient areas would not result in detrimental effects to translocated or resident animals.

The Service based its guidance for the upper limit of the number of desert tortoises translocated into an area on the density of large animals. The Service generally recommends that the number of small desert tortoises released into a translocation area not exceed the number of released large individuals. Healthy populations have a large number of desert tortoises smaller than 180 millimeters (Turner *et al*. 1987). Additionally, natural mortality rates of smaller desert tortoises are greater than those of larger tortoises and we expect that small desert tortoises use resources differently than do large ones (Wilson *et al*. 1999). Finally, we expect that juveniles (small animals) and adults (large animals) interact much less frequently than do adults. Due to differences in habitat use, caused by both physical and physiological differences in large and small desert tortoises, we expect overlapping of ranges while the small desert tortoises are growing and dispersing. For these reasons, we do not expect translocating small desert tortoises according to our guidance is likely to result in density-dependent adverse effects.

Upper respiratory tract disease and other pathogens are spread by direct contact between desert tortoises. Consequently, increasing the density of desert tortoises in the recipient areas has the potential to exacerbate the spread of diseases because, presumably, animals that occur in higher densities would have more opportunity to contact one another. Several circumstances are likely to reduce the magnitude of the threat of disease prevalence being exacerbated by translocation. First, the Bureau will require project proponents to use experienced biologists and approved handling techniques that are unlikely to result in substantially elevated stress levels in translocated animals; animals are less likely to succumb to disease when they are not stressed. Second, desert tortoises on project sites are currently part of a continuous population with the resident populations of the adjacent recipient sites and are likely to share similar pathogens and immunities. Third, Drake *et al*. (2012) indicated that translocation does not seem to increase stress in desert tortoises. Fourth, density-dependent stress is unlikely to occur for the reasons discussed previously in this section. Finally, biologists who have been trained by the Service (or other specialist) will perform health assessments using Service-approved protocols and will not translocate any desert tortoise showing severe clinical signs of disease.

During translocations to date, we have detected few desert tortoises that were unsuitable for translocation. For projects authorized under the land use plan amendment, the Service and Bureau will determine their final disposition depending on the site-specific conditions. They may be placed in an agency-approved quarantine facility or used for research; extremely ill individuals may be euthanized.

Based on this information, we anticipate that post-translocation survival rates will not significantly differ from that of animals that have not been translocated. We expect that translocated desert tortoises would be at greatest risk during the time they are spending more time above ground than resident animals. We cannot precisely predict the level of post-translocation mortality because regional factors that we cannot control or predict (e.g., drought, predation related to a decreased prey base during drought, etc.) would likely exert the strongest influence on the rate of mortality and affect translocated and resident desert tortoises similarly. Translocation is an effective means of minimizing adverse effects on desert tortoises during project implementation when occupied habitat cannot be avoided.

Construction of Renewable Energy Facilities

With few exceptions, including differences in the amount of ground disturbance associated with different technologies, wind, solar, and geothermal facilities would affect desert tortoises in the same manner. Therefore, we will address the construction of all three types of renewable energy in this section.

The construction of a renewable energy facility usually results in the exclusion of desert tortoises from work areas. For solar facilities, the excluded areas can include thousands of acres. Wind and geothermal facilities generally cause less ground disturbance during construction; desert tortoises would be excluded from the discrete work sites but would remain in the areas between turbines and wells.

The Bureau will require project proponents to install fencing to preclude desert tortoises from entering work areas prior to removing all individuals that they can locate on the project site. During construction of the perimeter fencing and during other ground-disturbing activities that are outside of the fenced facility (i.e., access roads and generator-tie lines), the authorized biologists will perform pre-activity clearance surveys and move desert tortoises out of harm's way if they re-enter work areas.

Some potential always exists that surveyors may miss desert tortoises during clearance surveys and construction monitoring. We cannot predict how many desert tortoises that clearance surveys and construction monitoring would miss. However, we anticipate the number is likely to be small because the Bureau would authorize projects only when the anticipated number of desert tortoises is low and the proponents will use qualified biologists authorized by the Service for the clearance surveys. Weather conditions can also affect the number of animals detected during surveys; warm weather after average or above-average rainfall would lead to more activity in desert tortoises, which would facilitate their detection.

In some cases, desert tortoises that have been fenced out of their home ranges make repeated efforts to return and follow fence lines for long periods. Desert tortoises would die when exposed to harsh conditions (i.e., cold or hot temperatures) while pacing fences. We expect that desert tortoises whose home ranges have been affected by projects would be most likely to pace fences.

The installation of fencing may also reduce the home range size of some individuals that inhabit areas immediately adjacent to the fence alignments or that overlap the project footprint. This reduction could result in future injury or mortality of these individuals as they expand their home range into adjacent areas where unknown threats may occur or where adverse social or competitive interactions may occur with neighboring desert tortoises. Larger projects are likely to destroy the territories of more desert tortoises; however, given the Bureau's management direction to site activities in habitat that does not support large numbers of desert tortoises (DFA-VPL-BIO-IFS-3), we do not expect that individual activities are likely to destroy numerous territories.

Desert tortoises often construct their nests at the entrance to their burrows (Ennen *et al*. 2012). The Bureau will require applicants to follow the Service's guidelines for clearance surveys; these guidelines call for the excavation of all desert tortoise burrows within construction footprints prior to the onset of ground disturbance. Consequently, the biologists may detect at least some of the nests and eggs. Overall, we anticipate that detection of eggs is unlikely because the buried nests are difficult to find. Because hatchlings can take shelter in burrows of all sizes and are difficult to see due to their cryptic nature and their small size, surveyors are less likely to detect them than they are larger desert tortoises. Consequently, we expect that most of the hatchlings and eggs are likely to remain in the work areas during construction. Construction is likely to kill these desert tortoises. Because construction activities are likely to occur year round, they are likely to affect both hatchlings and eggs (Eggs and small desert tortoises, even those that are larger than hatchlings, are always more difficult to detect than larger animals and therefore more likely to be killed during every type of activity; we will not repeat this fact for every activity).

Numerous variables complicate our estimations of the number of desert tortoises on a project site. For example, we usually do not know the precise number of desert tortoises onsite, the size of those individuals, whether eggs will be present at the time of construction, the time of year that construction occurs, and the weather before or during construction. Regardless of these factors, we expect that few large desert tortoises are likely to be killed or injured during construction because the Bureau will require the proponents to site activities in areas with lower densities and to implement measures that have proven effective in the past in reducing mortality and injury. Small desert tortoises are likely to be killed or injured in greater numbers because they are more difficult to find. However, because activities would occur in areas of lower density, we do not expect large numbers of small desert tortoises to be killed or injured. The loss of small desert tortoises is also not as deleterious to the population as the loss of reproductive animals, because they require up to 20 years to reach sexual maturity, have low reproductive rates during a long period of reproductive potential, and individuals experience relatively high mortality early in life (Service 2011b).

Construction of Linear Facilities

Linear facilities have different effects on desert tortoises relative to construction on large blocks of habitat. Construction of linear facilities (e.g., access roads, collector routes, water pipelines, and installation of the fence along access roads) often takes place outside of the permanent

perimeter fencing. Consequently, the primary adverse effect associated with the construction of linear features is not the loss of habitat; it is the greater potential to kill desert tortoises with vehicles and other equipment. Additionally, if trenches or holes are left uncovered, desert tortoises could become entrapped and die of exposure or be killed by predators.

During construction of linear components, the proponent would move desert tortoises out of harm's way into adjacent habitat. These animals would remain within their territories because they would be moved short distances and the minor habitat disturbance would not remove their territories. Generally, the construction of linear facilities would not affect numerous desert tortoises because the Bureau will require the proponents to site activities in areas with lower densities and linear facilities comprise small portions of the projects. However, depending on the local density of desert tortoises and the length of the linear component, the use of linear components during construction may result in the death or injury of numerous individuals because vehicles frequently use these roads, which are usually not fenced.

The Bureau may require the proponent to fence a linear feature during construction. For example, if desert tortoises are particularly active at the time of construction (e.g., if work occurred during a spring with abundant wild flowers), temporary fencing could prevent numerous deaths and injuries.

The Bureau (2015c, LUPA-BIO-IFS-5, 6, 7, and 8) will require project proponents to monitor activities, check under vehicles before moving them, and not exceed a speed limit of 15 miles per hour when working outside of desert tortoise exclusion fencing. These conservation and management actions should reduce the number of desert tortoises that are killed or injured outside of fences.

Overall, we expect that the construction of linear facilities is likely to injure or kill relatively few desert tortoises. We cannot quantify the number of desert tortoises that these activities may affect because we do not know how many animals will enter linear work areas during construction. Also, we expect that monitors would be able to detect and protect most desert tortoises.

Operations and Maintenance

We are aware of occasions where desert tortoises have been able to enter fenced facilities, such as a pump station for a gas pipeline and an operating solar plant; they entered through gaps under the fencing or open gates. Floods can damage fences to the point where desert tortoises may be able to enter the facilities. Once inside the fencing, desert tortoises would be at risk of being killed or injured by operations or maintenance. The Bureau (2015c, LUPA-BIO-IFS-4) would ensure that project proponents maintain fences to prevent entry by desert tortoises.

Over the life of the projects, proponents are likely to conduct ground-disturbing maintenance activities outside of fenced areas. These activities have the potential to injure or kill desert tortoises primarily by vehicle strikes, as workers travel to and from work sites outside of fenced

areas; a limited possibility exists that desert tortoises could be injured or killed by equipment or workers moving around a work site.

Maintenance activities associated with repair of desert tortoise exclusion fencing would likely kill or injure few, if any, desert tortoises for the following reasons. First, fence repairs are likely to result in minimal ground disturbance in localized areas. Second, at least a portion of the work area would be on disturbed areas within the fenced project site. Third, the permanent perimeter roads, located outside the perimeter fencing, would allow access to most repair locations with minimal off-road travel. Finally, the proponent would implement protective measures to reduce the potential for injury or mortality of desert tortoises.

We expect that the operations and maintenance of renewable energy facilities is likely to injure or kill relatively few desert tortoises because the majority of these activities will occur within areas that have been cleared of desert tortoises and have been fenced to prevent their entry. We cannot quantify the number of desert tortoises that these activities may affect because we do not know how many animals workers will encounter during operations and maintenance. Also, we expect that authorized biologists would be able to detect and protect most desert tortoises.

Decommissioning

Work associated with decommissioning of renewable energy facilities within perimeter fences are unlikely to injure or kill desert tortoises because desert tortoises would not be present. The effects of work outside of the exclusion fence would be similar to those associated with construction and described previously in this biological opinion.

The Bureau (2015c, LUPA-BIO-8) will require project proponents to restore areas disturbed by project activities to the pre-disturbance plant community. Restoration activities that occur outside of fenced areas have the potential to kill or injure desert tortoises, particularly after the plant community has begun to recover and individuals begin to return to the area.

We anticipate that decommissioning is likely to kill or injure few desert tortoises. The Bureau will informally consult with the Service as the time for decommissioning approaches; if some aspect of decommissioning and restoration may affect desert tortoises differently than we have anticipated in this biological opinion, the Bureau would need to re-initiate formal consultation, pursuant to section 7(a)(2) of the Endangered Species Act.

The biological assessment notes that some potential exists for continued use of solar facilities. In such a case, re-initiation of consultation, pursuant to section 7(a)(2) of the Endangered Species Act, may be necessary.

Loss and Degradation of Habitat

The construction of renewable energy facilities would result in the long-term loss of habitat. In the following table, we have summarized the estimates of impacts to desert tortoise habitat from

Table R.IV.7 in Appendix R of the final environmental impact statement (Bureau 2015c). Based on this information, we anticipate that development of renewable energy facilities under the land use plan amendment would remove or degrade up to 11,290 acres of desert tortoise habitat within the action area. All units are in acres.

Recovery Unit Ecoregion	**Modeled Habitat[1]**	**Solar**	**Wind**	**Geothermal**	**Total**
Colorado Desert Recovery Unit		3,000	400	0	3,400
Cadiz Valley and Chocolate Mountains	1,169,000	3,000	400	0	3,400
Imperial Borrego Valley	72,000	0	0	0	0
Eastern Mojave Recovery Unit		90	0	0	90
Kingston and Funeral Mountains	860,000	90	0	0	90
Western Mojave Recovery Unit		6,400	500	900	7,800
Mojave and Silurian Valley	661,000	300	0	0	300
Owens River Valley	34,000	500	0	900	1,400
Panamint Death Valley	159,000	300	0	0	300
Pinto Lucerne Valley and Eastern Slopes	385,000	1,000	400	0	1,400
Piute Valley and Sacramento Mountains	719,000	0	0	0	0
Providence and Bullion Mountains	1,045,000	300	0	0	300
West Mojave and Eastern Slopes	583,000	4,000	100	0	4,100
Total Impacts		9,490	900	900	11,290

[1] The Bureau derived the acreages of modeled desert tortoise in this table by combining outputs of the Nussear *et al*. (2009) model with a binary layer that depicts the predicted suitable habitat (Karuzas 2015c). The quantitative habitat model developed by Nussear *et al*. (2009) is based on the statistical probability of habitat potential based on an extensive set of field-collected presence data, information from literature, and expert knowledge. The binary layer includes most potential habitat with known occurrences and other habitat with a high probability of supporting the species but with no known occurrences; it also excludes agriculture, developed, and disturbed areas from modeled suitable habitat. The Service generally uses the Nussear *et al*. (2009) model with a habitat potential set at a probability of 0.5 to conduct its analyses. The model using combined outputs of the habitat potential and the binary layer in this table expands the area of potential desert tortoise habitat to include areas that would fall below the 0.5 probability of the Nussear *et al*. (2009) model. Therefore, although this model expands the covered area, the added habitat likely does not include numerous desert tortoises because of the lower probability that they occur in the additional areas.

If the Bureau disposes of lands within the right-of-way and the proponent elects to maintain the renewable energy facility, the habitat loss would be permanent. If the renewable energy facilities are abandoned at the conclusion of the right-of-way grant, the Bureau (2015a, LUPA-BIO-7) would require restoration of the lands.

Following extensive disturbance and compaction, Mojave Desert substrates can take between 92 and 124 years to recover in the absence of active restoration (Webb 2002). Lovich and Bainbridge (1999) state that natural recovery to pre-disturbance plant cover and biomass may take 50 to 300 years and active restoration can “enhance the success and rate of recovery, but the costs are high and the probability for long-term success is low to moderate.”

We cannot predict how soon desert tortoises would reoccupy the site after decommissioning because of the many variables involved. These variables would include the amount or degree to which substrates and shrubs have been disturbed, weather conditions, and the restoration methodologies; additionally, different portions of the site may return to functional habitat at different rates. Some facilities (e.g., the Ivanpah Solar Electric Generating System) retained most of the desert scrub plants in large portions of their facilities; the recovery times for such facilities are likely to be shorter. The potential exists that severely disturbed habitat within the facilities may be permanently lost if restoration efforts are not successful.

The disturbance of desert substrates can lead to the invasion of non-native invasive plant species that are introduced on equipment and vehicles; the disturbance of substrates can also provide a competitive advantage to non-native species that are already present. These non-native species generally do not provide adequate nutrition to desert tortoises; when they outcompete native forage plants, they reduce the amount of food available to desert tortoises. Non-native species can occur in densities that can increase the risk of fires, which may result in further habitat loss.

The Bureau (2015c, LUPA-BIO-10) will require project proponents to manage weeds during all phases of activities. Because the objective of weed management is to ensure that the presence of weed populations on and adjacent to a project site does not increase due to the activity and because available technology, consistently and persistently applied, can achieve this objective, we expect that this conservation and management action would prevent the introduction of new weedy species or a substantial increase in the amount of non-native species that are already present in the action area.

Reduced Connectivity

To date, areas that have been developed for solar facilities have been fenced to exclude desert tortoises. These large fenced areas have the potential to decrease connectivity within and among populations of desert tortoises. We are aware of one study that has evaluated the potential effects of the development of solar facilities on connectivity of desert tortoise populations.

Shaffer *et al*. (2015) "… generated a DNA dataset consisting of full genomes of 270 (desert) tortoises…" and "… predict(ed) the relative impacts of five proposed development alternatives within the (Desert Renewable Energy Conservation Plan) and rank(ed) them with respect to their likely impacts on desert tortoise gene flow and connectivity in the Mojave (Desert)." Among other data layers, they used the model developed by Nussear *et al*. (2009) to assess how genes might move across the landscape. Shaffer *et al*. (2015) predicted that the preferred alternative for the Desert Renewable Energy Conservation Plan would likely increase isolation of desert tortoises by 729 years, where "isolation is the mean amount by which the commute time has increased to nearby areas across this area where it has increased; it measures the intensity of decrease in gene flow." By this measure, the preferred alternative would increase relative isolation by 18 percent; relative isolation is "the ratio of the amount by which commute time has increased to the commute time without blocking any areas, averaged over the set of nearby locations."

We considered the results of the Shaffer *et al*. (2015) study within the context of the overall survival and recovery of the species. Although the study demonstrates that information regarding the genetics of desert tortoises will likely be useful to the long-term conservation of the desert tortoise, its results do not warrant a detailed analysis in this biological opinion. We have reached that conclusion for two reasons. First, Shaffer *et al*. based their analysis on "discrete potential areas of development" within development focus areas as described in the draft Desert Renewable Energy Conservation Plan. The development focus areas in the draft Desert Renewable Energy Conservation Plan were substantially larger in area than those the Bureau has proposed in its land use plan amendment (Compare the development focus areas in figure 10 of Shaffer *et al*. (2015) to the map on page 5 of this biological opinion). Shaffer *et al*. estimated that approximately 1,250,595 acres of habitat would be removed as a result of the proposed Desert Renewable Energy Conservation Plan. Under the proposed land use plan amendment, the Bureau estimates that approximately 48,419 acres are likely to be of disturbed by all forms of renewable energy development in development focus areas (solar - 38,366; wind - 3,239; geothermal - 6,814). As Shaffer *et al*. note, "… the effect in terms of Relative Isolation is about five times the percentage of habitat removed …." Consequently, the removal of less habitat will result in less disruption of connectivity.

Second, Shaffer *et al*. "… assume(d) that (the discrete potential areas of development) represent zones of inaccessible habitat …" for desert tortoises. This assumption does not account for the Bureau's conservation and management actions, such as LUPA-BIO 13, which will require that all activities be sited and designed "to avoid impacts to vegetation types, unique plant assemblages, climate refugia, occupied and suitable habitat for sensitive species and to maintain the function of connectivity of sensitive species in identified areas." Because of this conservation and management action, the Bureau, in consultation with the Service, will evaluate every future proposed activity to ensure that large blocks of disturbance do not disrupt long-term connectivity.

In summary, Shaffer *et al*. (2015) demonstrate that the disturbance of habitat can decrease the gene flow of desert tortoises across the landscape. The results of the specific investigation that they conducted do not reflect the scale of the proposed action or conservation and management actions that the Bureau has proposed to reduce adverse effects to connectivity. However, a refined model may be useful in assessing the effects of habitat disturbance resulting from specific activities in the future.

Common Ravens, Coyotes, and Other Predators

Construction and operation of renewable energy facilities have the potential to attract common ravens, coyotes, and other mammalian predators, provide subsidies in the form of food, water, and shelter, and allow for an increase in their abundance. These species prey on desert tortoises; increases in their numbers would lead to an increase the threat of predation on desert tortoises.

The Bureau (2015c, LUPA-BIO-6) will require project proponents to implement measures to reduce subsidies that activities may provide to predators. These measures would vary on a

project-specific basis but would include control of attractants (food, water, shelter), monitoring and reporting programs, and implementing adaptive management techniques such as devices to discourage the predators from using project-related structures.

The Bureau (2015c, LUPA-BIO-6) will require project proponents to participate in the regional management and monitoring program for common ravens. The Service developed this program in coordination with the Desert Managers Group, which is a consortium of land management agencies and other stake holders in California, and the Renewable Energy Action Team, which is composed of the Service, Bureau, California Energy Commission, and California Department of Fish and Wildlife. To date, management actions undertaken as part of this program include surveys to determine where common ravens are most abundant and removal of birds that are known to be preying on desert tortoises. Because common ravens are intelligent and learn behaviors from one another, the removal of individuals that are killing desert tortoises has both direct and indirect benefits.

We cannot reasonably predict the amount of predation on desert tortoises that construction and operation of the project is likely to add to baseline levels within the action area. Generally, best management practices are effective in eliminating some, but not all, use of the project sites by predators. Contributions to the management program for common ravens would assist in recovery actions for the desert tortoise throughout the desert and, in that manner, further assist in reducing the effects of these predators.

Climate Change

Increases in atmospheric carbon are responsible for changes in climate. As we discussed in the Status of the Desert Tortoise section of this biological opinion, climate change is likely to cause frequent and/or prolonged droughts with an increase of the annual mean temperature. Increased temperatures would likely adversely affect desert tortoises by decreasing the range of temperatures at which desert tortoises would be active; decreased rainfall would likely result in fewer annual plants on which desert tortoises feed.

Although one of the objectives of increasing sources of renewable energy is to decrease the amount of anthropogenic carbon in the atmosphere to combat climate change, scientists have been discussing how this development affects carbon sequestration on project sites and whether wind and solar facilities may affect local weather patterns and climate. Others have questioned how the development of renewable energy facilities in the desert is likely to affect listed species in the action area. We will discuss these issues in this section.

Carbon Sequestration. Plant communities in arid lands sequester carbon by incorporating it into their tissues. Plants also respire carbon into the substrate, where it combines with calcium to form calcium carbonate; calcium carbonate also sequesters carbon (Allen and McHughen 2011). The amount of carbon that desert lands sequester is a matter of scientific debate. For example, Schlesinger *et al*. (2009) contend that previous high estimates of carbon sequestration in the Mojave Desert bear re-examination. Liu *et al*. (2015) found that the absorption rate of carbon

dioxide was lower than previously reported rates and concluded the differences were "likely as a result of differences in soil property." That is, the different substrates and plants found around the world will absorb carbon dioxide at different rates. Evans *et al*. (2014) note that arid ecosystems are "significant … sinks" for atmospheric carbon dioxide and are important globally because they are so widespread.

Regardless of the rate at which desert substrates sequester carbon dioxide, the next issue to consider is whether renewable energy facilities decrease the amount of carbon released into the atmosphere relative to the amount of sequestration they disrupt as a result of their construction. We do not have information regarding wind and geothermal facilities, which disturb much less land than solar projects. Fernandes *et al*. (2010) report that thin film photovoltaic technology reduces overall atmospheric carbon by 4 million grams of carbon per acre per year and that, by contrast, the amount of annual carbon uptake by desert land is approximately 429,000 grams of carbon per acre per year. Therefore, for at least this type of technology, the proposed action is likely to result in a net decrease in the amount of carbon dioxide in the atmosphere over time.

Finally, the removal of plant life from the approximately 11,290 acres within the action area that the Bureau (2015c, Table R.IV.7) estimates would be developed under the land use plan amendment is likely to reduce the amount of carbon that natural processes can sequester. We acknowledge that portions of the sites would be restored during the life of the project and that the regrowth of shrubs in that area may restore, to some degree, the carbon-sequestering ability of the land; we cannot quantify the difference in carbon sequestration this amount of restoration would cause. With regard to carbon sequestration, the proposed action is unlikely to affect desert tortoises in a measurable manner (either positively or negatively). We have reached that conclusion because the proposed action would affect a relatively small portion of the 10,869,000-acre action area. Additionally, any changes in the level of carbon production or sequestration would be dispersed far beyond the boundaries of the action area of this biological opinion; consequently, we could not link any such changes to any specific impacts to desert tortoises within or outside the action area of this consultation.

Generation of Heat. The proposed action is also unlikely to alter the surface albedo of the action area to the degree that it affects local climatic conditions (Albedo is the amount of light reflected by an object. An object that reflects more light is heated less. The opposite is also true; an object that reflects less light is heated more). Millstein and Menon (2011) found that large-scale photovoltaic plants in the desert could lead to significant local temperature increases (0.4˚C) and regional changes in wind patterns because the solar plants are less reflective than many substrates in the desert. As we discussed above, increases in temperatures would likely impair the activity patterns of desert tortoises.

The proposed action is unlikely to affect desert tortoises in a measurable manner with regard to changes in the albedo of the action area because Millstein and Menon's (2011) prediction was based on a model that analyzed the effects of a 1-terawatt solar facility that covered 4,633,207 acres; that is, to achieve the modeled increase of 0.4^{o}C, approximately half of the action area would need to be developed with solar facilities. The Bureau estimates that approximately

38,366 acres are likely to be developed as a result of the land use plan amendment; adding the acreage of all the existing solar facilities in the California would not begin to approach the area they modeled.

Millstein and Menon's model is also based on numerous assumptions that would affect how a solar plant may actually affect the local environment. Millstein and Menon acknowledge that their assumptions regarding the density of solar panels within the plant and the effectiveness of the panels would influence predictions of the amount of heat generated by the facility. Specifically, they assumed that solar panels would completely cover the ground's surface (they do not, which could alter the reflectivity they predicted) and a specific efficiency of the panels (they acknowledge that more efficient panels are being developed that generate less heat). Additionally, the model assumes specific reflectivity of the desert's surface in two places (near Harper Dry Lake in western Mojave Desert and near Blythe in the Colorado Desert) that may be substantially different than that of the proposed project areas. All of these factors would likely render the model's predictions somewhat different than real-world conditions and outcomes.

Fthenakis and Yu (2013) also evaluated flows to the environment related to the operation of solar facilities. They measured heat flows that emanated from four solar fields that, in total, covered approximately 7 acres. They determined that air temperatures above the solar panels at the center of the field were slightly higher (2.5^{o}C) than ambient; temperatures at the edges of the field were lower than those in the center; and temperatures returned to ambient levels at approximately 300 meters from the perimeter of the solar field. Fthenakis and Yu (2013) concluded that heat island effects are unlikely to occur and that the access roads between solar fields allow for substantial cooling; they also concluded that "an increase of the size of the solar farm may not affect the temperature of the surroundings." This study also seems to indicate that solar facilities are unlikely to alter local temperatures to the degree that they would affect desert tortoises.

Wind development. Zhou *et al*. (2012) demonstrated that wind facilities covering a large area caused "a significant warming trend of up to 0.72^{o} C per decade, particularly at night-time, over wind farms relative to nearby non-wind-farm regions." Their study area included 2,358 wind turbines in Texas. Zhou *et al*. (2012) found that stronger winds in the summer months and at night cause the "strongest warming effect at night" because the atmospheric boundary layer is typically more stable and much thinner at night than during the day; therefore, the "turbine-enhanced vertical mixing produces a stronger night-time effect."

The Bureau (2015c, Table IV.7-27) estimated the number of wind turbines that would likely be built within the development focus areas. In total, the Bureau estimated that 704 turbines may be constructed within development focus areas, with the greatest number (529) in the Cadiz Valley and Chocolate Mountains Ecoregion, which includes 2,435 acres.

The proposed action is unlikely to cause measurable warming because fewer turbines would be constructed in the action area than in Texas (i.e., 704 turbines compared to 2,358). Also, the action area for the land use plan amendment is vastly larger than the study area in Texas; therefore, turbines in the action area would be much more dispersed.

In the area of the Tehachapi Mountains, the Bureau estimates that 58 wind turbines are likely to be developed under this land use plan amendment. These added turbines are highly unlikely to increase warming, even in combination with existing turbines. If warming similar to that observed by Zhou *et al*. occurred (0.72^{o} C per decade), we expect that it would not have a measurable effect on desert tortoise populations because the change would be minor and very few desert tortoises occur in this portion of the action area.

Compensation

The Bureau (2015c, LUPA-BIO-COMP-1) will require project proponents to compensate for the loss of desert tortoise habitat. The Bureau will apply various ratios to the activity, depending on the resource that is affected; for example, the ratio is 1:1 for activities in development focus areas and 5:1 in desert riparian woodlands.

The Bureau will require that project proponents compensate by acquiring the calculated amount of habitat or paying a corresponding fee that the Bureau would use to either acquire lands or implement other actions that would benefit desert tortoises. The project proponent may also use a combination of these measures.

Because land acquisition and other recovery actions would occur in conservation areas, the proposed compensation would benefit the recovery of the desert tortoise. The funding of management actions is likely to result in restoration and rehabilitation of degraded habitat, protection of existing habitat from future sources of degradation, and a reduction in the direct mortality of desert tortoises. In general, the original and revised recovery plans (Service 1994, 2011b) identify the actions proposed for compensation as being necessary for the recovery of the desert tortoise. We cannot quantify the level of effects that these actions will have because we do not know the specific actions that will be implemented at this time. However, in light of the continued decline of desert tortoises within conservation areas, the Service (2015c) has emphasized the need “for more aggressive and better prioritized recovery implementation.” The use of compensation to address this need is more important than ever.

We also note that the Bureau’s compensation requirements for other resources, such as desert riparian woodland and the State of California-listed Mohave ground squirrel (*Spermophilus mohavensis*), may also benefit desert tortoises if they are conducted in conservation areas for the desert tortoise.

Effects of the Action on Critical Habitat of the Desert Tortoise

Development focus areas overlap critical habitat of the desert tortoise in two general regions of the action area: the Chuckwalla Critical Habitat Unit near Interstate 10 in eastern Riverside County and the northwestern edge of the Fremont-Kramer Critical Habitat Unit, to the north of the Desert Tortoise Research Natural Area.

Approximately 4,498 acres of the Chuckwalla Critical Habitat Unit overlap the East Riverside Development Focus Area within subunit 2 of the Cadiz Valley and Chocolate Mountains Ecoregion. The first area of overlap lies adjacent to and immediately north of Interstate 10 in three or four parcels to the east of State Route 177; the second area lies to the east of the first area and between Interstate 10 and Chuckwalla Valley Road, which is south of Interstate 10. The Bureau (2015a, page 215) estimates that this subunit may support the development of approximately 16,338 and 2,435 acres of solar and wind facilities, respectively.

Approximately 236 acres of the Fremont-Kramer Critical Habitat Unit overlap the Koehn Dry Lake Development Focus Area within subunit 2 of the Western Mojave and Eastern Slopes Ecoregion. The critical habitat comprises two parcels that extend into the development focus area. The Bureau (2015a, page 215) estimates that this subunit may support the development of approximately 4,444 and 264 acres of solar and wind facilities, respectively.

In the following paragraphs, we consider the effects of the proposed action on the physical and biological features of desert tortoise critical habitat. To approach this analysis in a conservative manner, we will assume that the entire area of critical habitat within the development focus areas would be developed as solar facilities. We are aware that the Bureau has proposed to site and design projects to maintain the connectivity for wildlife across Interstate 10 through three north-south wildlife corridors; they are within a 5-mile-wide linkage centered on Wiley's Well Road, a 3-mile-wide linkage between the Chuckwalla and Palen mountains, and a 1.5-mile-wide linkage between the Chuckwalla Mountains to the Chuckwalla Valley. We have considered that fact in our analysis but cannot quantify the acreage of the corridors because the Bureau will determine their precise size and alignment on a project-specific basis. An additional factor to consider is that the Service mapped critical habitat along section lines; therefore, the boundaries in the final rule designating critical habitat do not necessarily indicate a discrete change in habitat conditions.

Sufficient Space to Support Viable Populations within Each of the Six Recovery Units and to Provide for Movement, Dispersal, and Gene Flow

Chuckwalla Critical Habitat Unit. The isolated parcels of critical habitat to the north of Interstate 10 and Chuckwalla Valley Road do not, in and of themselves, provide sufficient space to support a viable population or to provide for movement, dispersal, and gene flow. Interstate 10 currently functions as a major barrier to movement, dispersal, and gene flow to the south; conceivably, underpasses could provide connectivity between these parcels and the main block of the critical habitat unit south of Interstate 10. Chuckwalla Valley Road is generally lightly used and likely does not pose a substantial barrier to the movement of desert tortoises.

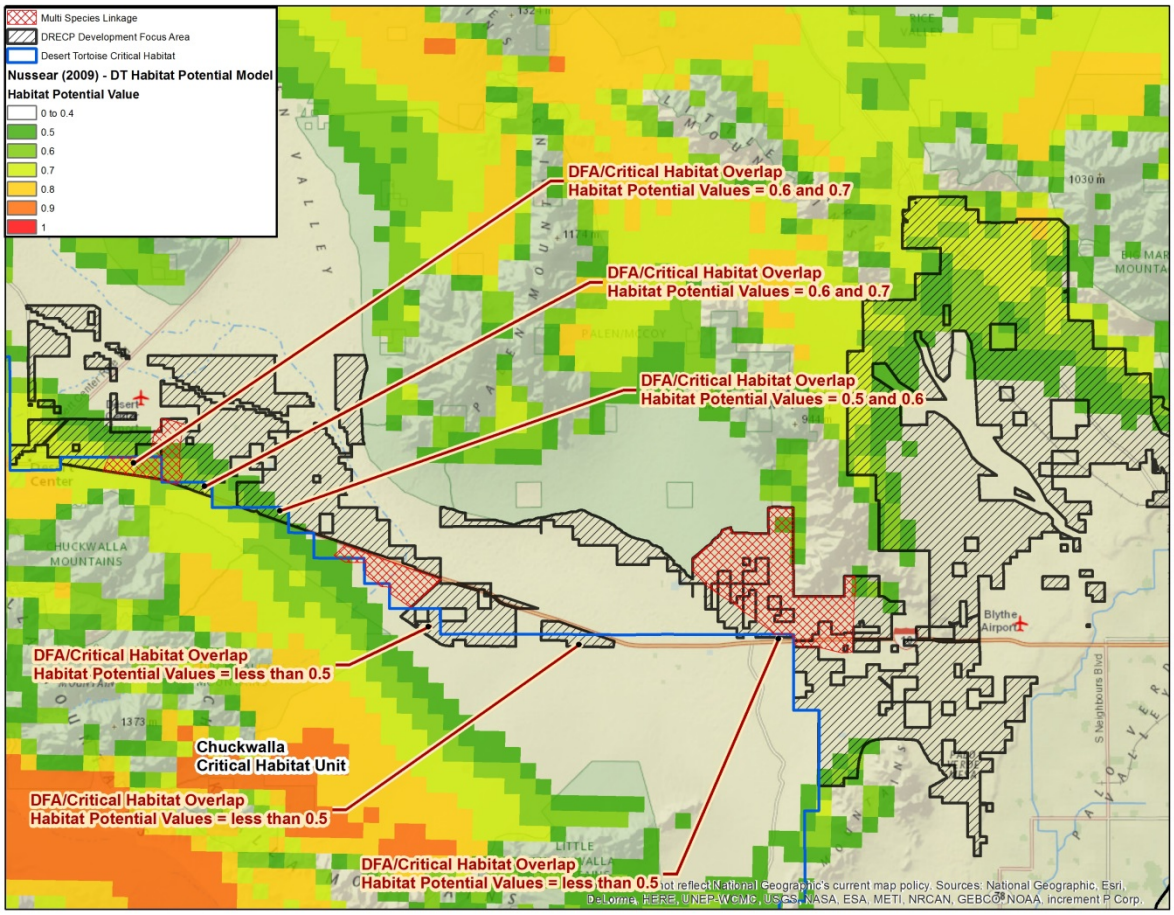
The Nussear *et al*. (2009) model indicates that desert tortoises are less likely to be present in these portions of critical habitat than they are farther to the south. The westernmost parcels of the development focus area that overlap critical habitat have probabilities of 0.6 and 0.7 of supporting desert tortoises; to the east of these areas, the next parcel of the development focus area that overlaps critical habitat has probabilities of 0.5 to 0.6. These parcels lie to the north of Interstate 10.

(This discussion of the effects of the proposed action on critical habitat relies in part on the Nussear *et al*. (2009) model, which predicts the likelihood of desert tortoises being present in an area. Although the value of and effects to critical habitat are independent of the presence of desert tortoise, our use of the habitat model is appropriate in this instance because the model incorporates environmental variables that are related to the second through fifth physical and biological features of critical habitat of the desert tortoise. The habitat model does not consider the spatial needs of the desert tortoise (the first physical and biological feature) or anthropogenic impacts on habitat (the sixth physical and biological feature)).

Farther to the east, the next two parcels where the development focus area overlaps critical habitat lie south of Interstate 10, the probability that desert tortoises occur on these parcels falls below 0.5. The probability of finding desert tortoises falls below 0.5 in the eastern portion of the development focus area.

The easternmost overlap of the development focus area with critical habitat occurs to the north of Interstate 10. The probability of finding desert tortoises is below 0.5 in the small portion of critical habitat that extends to the north of Interstate 10.

The following map depicts the locations of the development focus area, critical habitat, and the proposed wildlife corridors within the Chuckwalla Critical Habitat Unit.



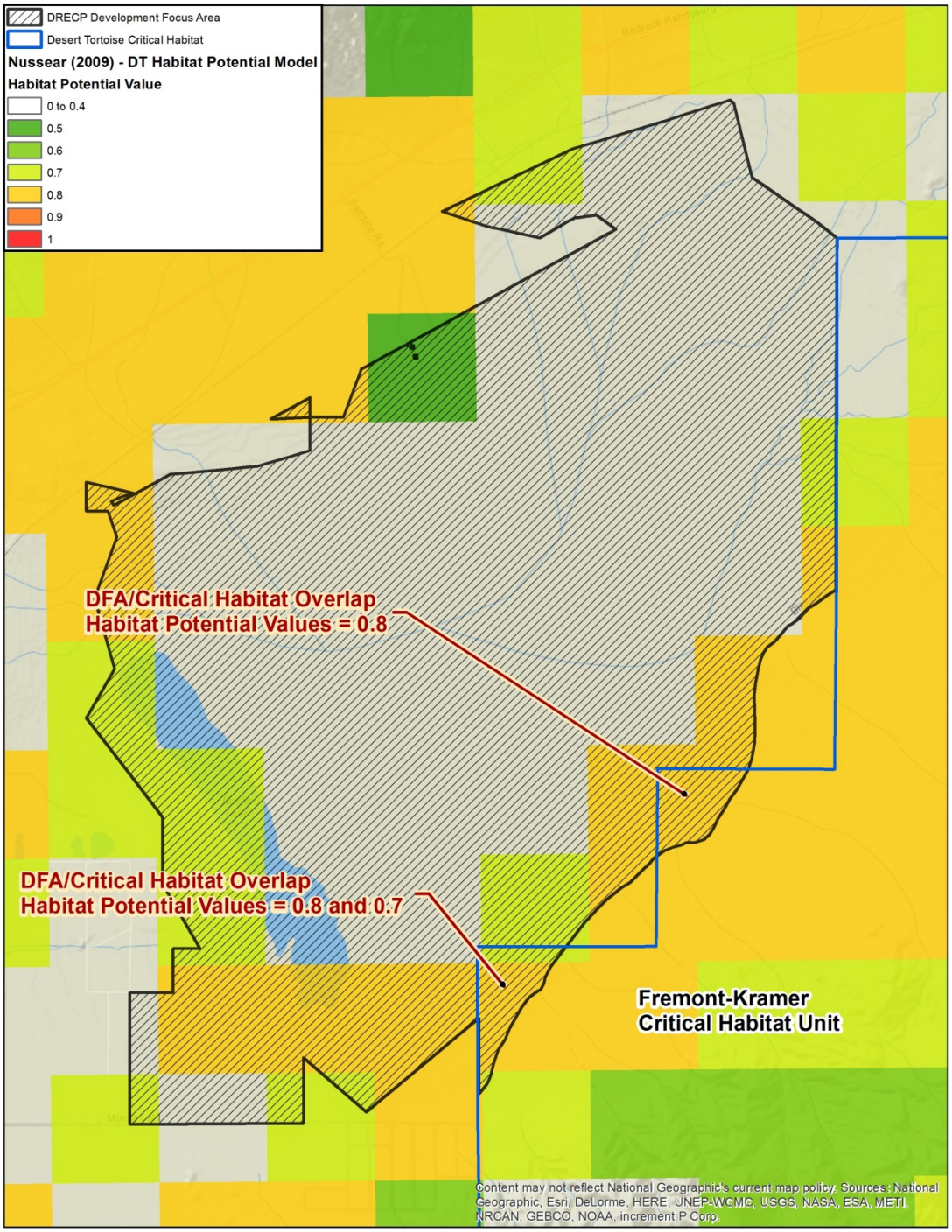
Because of the nature of the habitat in this area and the fact that the Bureau will require the maintenance of wildlife corridors in this area, the minor overlap of portions of the East Riverside Development Focus Area and the Chuckwalla Critical Habitat Unit would not have a measurable effect on the ability of the critical habitat unit to support viable populations or to provide for movement, dispersal, and gene flow. The maximum acreage of overlap is approximately 4,498 acres; however, because the Bureau (2015c, page II.3-169, LUPA-BIO-13) will maintain substantial wildlife corridors in this region, the actual amount of disturbance to Chuckwalla Critical Habitat Unit would be substantially less.

Fremont-Kramer Critical Habitat Unit. The parcels of critical habitat extend to the northwest of the main body of the Fremont-Kramer Critical Habitat Unit towards Koehn Dry Lake. Because of their small size, these parcels, in and of themselves, cannot provide sufficient space to support a viable population or to provide for movement, dispersal, and gene flow. Because desert tortoises rarely cross large dry lake beds, these parcels do not provide an important linkage between critical habitat and any other desert tortoise habitat.

The Nussear *et al*. (2009) model indicates that the parcel to the northeast has a 0.8 probability of supporting desert tortoises; most of the other parcel has a 0.8 probability, except for the northern

portion, which is 0.7. The probability of desert tortoises occurring to the north, on Koehn Dry Lake, is less than 0.5; to the southwest, deeper within critical habitat, the probability rises to 0.9.

The following map depicts the locations of the development focus area, critical habitat, and the proposed wildlife corridors within the Fremont-Kramer Critical Habitat Unit.



The minor overlap of the Koehn Dry Lake Development Focus Area and two parcels of the Fremont-Kramer Critical Habitat Unit would not have a measurable effect on the ability of the critical habitat unit to support viable populations. Because of the location of these two parcels, at the edge of a dry lake, they currently are not important for the movement, dispersal, and gene flow of desert tortoises; therefore, their disturbance for the development of renewable energy facilities does not impair this function of critical habitat.

Sufficient Quality and Quantity of Forage Species and the Proper Soil Conditions to Provide for the Growth of these Species; Suitable Substrates for Burrowing, Nesting, and Overwintering; Burrows, Caliche Caves, and Other Shelter Sites; Sufficient Vegetation for Shelter from Temperature Extremes and Predators

The second through fifth physical and biological features represent the plant species desert tortoises require for food and shelter, the substrates that are necessary for these plants to grow and for desert tortoises to construct burrows, and the burrows and other shelter sites they use. These features are the components of the environment necessary to meet desert tortoise's need for food and shelter. Because the condition of substrates, annual forage species, and perennial shrubs and other cover sites are so interrelated, we have combined our analysis of the effects of the proposed action on these physical and biological features.

Chuckwalla Critical Habitat Unit. The Chuckwalla Critical Habitat Unit includes approximately 1,020,600 acres. Although the development focus area and critical habitat overlap by 4,498 acres, the Bureau's commitment to provide for three wildlife corridors in this area ensures that renewable energy facilities would not occupy the entire area of overlap. To present a conservative analysis, however, we will assume that all 4,498 acres would be developed. The loss of the overlap area would comprise approximately 0.44 percent of the Chuckwalla Critical Habitat Unit (That is, 4,498 divided by 1,020,600, multiplied by 100). Because of the small size of the separate parcels, we conclude that the loss of 4,498 acres, distributed among several parcels, of the Chuckwalla Critical Habitat Unit to solar development would not have a measurable effect on the ability of the critical habitat unit as a whole to provide suitable substrates, annual forage species, and perennial shrubs and other cover sites to desert tortoises.

Fremont-Kramer Critical Habitat Unit. The Fremont-Kramer Critical Habitat Unit includes approximately 518,000 acres. To present a conservative analysis, we will assume that all 236 acres of overlap between the development focus area and the critical habitat unit would be developed. The loss of the overlap area would comprise approximately 0.05 percent of the Fremont-Kramer Critical Habitat Unit (That is, 236 divided by 518,000, multiplied by 100). Because of the small size of the two parcels, we conclude that the loss of 236 acres of the Fremont-Kramer Critical Habitat Unit to solar development would not have a measurable effect on the ability of the critical habitat unit as a whole to provide suitable substrates, annual forage species, and perennial shrubs and other cover sites to desert tortoises.

Habitat Protected from Disturbance and Human-caused Mortality

The analysis in this section applies to critical habitat in both the Fremont-Kramer and Chuckwalla critical habitat units. The construction of solar facilities would substantially increase the level of disturbance and the potential for human-caused mortality of desert tortoises within the project area. The level of activity and the potential for disturbance would be much less during operation of a solar facility. The area of a solar facility would not be able to support the function of critical habitat unless the other physical and biological features (appropriate substrate, cover sites, annual forage species, and perennial shrubs) remained after construction; to date, we are unaware of any solar facilities where hypothesis-driven research has demonstrated that the physical and biological features of critical habitat of the desert tortoise would persist within a solar field during operations.

Solar facilities do not cause indirect effects during operation in the same manner as housing developments. That is, solar facilities do not result in an increase in feral cats and dogs and an increase in unauthorized vehicle use; consequently, we expect that the operation of solar facilities would have limited, if any, effect upon this feature of critical habitat outside a project area's boundaries. Conversely, because of activities related to the maintenance of turbines, the level of disturbance and human-caused mortality would continue to affect this physical and biological feature during the operation of wind facilities.

For both critical habitat units, the overall small amount of critical habitat located within the development focus areas and its distribution in two or more parcels at the edge of the critical habitat units are important factors to consider in this analysis. For the areas within the Chuckwalla Critical Habitat Unit, Interstate 10 is currently a major source of disturbance and human-caused mortality of desert tortoises. The proximity of the overlap to the freeway may exacerbate this effect; the potential also exists that the freeway has already impaired the function of this physical and biological feature to the point where additional disturbance by renewable energy facilities would not alter the existing conditions. Conversely, the Bureau's commitment to develop three wildlife corridors would reduce the adverse effects of renewable energy facilities on this physical and biological feature and may, if Interstate 10 is fenced to reduce wildlife mortality, also reduce the effects of the freeway. Overall, the increased level of activity that may result from the development of renewable energy facilities in the areas where critical habitat overlaps development focus areas would not have a measurable effect on the ability of the critical habitat units to provide the desert tortoise with habitat that is protected from disturbance and human-caused mortality.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act. The Bureau manages all of the land in the action area; any future action on public lands will require consultation,

pursuant to section 7(a)(2) of the Endangered Species Act. Consequently, we do not anticipate any cumulative effects.

CONCLUSIONS

Desert Tortoise

As we stated previously in this biological opinion, "jeopardize the continued existence of" means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR 402.02). This regulatory definition focuses on how the proposed action would affect the reproduction, numbers, or distribution of the species under consideration in the biological opinion. For that reason, we have used those aspects of the desert tortoise's status as the basis to assess the overall effect of the proposed land use plan amendment on the species.

Additionally, we determine whether a proposed action is likely "to jeopardize the continued existence of the species" through an analysis of how a proposed action affects the listed taxon within the action area in relation to the range of the entire listed taxon. For the desert tortoise, this process involves considering the effects at the level of the action area, then at the level of the recovery unit (in this case, the Western Mojave, Eastern Mojave, and Colorado Desert recovery units), and then finally for the range of the listed taxon. Logically, if a proposed action is unlikely to cause a measurable effect on the listed taxon within the action area, it is unlikely to affect the species throughout the recovery unit or the remainder of its range. Conversely, an action with measurable effects on the listed entity in the action area may degrade the status of the species to the extent that it is affected at the level of the recovery unit or range-wide.

In the following sections, we will synthesize the analyses contained in the Effects of the Action section of this biological opinion to determine how each of the proposed actions affects the reproduction, number, and distribution of the desert tortoise. We will then assess the effects of the proposed actions on the recovery of the species and whether they are likely to appreciably reduce the likelihood of both the survival and recovery of the desert tortoise.

Reproduction

The proposed action has the potential to introduce new species of invasive, non-native plants into habitat of the desert tortoise; it may also increase the distribution and abundance of non-native species that are already present. If these non-native species displace native species upon which desert tortoises feed, the potential exists that females may lay fewer eggs. We are unaware of any research that demonstrates this effect; many other factors influence egg production in desert tortoises. The Bureau will require project proponents to manage weeds during all activities; this direction should decrease the likelihood that weeds will increase in abundance or distribution.

As a reminder, the Bureau will require that all project proponents, not merely those applying for right-of-way grants for renewable energy facilities, implement these measures. The Bureau's adoption of a revised disturbance cap system will prompt the restoration of disturbed habitat in desert tortoise conservation areas throughout the desert. We expect that those measures will also function to control non-native species.

As we discussed in more detail previously, Nussear *et al*. (2012) found that, in the first year after translocation, the mean reproductive effort for translocated desert tortoises was slightly less than that of residents. In the second and third years after translocation, the mean number of eggs was not different between resident and translocated desert tortoises. Relatively few desert tortoises are likely to be translocated because the Bureau generally sited development focus areas in regions where desert tortoises occur in low densities; additionally, the conservation and management actions will require project developers to avoid higher density areas within the development focus areas. For these reasons, we expect that the translocation of desert tortoises as a result of the development of renewable energy facilities is likely to result in the short-term reduction of the reproductive of relatively few desert tortoises.

For these reasons, we conclude that the land use plan amendment is likely to have a minimal negative effect on the reproductive capacity of desert tortoises in the action area.

Numbers

As we discussed in the Desert Tortoise - Environmental Baseline section of this biological opinion, the development focus areas support relatively few desert tortoises; some of them do not support any desert tortoises. The Bureau (2015c, DFA-VPL-BIO-IFS-3) will require that proponents conduct protocol surveys of their proposed project sites; if the results of these surveys indicate that more than 35 individuals larger than 160 millimeters occur on site or the density of desert tortoises exceeds 5 per square mile (160 millimeters or larger), the Bureau will require the proponent to redesign or relocate the project (The Bureau will use the number calculated through the Service's protocol survey, not the actual number of desert tortoises found during surveys, to implement these thresholds).

Desert tortoises seem to survive translocation from project sites, when the translocation is conducted appropriately. We acknowledge that we have not monitored translocated animals for longer than 5 years; however, as we discussed previously in this section, translocated desert tortoises had similar rates of survival as resident and control animals within a year or two of translocation.

The construction and operation of renewable energy facilities may kill or injure desert tortoises, particularly small ones that are difficult to see. We expect that some desert tortoises are not found during construction and that these animals are killed. In general, however, we are aware of few large individuals that have been killed or injured by activities associated with the development and operation of renewable energy facilities.

With these facts in mind, we expect that the development of renewable energy facilities within the development focus areas, as proposed under the land use plan amendment, is likely to kill or injure few large desert tortoises. Because we have not conducted extensive surveys in these areas, we cannot provide an overall estimate of the numbers of large individuals that are likely to occur in the development focus areas. Because we also do not know exactly where renewable energy facilities would be sited, we cannot predict how many desert tortoises would be affected. Therefore, we conducted a conservative analysis, using the following assumptions:

Renewable energy facilities will occupy 11,290 acres of desert tortoise habitat (based on the Bureau's estimate using the binary model we described previously in this biological opinion) within the development focus areas;

The density of large desert tortoises throughout the development focus areas is 5 per square mile (because the Bureau would require re-design or re-siting of projects in areas with higher densities); and

Development of the renewable energy facilities will kill every desert tortoise within the 11,290 acres of the developed habitat.

The 11,290 acres equate to approximately 17.6 square miles (11,290 acres / 640 acres per square mile = 17.6). The maximum number of large desert tortoises in the areas to be developed within the development focus areas equals 88 (17.6 square miles x 5 desert tortoises per square mile = 88).

We then estimated the number of desert tortoises within desert tortoise conservation areas in California (Service 2015c) (Although the action area for this biological opinion comprises only lands managed by the Bureau, desert tortoise conservation areas extend over lands managed by other entities; the Service's range-wide sampling also covers lands managed by agencies other than the Bureau. However, because desert tortoises do not recognize land ownership boundaries, the comparison is legitimate). Most of the Eastern Mojave Recovery Unit is located in Nevada, as is a small portion of the Colorado Desert Recovery Unit. To account for this, we used half of the number of desert tortoises in the Eastern Mojave Recovery Unit in our exercise; because so little of the Colorado Desert Recovery Unit is outside of California, we included the entire number of desert tortoises for this area.

Recovery Unit	**Estimated Number of Desert Tortoises**
Western Mojave	17,644
Eastern Mojave	42,770
Colorado Desert	2,646
Total	63,060

Based on these calculations, the loss of 88 large desert tortoises represents 0.14 percent of the estimated total number of large desert tortoises within desert tortoise conservation areas in

California (88 / 63,060 x 100 = 0.1395). We reiterate that this is an overestimate of the number of large desert tortoises that are likely to be killed as a result of renewable energy facilities associated with the land use plan amendment because:

> Surveyors find most large desert tortoises during clearance surveys and translocate them to habitat where they have the same survival rates as resident and control animals. Therefore, killing every large desert tortoise within every project site would never occur;
>
> To date, proponents have cleared approximately 18,637 acres for solar development in eastern Riverside County (This acreage includes all desert scrub habitat without application of the binary habitat model we described previously in this biological opinion). They have found 8 desert tortoises, which is far below the density of 5 per square mile we used in our calculation; and
>
> Our calculation does not include an estimate of the number of large desert tortoises that reside outside of conservation areas. We acknowledge that far fewer desert tortoises likely reside outside the conservation areas than inside; therefore, if we included that estimation in the calculation, the overall percentage of desert tortoises that would be killed would decline further.

For these reasons, we anticipate that implementation of the proposed action in relation to renewable energy facilities would injure or kill far less than 0.14 percent of the number of the large desert tortoises in the action area. We state that "far less than 0.14 percent" would be killed or injured because 88 is the maximum number of large individuals that would be captured; in our experience, the number of desert tortoises that die or are injured during translocation comprises a small fraction of the total number of animals that are moved. When we extend our calculation to all large desert tortoises within conservation areas range-wide (i.e., 85,686; Service 2015c), the percentage drops from 0.14 to 0.10 (88 / 85,686 x 100 = 0.1027). Therefore, we conclude that the land use plan amendment would have a negligible effect on the number of desert tortoises in the action area and range-wide.

Turner *et al*. (1987) predicted that desert tortoises under 160 millimeters comprised approximately 85 percent of the total population at their study site. Occasionally, the Service will use the work of Turner *et al*. to estimate the number of desert tortoises on a project site that are smaller than 160 millimeters. These estimates involve several assumptions and the number of assumptions increases with the size of the project site. Consequently, we have declined to specifically estimate the number of smaller desert tortoises that may be affected by the development of renewable energy facilities within the development focus areas.

Because smaller desert tortoises are more difficult to find, they are more likely to be missed during surveys; if they are not detected prior to the start of construction, they will likely be killed. The loss of these individuals is not likely to appreciably diminish the numbers of desert tortoises overall because relatively few desert tortoises will be affected by renewable energy facilities within the development focus areas in comparison to the number of individuals in the

conservation areas. Additionally, smaller desert tortoises have naturally higher rates of mortality than large animals; therefore, the key to protecting desert tortoises in the long term is to focus conservation efforts on the large animals that have higher rates of survival and are currently reproducing.

Distribution

The Bureau (2015a, page 214) specifically located the development focus areas in regions that have lower potential to support desert tortoises (Nussear *et al*. 2009). From experience, we know that desert tortoises do not occur in some of the development focus areas. The Bureau also estimates that 11,290 acres of modeled desert tortoise habitat within the development focus areas are likely to be developed.

The long-term or permanent loss of approximately 11,290 acres of habitat that may result from implementation of the land use plan amendment related to the development of renewable energy facilities would have a negligible effect on the distribution of the desert tortoise. The following table depicts the amounts of modeled desert tortoise habitat in the affected recovery units (Darst 2014; see table in the Status of the Desert Tortoise section of this biological opinion) and of the estimated amount of habitat likely to be disturbed by the development of renewable energy facilities under the land use plan amendment (Table R.IV.7, Appendix R, Bureau 2015c). All units are in acres.

Recovery Unit	Modeled Habitat	Disturbance	Percentage of Modeled Habitat
Western Mojave	5,595,469	7,800	0.139
Eastern Mojave	3,937,849	90	0.002
Colorado Desert	4,439,363	3,400	0.077

The Colorado Desert Recovery Unit currently supports the most extensive solar development in the action area (i.e., approximately 18,637 acres). If the East Riverside Development Focus Area was fully developed, the amount of disturbance would increase by 3,400 acres. This total loss would amount to 0.50 percent of the modeled desert tortoise habitat in the recovery unit ([3,400 + 18,637] / 4,439,363 x 100 = 0.4964). The loss of this amount of habitat that has lower potential to support desert tortoises will not affect the distribution of the species.

The potential exists that the placement of renewable energy facilities within development focus areas would fragment habitat, even if the proposed action did not appreciably decrease the distribution of the desert tortoise. The Bureau has avoided the placement of development focus areas in locations identified as modeled linkages and high priority habitat and proposed the designation of linkages in the action area (See Figures H-1, 2, and 5 in Appendix H, Bureau 2015c).

Renewable energy facilities within development focus areas would likely cause the disruption of the local movements of a few desert tortoises. However, because the development would not

occupy the entire area of the development focus area and the Bureau (2015c, DFA-VPL-BIO-IFS-3) would require the relocation or redesign of proposed projects with more than 35 large desert tortoises, we expect that the effects of fragmentation on desert tortoise populations as a whole would also be minimal. The following table, which we modified from the final environmental impact statement (Bureau 2015c, Table IV.7-21), depicts the amount of disturbance that the Bureau estimates would occur within linkages; development of renewable energy facilities would occupy a minimal amount of habitat within linkages for the desert tortoise. All units are in acres.

Recovery Unit	Available Lands within Linkages	Solar	Wind	Geothermal	Total
Western Mojave	791,000	3,000	300	0	3,300
Eastern Mojave	728,000	0	0	0	0
Colorado Desert	405,000	600	90	0	690

Effects on Recovery

The Bureau's proposed land use plan amendment would increase protection for desert tortoises through most of the action area as a result of its designation of areas of critical environmental concern and National Conservation Lands and its adoption of numerous conservation and management actions. The Bureau (2015c, page IV.7-186) has proposed to include 92, 93, and 89 percent of the desert tortoise conservation areas and linkage habitat within the Colorado Desert, Eastern Mojave, and Western Mojave recovery units, respectively, within areas of critical environmental concern and National Conservation Lands. The Bureau designates National Conservation Lands to conserve, protect and restore nationally significant ecological, cultural and scientific values. It designates areas of critical environmental concern to highlight areas where special management attention is needed to protect and prevent irreparable damage to important historic, cultural, and scenic values, fish, or wildlife resources, or other natural systems or processes. The Bureau's designation of these land use allocations acknowledges the needs of the desert tortoise and its habitat as nationally significant.

The Bureau has also proposed numerous conservation and management actions to guide its activities throughout the action area. The conservation and management actions contained in the land use plan amendment will guide the Bureau's management of all activities, not merely those associated with renewable energy in development focus areas.

For example, the Bureau's proposal to use caps on the amount of land that can be disturbed within areas of critical environmental concern and National Conservation Lands directly addresses the issue of habitat loss and degradation within these areas that are important for the recovery of the desert tortoise. The Bureau is congressionally mandated to manage public lands for multiple uses; consequently, the Service acknowledges that the Bureau cannot eliminate every use that is likely to adversely affect desert tortoises. However, the proposed conservation and management actions, including the adoption of caps on disturbance, will increase the set of tools by which the Bureau can manage desert tortoises. As we discussed previously in this

biological opinion, the disturbance caps and other management direction that address the development of renewable energy and all other activities are more protective of desert tortoises than those currently in place.

The Bureau's requirement that proponents of all activities that are likely to adversely affect desert tortoises and their habitat compensate for these impacts will provide a mechanism by which the Bureau will be able to acquire additional lands and implement other actions that will benefit the recovery of the desert tortoise. The recovery plans for the desert tortoise (Service 1994, 2011b) recommend the acquisition of lands within conservation areas and the implementation of other actions that remove or reduce sources of mortality or restore habitat. Consequently, this aspect of the land use plan amendment will provide a substantial benefit to the recovery of the desert tortoise. The land use plan amendment does not specifically address how the Bureau would implement the compensation requirements; generally, compensation to date has been implemented on a project-by-project basis. This method can provide important benefits to the conservation of desert tortoises. It is constrained to some degree in that it does not approach the recovery of the desert tortoise in a planned, systematic manner; additionally, the extent to which recovery actions are implemented is a function of the degree of impact of a single project.

We discussed the objectives and criteria to achieve recovery of the desert tortoise in the Status of the Desert Tortoise section of this biological opinion. Several of the recommended actions in the recovery plan (Service 2011b) address issues that are relevant to the development of renewable energy. For example, the recovery plan recommends the siting of solar facilities outside desert wildlife management areas and areas of critical environmental concern and the conservation of sensitive areas that would connect functional habitat or improve management capability of surrounding areas connecting blocks of desert tortoise habitat, such as conservation areas, to maintain gene flow between populations. The Bureau's (2015c, CONS-BIO–IFS-1 through 3) conservation and management actions directly address these recommendations by prohibiting all activities (except transmission) within National Conservation Lands, areas of critical environmental concern, desert tortoise conservation areas, or linkages that would result in the long-term removal of habitat supporting more than 5 adults per square mile or more than 35 adults total. The conservation and management actions also impose disturbance caps with these areas that are designed to limit or reverse the amount of habitat degradation that may occur as a result of various activities.

We note that the Bureau would discontinue use of the term "desert wildlife management area" after adoption of the land use plan amendment. The first recovery plan for the desert tortoise (Service 1994) suggested the use of this term in recognition that recovery of the species was largely dependent on the management of the ecosystem upon which it depends; the goal was that land management agencies would focus on the ecosystem, rather than on single-species management. The Bureau's goals for National Conservation Lands and areas of critical environmental concern are to manage them for the integrity of their ecosystems; the use of the Bureau's own terms will likely facilitate the implementation of the national guidance on the management of these land use allocations. The Bureau's proposed change in terminology will

not adversely affect its management of the National Conservation Lands and areas of critical environmental concern with regard to the recovery of the desert tortoise.

Conclusion

After reviewing the current status of the desert tortoise, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that the Bureau's land use plan amendment, as proposed, is not likely to jeopardize the continued existence of the desert tortoise. We have reached this conclusion for the following reasons:

The proposed action will not affect the reproductive capacity of desert tortoises.

The development and operation of renewable energy facilities within development focus areas will not appreciably reduce the number of desert tortoises within the action area and, by extension, throughout the range of the desert tortoise.

The proposed action will not appreciably affect the distribution of the desert tortoise.

The proposed land use plan amendment will benefit the recovery of the desert tortoise. The Bureau's adoption of conservation and management actions that address all of its activities throughout the action area will increase the level of protection that desert tortoises currently receive (e.g., the revised disturbance caps, prohibitions against siting projects in areas that support more than 35 desert tortoises, etc.). Additionally, the Bureau's requirement that the proponents of all activities compensate for the loss of habitat will allow for the implementation of numerous actions (acquisition of land, habitat restoration, fencing of roads, etc.) that will promote the recovery of the desert tortoise.

Critical Habitat of the Desert Tortoise

As we stated previously in this biological opinion, "destruction or adverse modification" means a direct or indirect alteration that appreciably diminishes the value of critical habitat for the conservation of a listed species (50 CFR 402.02). This regulatory definition focuses on how the proposed action would alter the physical or biological features essential to the conservation of a species or that preclude or significantly delay development of such features.

We determine whether a proposed action is likely to result in the "destruction or adverse modification" through an analysis of how a proposed action affects the physical and biological features of critical habitat within the action area in relation to the entirety of designated critical habitat. For critical habitat of the desert tortoise, this process involves considering the effects at the level of the action area, then at the level of the critical habitat unit (in this case, the Chuckwalla and Fremont-Kramer critical habitat units), and then finally for the entirety of designated critical habitat. Logically, if a proposed action is unlikely to cause a measurable effect on critical habitat within the action area, it is unlikely to affect the species throughout the critical

habitat unit or the remainder of critical habitat. Conversely, an action with measurable effects on critical habitat in the action area may degrade the status of critical habitat to the extent that it is affected at the level of the critical habitat unit or the entire designated area of critical habitat.

After reviewing the current status of critical habitat, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that the proposed action is not likely to result in the destruction or adverse modification of critical habitat of the desert tortoise. We have reached this conclusion because the amount of affected critical habitat comprises approximately 0.44 percent of the amount of the critical habitat within the Chuckwalla Critical Habitat Unit, 0.05 percent of the Fremont-Kramer Critical Habitat Unit and an even smaller portion of the entirety of critical habitat. An additional factor that supports this conclusion for the Chuckwalla Critical Habitat Unit is that the Bureau's proposal to maintain wildlife corridors in this area would reduce the amount of disturbance within critical habitat. Therefore, the proposed land use plan amendment is not likely to diminish the value of critical habitat for the conservation of the desert tortoise.

INCIDENTAL TAKE STATEMENT FOR THE DESERT TORTOISE

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not the purpose of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this incidental take statement and occurs as a result of the action as proposed by the Bureau.

The measures described below are non-discretionary and must be undertaken by the Bureau or made binding conditions of any authorization provided to permittees. The Bureau has a continuing duty to regulate the activities covered by this incidental take statement. If the Bureau fails to assume and implement the terms and conditions of the incidental take statement or to make them enforceable terms of permit or grant documents, the protective coverage of section 7(o)(2) may lapse. To monitor the impact of incidental take, the Bureau must report the progress of its action and the impact on the species to the Service as specified in the incidental take statement (50 CFR402.14(i)(3)).

The regulations that implement section 7(a)(2) of the Endangered Species Act allow the Service to refrain from issuing an incidental take statement when it issues biological opinions on program-level consultations (see “framework programmatic action” at (50 CFR402.02). In many cases, anticipating the amount or extent of incidental take when evaluating a program-level action is not possible because we do not know the locations or nature of future actions.

For the proposed land use plan amendment, the Service knows, within reasonable bounds, the nature of the activities that are likely to be proposed within defined development focus areas. We also have information on how similar activities have affected the species over several years. With that information, we have projected, in the Effects of the Action section of this biological opinion, a conservative estimate of the anticipated amount of take as a result of right-of-way grants that the Bureau is likely to approve under the land use plan amendment. Therefore, we have determined that it is appropriate to include an incidental take statement in this biological opinion. This incidental take statement does not become valid until the Bureau issues its notice to proceed for each right-of-way.

We anticipate that all desert tortoises within the right-of-way for each project site are likely to be taken. We anticipate that most of the large individuals (i.e., those greater than 160 millimeters in length) within the area will be captured and moved from harm’s way to adjacent habitat. Desert tortoises that are not detected during clearance surveys prior to construction may be killed or injured; because of the difficulty in finding small desert tortoises, we expect that most of these individuals, as well as eggs, are likely to be killed, injured, or destroyed during construction.

We anticipate that, at most, 88 large desert tortoises may be present within the 11,290 acres of desert tortoise habitat that the Bureau estimates are likely to be developed. Protocol-level surveys have not been conducted throughout the development focus areas; however, several of the development focus areas are unlikely to support desert tortoises and others are adjacent to areas where few desert tortoises have been recorded in recent years. If more than 88 large animals are determined to be present within the boundaries of the 11,290 acres that the Bureau estimates is likely to be developed, this increased number of individuals would constitute new information revealing effects of the agency action that may affect the desert tortoise to an extent that the Service did not consider in this biological opinion.

Determining the amount or extent of the forms in which the take is likely to occur (killed, injured, or captured) is also difficult. Most of the large individuals within these areas will likely be captured and moved from harm’s way to adjacent habitat. Few larger desert tortoises are likely to be killed or injured because our prior experience is that the proposed avoidance and minimization measures will be effective. However, occasionally even large animals remain undetected during clearance surveys and are likely to be killed or injured during construction. The proponents are also likely to find and translocate some of the small desert tortoises; eggs are unlikely to be detected.

Using the total number of individuals within the 11,290 acres as the anticipated amount of incidental take in the form of desert tortoises that are killed or injured as a result of the renewable

energy facilities would be inappropriate because we fully expect that proponents will capture and translocate numerous individuals. Therefore, we anticipate that the number of individuals killed or injured resulting from the proposed action will be a subset of the number of desert tortoises estimated to be within the action area. Because proponents are not likely to find every dead or injured desert tortoise within the area of the renewable energy facility, the number of dead or injured individuals that are found likely will be a subset of the number that are killed or injured.

To summarize, we do not know the precise number of desert tortoises within the 11,290 acres of desert tortoise habitat that would be developed within development focus areas and cannot predict the total numbers of animals that proponents will capture and move from harm's way over the life of the right-of-way grants, the number of individuals that are likely to be killed or injured, or the number of dead or injured individuals that will be found. Therefore, we cannot precisely quantify the number of individuals that are likely to be killed or injured during the development of the renewable energy facilities. Because proponents are unlikely to find every individual that is killed or injured and we know that this number will be a subset of the total number of desert tortoises present, we will consider the amount or extent of take to be exceeded if the Bureau or monitors find more than 22 large desert tortoises that have been killed or injured as a result of construction, operation, maintenance, and decommissioning of renewable energy facilities within the 11,290 acres that the Bureau anticipates is likely to be developed.

We have chosen 22 large desert tortoises as the upper limit of desert tortoises that may be killed or injured without re-initiating consultation for the following reasons. Our experience with past projects indicates that authorized biologists will successfully translocate the vast majority of large desert tortoises from the project site and that project activities are likely to kill or injure few of these individuals. We also acknowledge that it is reasonable to believe that some large desert tortoises are killed or injured that are not detected. Therefore, because of our experience that most large desert tortoises are likely to be translocated, the amount of habitat that may be developed, and the number of desert tortoises that may be present within the developed areas, we consider the detection of more than 22 dead or injured large animals to be a reasonable point to re-initiate consultation.

We used large desert tortoises to establish this amount or extent of take because small desert tortoises are difficult to find and the method by which we calculate their abundance contains more assumptions and therefore more potential for variation than does our method for predicting the number of large desert tortoises. If the amount or extent of take for large desert tortoises is exceeded, the re-initiation of formal consultation would also require re-evaluation of the effects of the action on small desert tortoises.

We are not establishing an independent re-initiation criterion for the number of small desert tortoises or eggs that would be moved out of harm's way during the development of renewable energy facilities on the 11,290 acres. We refrain from establishing re-initiation criteria for small desert tortoises or eggs because they are difficult to find, their numbers change more rapidly over time, and we encourage proponents to aggressively search for these individuals without the fear of project delays.

The amount of incidental take associated with each right-of-way grant for a renewable energy facility will be a subset of the overall amount of incidental take for renewable energy facilities within development focus areas (i.e., 88 large desert tortoises within 11,290 acres of development and 22 killed as a result of project activities). Because site-specific pre-planning surveys will allow us to more closely assess the number of desert tortoises on site, we will allocate some portion of the total number of large desert tortoises (i.e., 88 present, 22 killed) to each project until the re-initiation criterion has been reached. At that point, the Bureau would either re-initiate consultation or redesign or relocate future proposed renewable energy facilities.

Based on the results of surveys for each proposed renewable energy facility and the list of project-specific protective measures, the Service will assess the amount of incidental take we anticipate related to the right-of-way grant for the individual project. The Service will then provide the Bureau with written documentation of the allocation of incidental take to the project-specific proposed action and the forms of that incidental take, and confirm that we concur with the list of project-specific protective measures. The project-specific allocation of incidental take will serve at the basis for re-initiating formal consultation as related to the specific project.

REASONABLE AND PRUDENT MEASURES AND TERMS AND CONDITIONS

The conservation and management actions proposed by the Bureau include all of the common procedures that it includes in its right-of-way grants and other authorizations to minimize the take of desert tortoises. Additionally, when proponents propose specific renewable energy facilities, the Bureau has proposed to coordinate with the Service, as described in the Description of the Proposed Action section of this biological opinion, to adapt the appropriate conservation and management actions for that activity. Consequently, we have not identified any reasonable and prudent measures or terms and conditions that we consider necessary or appropriate to minimize take of the desert tortoise at this time.

REPORTING REQUIREMENTS, DISPOSITION OF DEAD OR INJURED SPECIMENS, CONSERVATION RECOMMENDATIONS, AND RE-INITIATION NOTICE

These sections of the biological opinion are located after the incidental take statement for the Yuma Ridgway’s rail.

STATUS OF THE CALIFORNIA CONDOR

The Service listed the California condor as federally endangered on March 11, 1967 (32 FR 4001). We designated a population of California condors that was introduced in northern Arizona in 1996 as experimental, ‘non-essential,’ under section 10(j) of the Act (61 FR 54044; October 24, 1996).

Causes of the decline in the California condor population have probably been numerous and variable through time. With the extinction of the large Pleistocene Epoch mammals, California condors declined in range and numbers, possibly because of decreased food resources. Another

large decline occurred when European settlers arrived on the west coast and accelerated during the gold rush of 1849; settlers wantonly shot and poisoned California condors and collected eggs and adults. In the 1980s, recovery efforts included a captive breeding program; by 1987, we removed all individuals from the wild.

Since their reintroduction into the wild, threats were mostly anthropogenic and have included lead poisoning, other contaminants, power line collision, microtrash ingestion, and shooting. Habituation, habitat loss, disease (i.e., West Nile virus) and predation are additional threats. In addition, in 2013 two California condors were discovered dead in open-topped water tanks used to supply firefighting helicopters. Lead poisoning likely caused many deaths of California condors historically and continues to be the most substantial obstacle to recovery.

Lead Poisoning and Other Contaminants. California condors ingest spent lead ammunition that occurs in mammal carcasses that have been shot. Finkelstein *et al*. (2012) found that California condors in California remain chronically exposed to harmful levels of lead that cause significant subclinical health effects; each year, the levels of lead in their blood are high enough (≥450 ng/mL) that approximately 20 percent of wild birds need clinical intervention to avert morbidity and mortality. Between 1984 and 2014, 62 California condors have died of lead toxicity (Service 2015e).

Finkelstein *et al*. (2012) and Cade (2007) concluded that widespread exposure to lead from spent ammunition in all populations of wild California condors is inhibiting the species' recovery. Finkelstein *et al*. (2012) consider lead poisoning to be the most serious source of human-related mortality of California condors. Rideout *et al*. (2012) found that lead toxicosis was the most important mortality factor for the combined free-ranging populations from 1992 through 2009.

The State of California has enacted a ban on the use of lead ammunition for hunting (see next section), but does not restrict its use for other purposes (e.g., for depredation of nuisance animals). Comparisons of lead levels in the blood of California condors prior to and following the passage of the 2007 lead ban in California suggest that so far, these regulations have not reduced lead exposure (Finkelstein *et al*. 2012). In the Arizona/Utah experimental population, lead poisoning is the principal cause of mortality in the wild (Cade 2007). Lead ammunition is not regulated within the range of this population.

Researchers have used stable lead isotope tracer methods to assess lead poisoning sources and have demonstrated that lead ammunition is the primary source in California condors (Finkelstein *et al*. 2012, Church *et al*. 2006). Finkelstein *et al*. (2012) also found isotopes in the blood of several California condors that matched the lead in paint from an inactive fire lookout tower where birds perched.

The recovery plan for the California condor (Service 1996) advocates a supplemental feeding program as an integral component of the release program to reduce exposure to lead and other poisoning from contaminated carcasses. However, as the number of birds in the wild has increased, their range has expanded and they are foraging across larger portions of their range.

Despite the ongoing presence of supplemental food, California condors continue to find their own sources of carrion, including carcasses that contain lead ammunition. To some extent, supplemental food continues to provide lead-free feeding opportunities, but it has not proven to be an effective management tool to eliminate exposure to lead. The recovery field programs continue to use supplemental food to assist in trapping California condors, but it is not the primary food source for wild birds. Supplemental feeding is also used as a food source for recently released juvenile, captive-bred birds that would naturally be fed by their parents prior to learning how to find food.

Kiff *et al*. (1979) identified DDT, an organochlorine pesticide, as a potential contributor to the species' decline in the 1950s and 1960s. Snyder and Meretsky (2003) found little or no correlation between eggshell thinning and the decline of the California condor. In 2006, biologists recovered a thin-shelled California condor egg from the first nest in Monterey County in nearly 100 years; the nesting attempt failed.

Despite being banned in the 1970s, DDT continues to persist in California sea lions (*Zalophus californianus*) along the California coast at very high levels (LeBoeuf *et al*. 2002, Debier *et al*. 2005, Ylitalo *et al*. 2005). Because birds nesting in central California feed on marine mammals, they are susceptible to organochlorine exposure. Burnett *et al*. (2013) found a correlation between eggshell thinning and weight loss rates, an absence of the outer crystalline layer (a characteristic of DDE contamination), and a significantly different eggshell thickness in eggs between southern California birds (which generally do not feed on marine mammals) and birds that feed on marine mammals along the central California coast. DDE is a metabolite of DDT. Additional research is underway to determine if DDE is present in non-viable coastal condor eggs.

Collisions. California condors have not evolved to look directly ahead while flying, making them susceptible to collisions. The visual fields of *Gyps* vultures contain a small binocular region and large blind areas above, below and behind the head, and the head positions typically adopted by foraging vultures suggest that these visual fields provide comprehensive visual coverage of the ground below. However, vultures will often be blind in the direction of travel (Martin *et al*. 2012).

We have historical information that at least two California condors died from collisions with man-made objects, including power lines (Koford 1953). Thirteen of the California condors released since 1992 died as a result of collisions with or, electrocution by, power lines (Service unpublished data, Rideout *et al*. 2012, Meretsky *et al*. 2000, Grantham 2007, Mee and Snyder 2007).

Collisions with the moving blades of wind turbines are a potential threat as California condors move into areas where wind energy development is expanding. Several proposed and existing wind energy projects overlap with or are in close proximity to the occupied and historical range of the California condor, including but not limited to, the Tehachapi Mountains, Sierra Nevada, and the Salinas River Valley. Because of their communal feeding strategy, a single feeding event within a facility could kill many individuals.

To date, we have not documented California condors being struck by turbine blades or colliding with towers. However, several California condors have been documented flying over and near areas where wind energy facilities have been proposed, are operating, or are under construction (Service 2014b). We anticipate that, as they continue to reoccupy their known prior range and wind energy facilities continue to expand, the risk to California condors from wind facilities will increase.

To date, the Service has issued one biological opinion for a wind energy project (Alta East) that addressed California condors; we concluded that the proposed action was not likely to jeopardize the continued existence of the species (Service 2013e). No California condors have died as result of that project, which became operational in December 2013. The Service has not issued any section 10(a)(1)(B) permits on wind energy projects that address or cover the California condor.

Microtrash. Breeding California condors sometimes ingest small man-made materials (e.g., nuts, bolts, washers, copper wire, plastic, bottle caps, glass, spent ammunition cartridges; hereafter, microtrash) and feed these items to their nestlings (Grantham 2007, Mee *et al*. 2007a, Rideout *et al*. 2012). Nestlings are able to tolerate these items in small amounts; however, large quantities can result in impaction of the digestive track, evisceration, internal lesions, and death (Grantham 2007, Snyder 2007, and Rideout *et al*. 2012). The ingestion of microtrash has predominantly affected nestlings in California, where it is the leading cause of death; it has been the major cause of nest failure in the breeding population (Mee *et al*. 2007a, Rideout *et al*. 2012).

Mee *et al*. (2007b) compared the number and mass of foreign trash items collected from historical nests to those from nests of reintroduced California condors and found that trash was significantly more prevalent and numerous in the latter. The occurrence of trash items also tends to be more common in California nests, with the greatest amounts in the southern California region.

Shooting. Illegal shooting of wild California condors remains a potentially substantial threat. Since the reintroduction, two deaths of California condors have been attributed to shooting in California (Rideout *et al*. 2012). Additionally, an adult female required capture and permanent detention after being shot; radiography detected shotgun pellets embedded in the soft wing tissue and other areas of the bodies of two other birds. One California condor was shot and killed with an arrow (Rideout *et al*. 2012). Several poachers have been prosecuted and convicted of killing California condors (Service 2013c).

Habituation. The Service has defined habituation in California condors as the point at which individuals that are attracted to human activity and/or structures no longer respond effectively to hazing (i.e., Service-approved methods for deterring such behavior, including but not limited to yelling, hand clapping, use of leashed dogs, and automated water sprinklers) and must be removed from the wild to avoid physical injury or death to the habituated bird or, potentially, other nearby birds likely to mimic the habituated behavior.

Each release site for California condors has experienced unanticipated problems with birds landing on radio towers, telephone poles, houses and other structures; being fed by humans; and approaching or allowing humans to approach them (Service 2013a, 2014e). These undesirable habituation behaviors were exhibited at a much higher frequency during early years following the establishment of a release site, and persist to a lesser degree in each of the wild populations; however, the capture and temporary captivity of nine habituated condors in 2013 represents the largest number in the Condor Recovery Program's history (Service 2014e). These birds were interacting with humans in the residential communities of Bear Valley Springs, Stallion Springs, and Alpine Forest Park in the northern Tehachapi Mountains, where they have been spending more time. Habituation increases the risk of injury to California condors (or the people they approach) and the likelihood of their associating food with humans, which may result in reduced reliance on natural foraging behavior.

The habituation of California condors to human presence affects individuals because it substantially disrupts their essential behavioral patterns and impairs their ability to survive in the wild. For instance, a habituated bird may seek out and become dependent on humans for proffered food rather than forage in the wild for carrion. The ability to successfully forage is an essential feeding behavior that is necessary for the survival of a California condor in the wild. In many cases, human structures are inherently hazardous to California condors, which can become entangled or entrapped on or in structures, or ingest poisonous household or industrial items associated with human structures, leading to injury or death.

Entanglement in Loose Wires. A California condor became entangled in loose wires on a large tower and died (Service 2013c). California condors frequently perch on large towers; this individual was likely attracted to the wires as a result of the innate curiosity that California condors exhibit towards objects in their environment.

Habitat Loss. The threat of habitat loss is a concern. Habitat used historically by California condors for foraging has been lost to development in Kern, Los Angeles, and Ventura counties over the years. Habitat loss may become an active threat if additional important foraging grounds are converted to land uses that do not provide foraging habitat.

The Service (2013a) issued an incidental take permit to Tejon Ranchcorp for implementation of the Tehachapi Uplands Multiple Species Habitat Conservation Plan that considered the effects of commercial and residential development on 141,866 acres of land in Kern County on 25 covered species, including the California condor. The primary mitigation measure proposed by Tejon Ranchcorp under the habitat conservation plan was the permanent preservation of approximately 129,318 acres of the covered lands, including approximately 87,400 acres of suitable foraging habitat for California condors (Service 2013b). Although the incidental take permit would allow for the disturbance of 5,533 acres within the plan area, most of the area used by California condors for foraging would not be disturbed.

West Nile Virus. West Nile virus has killed both captive and wild California condors (Rideout *et al*. 2012). The recovery program currently uses RECOMBITEK® Equine West Nile

Virus Vaccine. To date, all captive and wild California condors are vaccinated for West Nile virus and provided with a booster annually. The efficacy of the vaccine is thought to be high; the low rate of infection in the population demonstrates this belief. One vaccinated wild bird died; another seemed to be infected but recovered from the disease.

Predation. Predators include black bears (*Ursus americanus*), coyotes (*Canis latrans*), mountain lions (*Puma concolor*), bobcats (*Lynx rufus*), and golden eagles (*Aquila chrysaetos*). Young and newly released condors are more susceptible to predation, whereas older, more experienced condors are known to be more vigilant to predators (Service 2013c). California condors in nests are also vulnerable to predation, particularly from common ravens (*Corvus corax*).

Drowning. Two California condors drowned in dip tanks used to supply firefighting helicopters in Tehachapi Mountain communities in 2013 (Service 2014e). In both cases, the water level was greater than 2.5 feet below the top of the tank and too deep for a California condor to stand.

Recovery Plan

The primary objective of the California condor recovery plan (Service 1996) is the reclassification of the species from endangered to threatened. The recovery plan states that this reclassification may be considered when, at a minimum, at least two non-captive populations of California condors do not require maintenance with one additional population remaining in captivity. Each of the 3 populations must number at least 150 individuals, contain at least 15 breeding pairs, be reproductively self-sustaining and have a positive rate of population growth. In addition, the non-captive populations must be spatially disjunct and non-interacting and contain individuals descended from each of the 14 founders (i.e., the first birds in the captive breeding program).

The recovery plan describes a strategy for reclassification, which includes the following actions: establish a captive breeding program to preserve the gene pool; reintroduce California condors to the wild; minimize mortality factors in the natural environment; maintain habitat for recovery; and implement information and education programs. All of these actions continue to be necessary to facilitate recovery. The captive breeding program is successful and is effective in producing juvenile birds for release. However, because the wild populations are currently not self-sustaining, captive breeding and the release of captive reared birds into the wild remain a necessity. The minimization of mortality factors also remains essential as the species continues to experience lead poisoning and other threats, such as the threat of collision with the turbines of new commercial wind farms, increase within the species' historical range. Maintaining suitable habitat also remains important as increasing numbers of wild birds continue to re-occupy more of their historical range. Additionally, information and education programs, particularly related to the threat of lead poisoning and, possibly to a lesser degree, shooting, continue to be necessary because of mortalities from lead poisoning and shooting.

To implement the tasks in the recovery plan, the agencies managing the groups of California condors treat birds whose blood lead level exceeds safe limits. These chelation treatments may

prevent mortality but are stressful to the birds. Research is underway to evaluate the effectiveness of these treatments versus natural lead depuration in condors. Based on analysis of lead isotopes in feathers, which provide approximately 3 months of lead exposure history, Finkelstein *et al*. (2012) found that only about 10 percent of lead exposures are identified from blood-lead values. Further, many lead exposures have already peaked at the time blood-lead samples are tested.

In July 2008, the California Fish and Game Commission prohibited the use of projectiles containing lead when hunting big game and nongame species within the range of the California condor. In October 2013, the State of California required the use of non-lead ammunition when taking any wildlife with a firearm in California (California Department of Fish and Wildlife 2015). The requirements of this law will be phased but must be fully implemented by July 1, 2019. Existing restrictions on the use of lead ammunition within the range of the California condor remain in effect while the requirements are being phased in. The regulations do not include ranchland management practices; that is, ranchers can still use lead ammunition to put down ill or injured livestock.

Population models based on demographic data show that ongoing intensive management is the sole reason for the increases in the number of California condors. Finkelstein *et al*. (2012) concludes that recovery is dependent upon the elimination or substantial reduction of lead poisoning rates. Research is underway to development more complex condor population viability models, integrating more recent condor survivorship rates, and a variety of different management scenarios.

Various agencies and landowners have also enacted measures to attempt to reduce the amount of lead in the environment. Tejon Ranch banned the use of lead shot and bullets for hunting on the ranch; this measure took effect on January 1, 2008. Fort Hunter Liggett and Camp Roberts have also banned the use of lead for on-base hunting. Alta Windpower Development, the developer of the Alta East Wind Project, is contributing approximately $100,000 annually to implement actions related to the recovery of the California condor, including outreach to hunters and ranchers regarding the threat of lead ammunition to the species.

Utility companies have removed or buried some electrical lines to reduce the likelihood of collisions. Many companies also design transmission lines according to the latest standards established by the Avian Power Line Interaction Committee. Pacific Gas and Electric has replaced several power lines along the Big Sur coast that were responsible for condor mortalities with insulated “tree” wire. These insulated lines may be more visible to California condors and will prevent electrocution if a mid-span collision occurs. To date, no additional mortalities have occurred in association with power lines that have been retro-fitted with tree wire.

Substantial areas of foraging habitat remain in protected open space to support the expanding number of California condors. Large areas of land managed by the Bureau, Forest Service, The Wildlands Conservancy, and other conservation organizations maintain habitat for wildlife and grazing and provide foraging opportunities for California condors. Tejon Ranch, which is located

in the western Tehachapi Mountains, has also conserved land that California condors use for foraging; California condors also use other private rangelands for foraging. We have no evidence to suggest that habitat loss is currently preventing or limiting the condor's expansion into its historical range in California.

The danger that dip tanks pose to condors resulted in the Service working with the local operators of each tank to prevent further condor deaths by keeping the tanks drained when not in use or covered when in use.

Biologists involved with recovery efforts for the California condor attempt to reduce the amount of microtrash and its threat through two methods. The first, known as nest guarding, involves periodically climbing into nests, cleaning the nest floor of any microtrash, and assessing the nestling for consumption-related distress, including stunted growth. Cleaning trash from nests has been effective in preventing impactions from forming in the birds' gastrointestinal tracts. Occasionally, biologists temporarily remove chicks with impactions from their nests, surgically remove the impaction, and return the chicks within 24 hours (Service 2013c).

The second method for reducing this adverse effect is by identifying and cleaning up the locations where the parents collect microtrash. Many of the actively breeding California condors carry GPS transmitters that broadcast locations and speed during daylight hours. Biologists can then determine potential sources of microtrash by investigating the locations where birds spend time on the ground. Microtrash sites tend to be roadside pullouts or overlooks where people discard bottles or other refuse that eventually breaks into coin-sized pieces. We have anecdotal evidence that cleanups have reduced the amount of microtrash collected by pairs with a propensity to use a particular site (Service 2013c).

Five-Year Review

The following information is from the 5-year review (Service 2013c); we are appending the 5-year review of the status of the California condor (Appendix 9; Service 2013c) to this biological opinion and are incorporating it by reference. Three populations of California condors currently exist in the wild: a blended population in central and southern California and independent populations in Arizona and Baja California. California condors remain absent from the northern portion of their former range.

Birds raised in captivity are routinely released in California, Arizona, and Baja California to expand the wild populations. Breeding pairs have formed in the wild after their release; some of these pairs have fledged chicks. In the 2015 breeding season, 30 percent of the birds in the southern California flock were paired and nesting (Kirkland 2015b).

Despite these efforts, the status of the species remains endangered due to the continued high mortality rates that cannot be naturally offset due to the low numbers of individuals and the naturally low reproductive rate of the species. The populations of wild California condors have not exhibited a positive rate of growth; annual mortality continues to surpass productivity in

these populations. The Service expects that releases and intensive management will be required to sustain and grow the populations into the future until the leading cause of mortality (lead contamination) is resolved in all three of the wild populations.

Core Criteria for the Jeopardy Determination

We have explained the relationship of these core criteria to our jeopardy determination in the Status of the Desert Tortoise section of this biological opinion.

Reproduction

Finkelstein *et al*. (2012) found that ingested lead results in decreased survival, poor body condition, behavioral changes, and impaired reproduction on wildlife. Although we know that California condors can die from ingesting lead, we do not have information regarding the impact of chronic lead exposure on their reproduction (Service 2013c). Breeding adults that have been exposed to lead may become so lethargic that their nests fail.

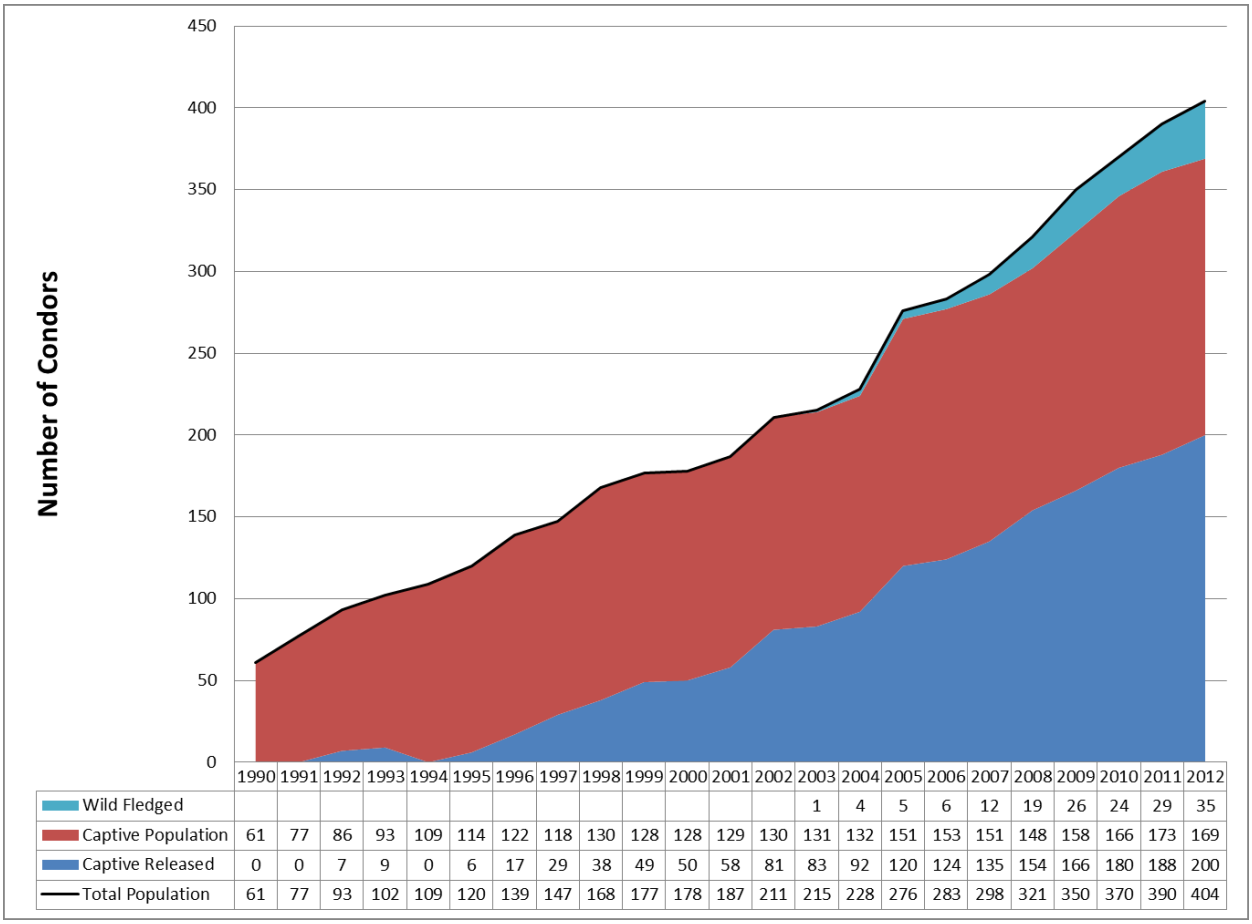
As we noted previously in this biological opinion, California condors along California's central coast are feeding on organochlorine-contaminated marine mammals. Bald eagles that scavenged similarly contaminated marine mammals exhibited eggshell thinning and reproductive failure (Garcelon *et al*. 1989 in Service 2013c).

Microtrash has also caused mortality of California condor chicks. California condors are slow to reach the age at which they can reproduce; they also have a low reproductive rate. Anthropogenic interference with the California condor's already-low reproductive rate impedes progress towards recovery of this species.

Numbers

As of April 2015, 421 California condors comprised the total world population (Service 2015e). In California, the central coast flock included 61 birds and the southern California flock included 67. The Baja California flock included 27 birds and the Arizona/Utah flock had 73 birds. The remaining 193 birds were in several captive breeding programs.

The following graph from the 5-year review (Service 2013c) depicts the number of captive birds, birds that were released into the wild, and wild bred from 1990 through 2012. The continued growth of the population results from the release of captive-bred California condors; the annual mortality of wild birds continues to surpass productivity.



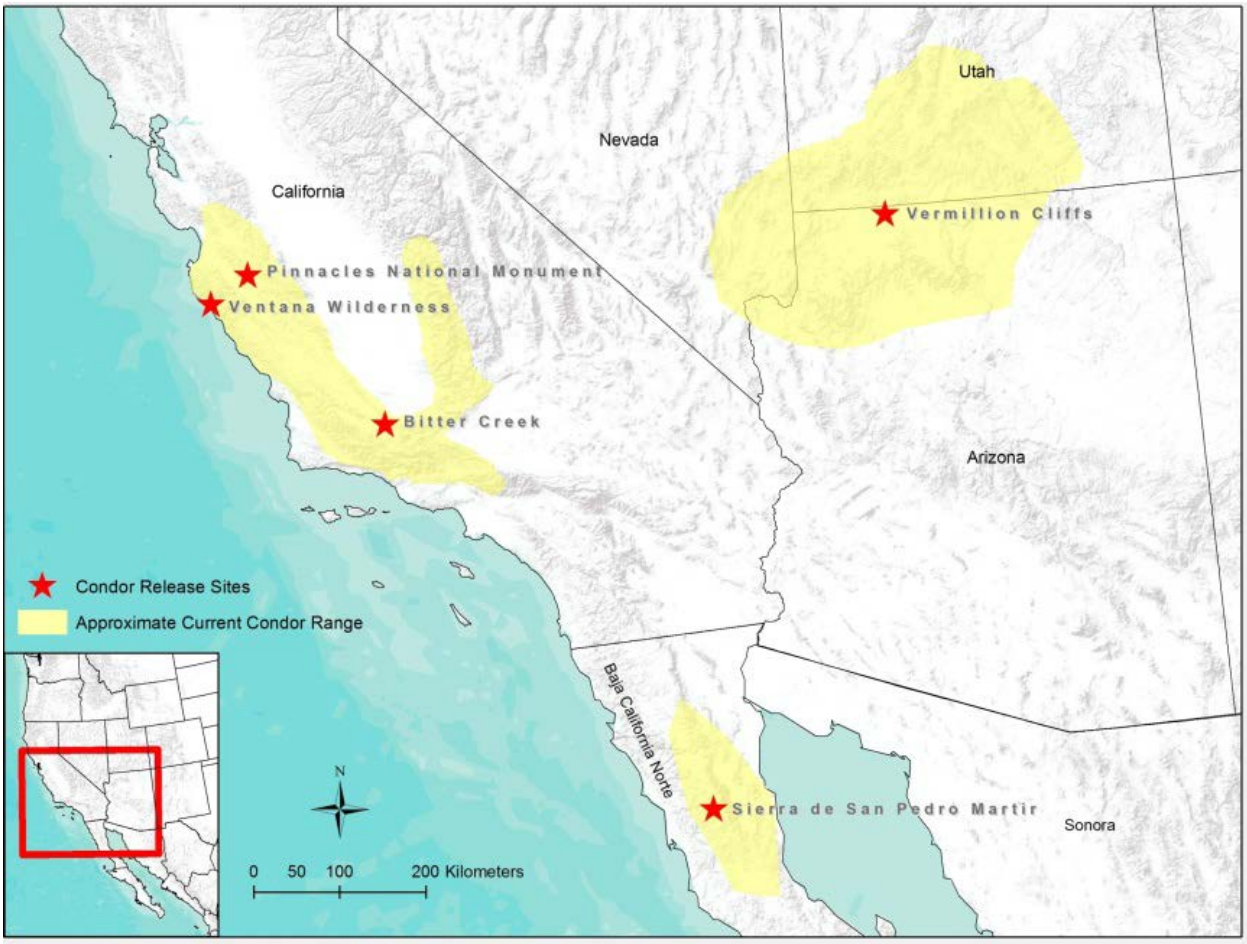
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Wild Fledged														1	4	5	6	12	19	26	24	29	35
Captive Population	61	77	86	93	109	114	122	118	130	128	128	129	130	131	132	151	153	151	148	158	166	173	169
Captive Released	0	0	7	9	0	6	17	29	38	49	50	58	81	83	92	120	124	135	154	166	180	188	200
Total Population	61	77	93	102	109	120	139	147	168	177	178	187	211	215	228	276	283	298	321	350	370	390	404

Distribution

California condors are highly dependent on topography, which dictates prevailing wind patterns (Service 1996). Their large body size and broad wings require California condors to soar rather than constantly flap their wings to cover long distances. Most flights by California condors follow mountains and foothills where they use orthographic lift generated by topography and thermal updrafts to generate lift. Only one California condor has been documented actually crossing over the Central Valley from the coast range to the southern Sierra Nevada (Snyder and Snyder 2000). However, distances across the Central Valley between inland mountain ranges, such as the Diablo Range near Pinnacles National Park and the Sierra Nevada foothills, are much shorter; as their numbers increase, California condors may begin to use this route. California condors freely cross flat agricultural regions that are much less extensive than the Central Valley, such as the Cuyama, Salinas, and western Antelope valleys. Recently, several birds visited the foothills of the Tehachapi Mountains west of the town of Mojave to scavenge a deer carcass.

Snyder and Snyder (2005 in Service 2013c) estimated that California condors ranged from southern British Columbia to Baja California Norte and possibly as far east as western Colorado

in approximately 1800. The following map from the 5-year review (Service 2013c) depicts the current range of the California condor.



In California, California condors are gradually moving farther north along both the coast and Sierra Nevada. They also occasionally fly farther east through the Tehachapi Mountains and the Transverse Ranges. Recently, a bird from the Grand Canyon flock flew to Los Alamos, New Mexico. We expect that the California condor will continue to increase the use of its former range as the number of wild birds increases.

ENVIROMENTAL BASELINE

Previous Consultations in the Action Area

The biological opinions for the Bureau's previous land use plan amendments and the Alta East Wind projects are the only consultations regarding the California condor that we have conducted within the action area. We have described the biological opinions regarding the land use plan amendments in the Consultation History section of this biological opinion. We discussed the

biological opinion for the Alta East Wind project in the Status of the California condor section of this biological opinion.

Status of the California Condor in the Action Area

California condors do not nest in the action area. At this time, California condors are found only in the West Mojave and Eastern Slopes Ecoregion. They may occasionally fly over the westernmost areas of subunit 1.

In subunit 2, we are aware of several flights that California condors have made to the eastern edge of the mountains north of the town of Mojave. They occasionally cross the western end of the Antelope Valley. Birds routinely roost, perch, forage, and fly over the higher elevations in the southern Tehachapi Mountains (e.g., Double and Covington mountains), which are located approximately 14 miles to the west of the town of Mojave; we are also aware of at least some scavenging activity on the southern slope of the Tehachapi Mountains in this area.

California condors are unlikely to use subunit 3, which is located farther east in the desert. Subunit 4 is located to the south of subunit 2. As we noted for subunit 2, birds occasionally fly across the western end of the Antelope Valley. California condors may enter the planning area infrequently along the ridges that lie just north of the Angeles National Forest, to the south of the Antelope Valley. At this time, California condors do not use the action area extensively; as the number of birds in the wild increases, we expect that they will become more common in the westernmost, mountainous portions of the action area.

EFFECTS OF THE ACTION ON THE CALIFORNIA CONDOR

The land uses associated with renewable energy have the potential to affect California condors through collisions with turbines, meteorological towers, or power lines; being struck by turbine blades; electrocution; exposure to microtrash; habituation to human structures and activities; and habitat loss. The Bureau's proposed action will also require the proponents of projects that may kill or injure a California condor to contribute towards recovery efforts for this species. We will analyze these potential effects in relation to wind and solar power. Based on the known distribution of the California condor in the action area (i.e., the Tehachapi Mountains and southern Sierra Nevada) and its distribution outside the action area (i.e., generally to the west of the action area), we have limited our analysis to subunits 1, 2, and 4 of the West Mojave and Eastern Slopes Ecoregion. The Bureau anticipates that geothermal development is unlikely to occur in these subunits; therefore, we did not address geothermal activities.

Wind Energy

<u>Construction</u>

The potential effects associated with construction would be short term, relative to the operational life of the wind facility. Construction activity could attract California condors to work sites

where they may collide with equipment (e.g., large cranes, meteorological towers, pre-operational turbines), become entangled in wires, and be exposed to microtrash and carcasses.

Collisions with Equipment. California condors could enter the action area and collide with large cranes, towers, and pre-operational turbines. Systems to detect California condors would not protect them from collisions with these objects because they are stationary. Martin *et al*. (2012) suggest that vultures will often be blind in the direction of travel due to their visual fields. Additionally, Smallwood (2013) has documented avian fatalities at wind facilities with non-operating turbines.

Conversely, Barrios and Rodriguez (2004) considered non-rotating turbines to be a "no-risk situation." Lucas *et al*. (2012) found that griffon vulture mortality at wind facilities in southern Spain was reduced by 50 percent after implementing a selective stopping program when vultures were observed near them. None of the mortalities were with non-operational turbines (Lucas 2013), which indicates these vultures were able to differentiate between rotating and stationary blades.

We expect the risk to California condors from cranes, towers, and inoperable turbines to be slight because they are large, stationary objects that would be fully visible to the birds. Rideout *et al*. (2012) examined the causes of mortality of 98 California condors that died from 1992 through 2007; they did not document any instances of California condors colliding with large, stationary objects such as cranes, towers, or non-operational turbines. Moreover, California condors routinely land and perch on radio towers, telephone poles, and other large structures (Service 2013c).

The meteorological towers may have guy wires; these wires likely pose a greater degree of threat to California condors because they are less visible than cranes or turbines. The Bureau would require any structures with guy wires to be marked with recommended bird deterrent devices at the appropriate spacing intervals (LUPA-BIO-IFS-17). These devices should increase the visibility of the guy wires. Additionally, guy wires used during construction would be in place for a relatively short period of time.

Entanglement in Wires. We are aware of one instance where a California condor landed on a large tower, became entangled in loose wires, and died (Service 2013c). The Bureau's conservation and management actions generally provide guidance that will require project proponents to design and build wind facilities such that loose wires on large towers will not be exposed (e.g., LUPA-BIO-IFS-15, 21, 23). Consequently, we do not expect that loose wires on large structures will kill or injure California condors.

Exposure to Microtrash and Carcasses. Due to their curious nature, California condors may be attracted to construction sites; the presence of microtrash and carcasses of animals killed by construction activities may cause them to land. If they land, they may become habituated to human activity, which could eventually lead to their deaths or removal from the wild.

This threat would likely be greatest when construction sites are idle; otherwise, the high level of activity would likely deter California condors from landing. Additionally, the Bureau will require

project proponents to implement several measures (LUPA-BIO-IFS-15, 18, 19, 21) that will reduce the likelihood that California condors will be injured or killed at construction sites. For example, workers will be required to contain all equipment and work-related materials in closed containers either in the work area or placed inside vehicles; this measure will reduce the likelihood that microtrash will be present. The presence of authorized biologists during construction (LUPA-BIO-2) will enable the Bureau to monitor construction activities and adapt on-site management to address specific circumstances that may arise; these measures would include the removal of microtrash and carcasses. For these reasons, we do not expect microtrash and carcasses to result in adverse effects to California condor during construction.

Common Ravens. Common ravens are often attracted to construction sites because of the increased human activity; California condors often follow common ravens to carrion. If California condors follow common ravens to construction sites, they may be exposed to the threat of the microtrash. As discussed previously, we do not expect microtrash to be a substantial threat during construction because the high levels of activity may discourage California condors from entering work sites. Additionally, the Bureau will implement measures to minimize potential impacts, if they arise during construction (LUPA-BIO-IFS-21). For these reasons, we do not expect adverse effects to California condors from attraction of common ravens to the site.

Habitat Loss. We are unaware of any nest sites within or near the development focus areas, although the potential exists that, at some point in the future, California condors may establish nests in the development focus areas that lie to the west of the Jawbone Canyon area. The Bureau (2015c, DFA-VPL-BIO-ICS-2) will require wind and transmission projects to be set back 5 miles from nest sites of California condors. This conservation and management action will ensure that future development of wind energy does not result in the loss of any nest sites.

The Bureau (2015a) estimates that approximately 250,000 acres of potential modeled habitat for the California condor occur within the action area; this area lies primarily in the Tehachapi Mountains and southern Sierra Nevada and has the potential to support foraging activity. Approximately 4,000 acres within development focus areas overlap the potential modeled habitat for the California condor; the Bureau estimates that full development of these development focus areas for wind energy would result in the loss of approximately 264 acres of foraging habitat (Table II.3-24, Bureau 2015a). Given the large areas that birds routinely fly in search of carcasses, the loss of 264 acres of foraging habitat would have a negligible effect on the species.

The Bureau (2015a, DFA-VPL-LIVE-2) would require the grazing permittee and wind operator to eliminate the grazing of livestock in areas used by the California condor within the right-of-way of the wind project. The Bureau (2015a) estimates that the rights-of-way for the development of wind energy may cover approximately 4,000 acres of potential foraging habitat. The removal of livestock from these areas may reduce the number of carcasses present. Some potential exists that native or feral wildlife may increase in abundance with the removal of livestock grazing and provide another source of carcasses to California condors; whether this happens is a function of the types of habitat present and the level to which livestock grazing influenced the abundance of other species. The removal of livestock carcasses may reduce the likelihood that California

condors would attempt to forage within the boundaries of a wind facility and thereby reduce the likelihood that birds would be struck by a turbine blade. This potential reduction in foraging habitat would have a negligible effect on the California condor because of the extensive areas that birds travel to forage.

The loss of habitat (and carcasses) that is likely to result from the proposed land use plan amendment is likely to have a negligible effect on California condors.

Overall, we expect that the construction of wind facilities is unlikely to kill, injure, or cause the habituation of California condors because of the short duration of these activities, the numerous protective measures that the Bureau will require to project proponents to implement, and the low probability that California condors will collide with large, stationary objects.

Operation

The potential effects associated with the operation of wind facilities would be similar to those associated with construction (e.g., collisions with equipment such as meteorological towers and turbines, entanglement in wires, and exposure to microtrash and carcasses) but would occur over a much longer period of time. In addition, moving turbine blades could strike California condors; the Bureau's proposed management of wind facilities may also increase the likelihood of collisions with generator-tie lines, alter the availability of carcasses upon which California condors feed, cause habituation of birds, and increase the attractiveness of the area to common ravens.

Even though the duration of operation and maintenance activities would be longer, the potential effects associated with collisions with equipment and exposure to microtrash and carcasses would be similar to those that would occur during construction. Because fewer workers would be present and less activity would occur, we expect that considerably less microtrash would be generated on a daily basis during operations.

Moving Turbine Blades. During the operation of wind facilities, California condors would be at risk of being struck by a moving turbine blade. To the best of our knowledge, no California condor has been killed or injured by a turbine blade. We attribute this to the fact that relatively few California condors exist in the wild (i.e., compared to turkey vultures (*Cathartes aura*) or several other species of large birds) and the areas where they have spent most of their time since their re-introduction into the wild do not overlap with wind energy facilities. That is, California condors have been sighted and tracked flying near and over wind facilities and on the ground near wind facilities but they currently do not frequent areas that are occupied by turbines. However, tracking data show that California condors are exhibiting an increasing trend toward more frequent flights over and near operational wind farms along the southern flank of the Tehachapi Mountains (Kirkland 2015b).

Other species of vulture with similar characteristics and behavior as the California condor, such as griffon (*Gyps fulvus*; an Old World species that is almost as large as the California condor) and turkey vultures, have been documented to collide with commercial wind turbines. Griffon

vultures were shown to be susceptible to colliding with turbines at some wind energy facilities in Europe (Barrios and Rodriguez 2004). Lucas *et al*. (2012) documented 221 dead griffon vultures within 13 wind farms in a 4-year period that contained a total of 296 turbines. In Wisconsin, Garvin *et al*. (2011) found that turkey vultures displayed high-risk flight behaviors, defined as flights directly toward a turbine without signs of avoidance, circling around a turbine and within the rotor plane, more often than all other raptor species.

Conversely, in one study in the Altamont Pass Wind Resource Area in California, the fatality rates of turkey vultures were considered low, which indicated that species-specific behavior or visual acuity reduced their susceptibility to collision (Smallwood *et al*. 2009). Although Garvin *et al*. (2011) found that turkey vultures displayed high-risk flight behavior, they also found that turkey vultures showed signs of avoidance, defined as changes in flight height category or flight direction that deviated away from turbines or turbine blades, regardless of distance to turbines. Cooper *et al*. (2012) did not observe griffon vultures colliding with wind turbines although most birds did not exhibit any reaction to them; that is, i.e., they did not change direction, altitude, or both. Cooper *et al*. (2012) suggested that "collision fatality estimates for griffon vultures may be best modeled using (greater than 99 percent) avoidance rates" and that this estimate be used to model collision risk for the California condor. We could not ascertain the differences in results from the information in these sources and we do not know if all collisions documented were with rotating or stationary blades as that is often not reported. In summary, based on the behavior of similar species, California condors may attempt to avoid moving turbine blades; however, at this time, we do not have sufficient information to predict their behavior in relation to moving turbine blades with any confidence.

We anticipate that the number of California condors in the wild, including in the southern California flock, will continue to increase over the life of the proposed land use plan amendment and of any right-of-way grants for wind facilities through both the release of birds raised in captivity and breeding in the wild. We also anticipate that California condors will continue to expand their use of the Tehachapi Mountains and the southern Sierra Nevada over this time. The increase in the numbers of birds and their wider use of habitat in the planning area would increase the level of threat of California condors being struck by a turbine blade.

To address this potential increased threat, the Bureau has proposed to implement LUPA-BIO-IFS-15 and 20 through 23. Through these conservation and management actions, the Bureau would require any project proponent to implement the best detection, deterrence, and curtailment strategy available at the time of the activity to minimize adverse effects and avoid or minimize the likelihood of injuring or killing a California condor; implement additional measures to minimize potential impacts to California condors if they begin to visit the site of an activity; curtailing operations or activities using best available techniques if an activity-specified trigger for injury or mortality of California condors is reached; and developing and implementing an activity-specific Condor Operating Strategy to avoid or reduce the likelihood of injury and mortality of California condors from that activity.

These conservation and management actions generally describe the protective system that the Alta East Wind Project (Alta East) implements. Alta East is the only wind facility on which the Bureau and Service have consulted in relation to the California condor (None of the wind facilities operating on private lands have applied for an incidental take permit, pursuant to section 10(a)(1)(B) of the Endangered Species Act, for the California condor). During all daylight hours, Alta East uses a scanner to detect California condors that have been fitted with VHF transmitters. Alta East also uses radar, which detects large birds, and a biologist located in a tower who visually scans the area. The biologist uses these three tools to assess whether a California condor (or golden eagle [*Aquila chrysaetos*]) is approaching too closely and informs Alta East if it needs to curtail its turbines.

Curtailment of the turbines involves turning the blades to the point that they are almost perpendicular to the wind, thereby reducing the surface area of the blade exposed to the wind and subsequently reducing the speed of the blade. If the blades cannot be positioned completely perpendicular to the prevailing wind, they would continue to rotate at approximately 3 miles per hour at the tip of the blade when the wind is approximately 55 miles per hour (Appendix D; Bureau 2012b). In comparison, the speed at the blade tip can reach 150 miles per hour when the turbine is not curtailed. The turbines at the Alta East Wind project come to a complete stop in approximately 2 minutes (Martin 2015a).

Our professional judgment is that California condors would be able to see blades when they are moving at 3 miles per hour, perceive that a solid object is nearby, and avoid contact. Lucas *et al*. (2012) found that selective curtailment of specific turbines within wind farms resulted in an approximately 50 percent decrease in the mortality of griffon vultures and suggested “that trained observers can be effectively used to mitigate mortality rates in operating wind farms.”

If the Bureau considers issuing a right-of-way grant for a wind facility within a development focus area under the proposed land use plan amendment, it would work with the Service and applicant to develop and implement a means of monitoring the project, detecting California condors if they approach the facility, and curtailing the turbine blades to reduce the risk that a turbine blade would strike a bird. The Bureau and Service will base this system on the best information available at the time of the right-of-way application. Such a system could be similar to that used at Alta East or it could involve different types of technology.

For example, a VHF-based detection system is dependent upon the Service capturing California condors and attaching transmitters to them. As they become more accustomed to the wild, California condors have become more difficult to trap to attach transmitters and, in the long term, the Service does not intend to maintain transmitters on most birds. A radar-only system has the disadvantage that it cannot, at this time, differentiate between California condors and other birds. We expect that wind companies will continue to experiment with other detection systems over time.

During project-specific planning, the Bureau will also incorporate triggers (e.g., killing or injuring a California condor) that would require the implementation of adaptive management,

such as nighttime-only operations. The use of adaptive management will allow the Service and Bureau to address new circumstances appropriately and maintain a high level of protection for California condors.

If a California condor is struck by a turbine blade and the individual was a member of a pair that was caring for a nestling that was close to fledging, we expect that the nestling would likely survive. If the California condor was a member of a pair that was caring for an egg or young nestling, the egg or young nestling would also perish because single parents cannot incubate an egg or care for a young nestling on their own. During the 2015 breeding season, 30 percent of the birds in the southern California flock were breeding (Kirkland 2015b). California condors that nest successfully generally typically breed every other year; this aspect of their breeding ecology lessens this risk to some degree. The lack of traditional roost or nest sites for the California condor within the development focus areas also reduces this risk. Finally, the proposed protective measures would likely allow project operators to curtail turbines to avoid injury or mortality of birds. In the long term, this risk would increase because we expect more breeding birds to be present in the population; however, the protective measures would remain in place as their numbers increase.

The potential exists for several California condors to enter a wind facility over a short period of time to feed. California condors descending on a carcass may be less likely to notice a moving turbine blade; these birds would be vulnerable to being struck by turbine blades. We do not expect that such an event could occur at a project site without being detected because, with so many birds in one place, the VHF, radar, or other system or the human observer would detect the approach of numerous individuals, which would lead to curtailment.

Although the monitoring system at the Alta East Wind Project has detected California condors in the vicinity, none have approached the facility. One could argue that the lack of close approaches by California condors means the detection system has not been tested. However, between the onset of operations and August 2015, the approach of golden eagles has caused the Alta East Wind Project to curtail its turbines 120 times (Martin 2015b); to the best of our knowledge, no golden eagles have been struck by the blades of turbines at the Alta East Wind Project. Because golden eagles are smaller and faster but are being detected at Alta East, we expect that such a system would function equally well for California condors.

The Bureau (2015a) estimates that between one and three California condors could be struck by turbines over the life of right-of-way grants issued under the auspices of the proposed land use plan amendment. Although none have been killed during approximately 2 years of operation of the Alta East Wind Project, the longer time frame of the proposed land use plan amendment, the larger area that may be used for wind energy generation, the expected increase in the number of California condors in the wild, and their expanding range render this a reasonable estimate. For the purpose of our analysis, we will assume that three California condors may be struck by turbine blades over a 30-year period, which is the likely life of a right-of-way grant for a wind facility.

As we discussed previously, if a California condor that is struck by a blade has a young nestling or egg in its nest, the nestling or egg would likely also die. We consider it unreasonable to assume that all three California condors that may be struck by turbine blades would have a young nestling or egg in the nest at the time of its death. Consequently, for the purposes of this analysis, we will assume that one young nestling or egg may die as a result of one of its attending adults being struck by a turbine blade over the life of the land use plan amendment and issued right-of-way grants (In the event that a California condor caring for an egg or young nestling is struck by a turbine, biologists working on recovery of the California condor may attempt to recover the egg or young nestling and raise it in captivity for future release into the wild if they know where the nest is and that a parent bird was lost).

Over the life of the land use plan amendment and issued right-of-way grants, we anticipate that the number of California condors in the wild will continue to increase and that these birds will expand the area that they use. We expect that this expansion will include the Tehachapi Mountains and southern Sierra Nevada.

The Bureau's proposed conservation and management actions also address the potential that its activities may have unanticipated effects on California condors. Through LUPA-BIO-IFS-22, the Bureau would require the operator to curtail operations or activities using best available techniques if an activity-specified trigger for injury or mortality of California condors is reached.

For example, at the time that the Bureau considers a future project, one activity-specified trigger that the Bureau may require is that the operator would go to night-only operations if a turbine blade strikes a California condor; day-time operations could resume when the Bureau and Service agree that the operator has implemented sufficient additional measures to prevent a reoccurrence. The Alta East Wind Project is currently operating under similar direction; the Bureau requires the project operator to implement adaptive management if the number of California condors increases in the project area, they change their flight patterns in a manner that brings them into the detection perimeter, or the percentage of birds equipped with VHF transmitters drops below 70 percent of the southern California flock. This strategy requires the operator to implement an alternative detection system or to implement night-time only operations (because California condors do not routinely fly at night). Either option will ensure that the risk of a turbine blade striking a California condor remains low.

Collisions with and Electrocution by Generator-tie Lines. California condors have died as a result of collisions with transmission lines, resulting from both blunt-force trauma and electrocution. (The biological assessment (Bureau 2015a) includes generator-tie lines in its discussion of transmission lines). Several of these events involved immature birds repeatedly using a flight path that crossed transmission lines. In most cases, however, California condors are able to avoid collisions with transmission lines. Additionally, the Bureau will require project proponents to bury collector lines, restrict perching opportunities, and reduce collision risks, where feasible (TRANS-BIO-1). In one situation where two California condors had collided with a transmission line and been electrocuted, the power company replaced standard wiring with insulated "tree" wire, which is approximately 0.25- to 0.5-inch thicker than standard wiring and

is covered in a black plastic sheath; since that replacement, no other California condors have collided with the transmission line (Kirkland 2015a). A power company has modified power poles where California condors were regularly perching to decrease the likelihood of electrocution.

The recovery program trains California condors to avoid perching on power poles prior to their release into the wild (aversion training). The training works to some degree but wild-bred birds do not receive this training (Kirkland 2015a). A power company recently installed a mock power pole outside a flight pen to help condition wild and captive bred birds to avoid such perch sites (Kirkland 2015b). Aversion-trained birds that observe wild-bred individuals perching on power poles may forget their training.

The Bureau will require the project proponents to site generator-tie lines to avoid ridgelines and the crossing of canyons, to the maximum extent practicable (TRANS-BIO-3). This measure would also reduce the likelihood that California condors will collide with a line. California condors routinely cross transmission lines; experienced birds are likely aware of the locations of transmission lines in areas that they regularly use. Consequently, adding a generator-tie line to a corridor that already contains other lines is unlikely to present a substantial new hazard to California condors.

The Bureau (2015a) notes that these measures would reduce the likelihood that generator-tie lines would kill or injure California condors. It also notes that eliminating all risk of electrocution is impossible. We concur with the Bureau's conclusions.

Collisions with and electrocutions by powerlines resulted in 11 of the 135 deaths of California condors between October, 1992, when the first captive-bred California condor died, and December, 2009 (Rideout *et al*. 2012). Although Rideout *et al*. (2012) note that the number of lethal interactions with transmission lines "declined significantly" between 1994 and 2007, we are aware of at least three instances of California condors striking powerlines since 2007 (Kirkland 2015a); the potential also exists that some birds may have died as a result of collisions but were never found. Overall, we conclude that generator-tie lines pose a low risk to California condors.

Habituation. As part of their natural behavior, California condors investigate their environment, which increasingly includes humans and human structures. California condors in close proximity to humans and their structures will likely experience positive reinforcement (e.g., microtrash, garbage upon which they can feed, direct feeding by people) that can lead to a potentially dangerous situation (e.g., entanglement in wires and screens, ingestion of trash or harmful chemicals). California condors may teach undesirable behavior to other individuals, which further expose more birds to injury or mortality. The potential also exists that the Service would take birds that become habituated to human activities into captivity. They could be released back into the wild at a later date or remain in captivity, either as part of the captive breeding program or put on exhibit depending on their genetic value to the captive population.

We cannot predict whether activities at a wind facility would lead to a situation where California condors may become habituated to human activities. If California condors began to frequent a wind facility and seemed to be attracted by activity, the Bureau will implement additional measures to minimize potential impacts (LUPA-BIO-IFS-21). These measures could include modification of the activity to reduce its attractiveness to California condors or hazing of the birds to cause them to leave. We conclude that the operation of wind facilities is unlikely to result in the habituation of California condors to human activities.

Common Ravens. The operation of wind turbines may result in the mortality of various species of birds and bats; common ravens may be attracted to their carcasses. Because California condors often follow common ravens to carcasses, they may lead California condors to the site and the threat of the turbines. As with habituation, however, the Bureau will implement additional measures to minimize potential impacts, if they arise during operation (LUPA-BIO-IFS-21). For this reason, we do not expect adverse effects to California condors from attraction of common ravens to the site.

Climate Effects. Refer to the previous discussion with regard to climate effects on desert tortoises for background on research conducted by Zhou *et al*. (2012). The Bureau (2015c, Table IV.7-27) estimates that 58 wind turbines are likely to be developed within subunit 2 of West Mojave and Eastern Slopes Ecoregion under this land use plan amendment.

The 58 turbines that may be constructed as a result of the proposed land use plan amendment are unlikely to cause measurable warming of the local area because of the relatively low number of turbines compared to those in the study area in Texas (i.e., 58 turbines compared to 2,358; Zhou *et al*. 2012). Additionally, the development focus areas in the proposed action are scattered in numerous parcels over a large area; we expect that this scattering of turbines over a large area would further dilute any effects of warming due to the turbines.

As a component of all the turbines in the region, the potential exists that warming could occur over a larger area that would include the development focus areas. Based on the available information, we cannot determine whether the regional temperature would increase as a result of the wind facilities; differences in topography and daily wind patterns between the study area and the project site may produce dissimilar results from those found by Zhou *et al*. (2012). Additionally, we are uncertain how a minor warming of the area over decades would affect the plant community, which would, in turn, affect the type and abundance of carcasses in the region. Finally, we cannot assess how wind energy generated within the action area would affect larger-scale climate change (e.g., potential reductions in carbon emissions). In conclusion, given the large range of the California condor and the potential slight warming of a small portion of that range, any climate effects associated with the development of wind energy in the action area is unlikely to measurably affect California condors.

Support for Recovery of the California Condor. The Bureau will require the proponents of projects that have the potential to kill or injure a California condor to develop a condor operations strategy that includes measures to assist in the conservation of the species (LUPA-BIO-IFS-23). These

measures may include providing funding to reduce other risks (such as lead poisoning), outreach and education regarding the threat that lead ammunition poses, scientific research to guide future wind development in the action area to further protection of California condors, or other means of support for the recovery program. Any of these actions would benefit the recovery of the California condor.

As noted previously, lead poisoning is inhibiting the recovery of the California condor throughout its range; alleviating this threat would likely result in fewer deaths of California condors and facilitate achieving the recovery goal of a self-sustaining wild population (Finkelstein *et al*. 2012). Regulatory efforts in California, enacted in 2008 and 2015 (California Department of Fish and Wildlife 2015), seek to mitigate this hazard to California condors by partial bans on the use of lead ammunition within the range of the California condor. Currently, lead ammunition cannot be used for hunting within the range; by July 2019, the State of California will require the use of non-lead ammunition when taking any wildlife with a firearm anywhere in California.

Kelly *et al*. (2011) found that lead exposure in both golden eagles and turkey vultures declined significantly post-ban. However, Finkelstein *et al*. (2012) found no indication that lead levels in the blood of California condors had declined in 2009 and 2010 compared with 2006 and 2007. We are unable to explain these conflicting results.

In addition to regulatory efforts, agencies and partners have focused on providing public education and outreach on the lead threat to California condors. Although not quantifiable, these efforts seem to be effective at getting information on the threat of lead in ammunition to hunters at sporting events and expositions (Garcelon 2013, Kuhlman and Garcelon 2015).

The current ban on the use of lead ammunition for hunting in California within the range of the California condor and the future banning of lead ammunition for the taking of all wildlife in California will reduce the amount of lead in the environment and should decrease its availability to California condors. The State of California's regulations currently apply only to hunting. Ranchers can continue to use lead ammunition to put down livestock. Poaching of wildlife occurs within the range of the California condor; we expect that participants in this illegal activity are unlikely to be concerned about the effects of lead on California condors. Old buildings and structures likely continue to be a source of lead, although they are likely not a substantial source of lead for California condors at this time. Consequently, California condors may continue to be exposed for some time to lead fragments in the carcasses of poached wildlife and downed livestock. Absent an effort to remove lead from the environment, however, the levels of lead exposure in California condors would never decrease and we would never achieve a self-sustaining wild population. The Bureau's proposal to fund continuing efforts to reduce the amount of lead in the environment would assist in maintaining or expanding a key component of the recovery effort for the California condor.

Solar Energy

At this time, we have no indication that construction, operation, and maintenance of solar energy projects using photovoltaic or solar trough technologies would kill or injure California condors. Much of the action area that overlaps the range of the California condor is too rugged for large solar facilities. Although a few California condors have landed within the western Antelope Valley (a large, mostly flat area that birds do not frequent), we have no evidence that they have visited or died at existing solar facilities.

Other bird species have died at photovoltaic or solar trough facilities; one theory for these deaths is that some species mistake the numerous solar panels for water and either crash into fences or panels or cannot take flight once they have landed on solid ground. We expect that California condors, with their acute vision and lack of attraction to large water bodies, are unlikely to be attracted to and subsequently die at these solar facilities.

Power towers, with solar flux extending hundreds of feet above the ground, would likely pose a risk to California condors. The flux would singe their feathers and possibly damage their eyes; although the larger body mass of California condors would likely protect them to some degree from elevated body temperatures that may occur in smaller species, long exposure to high levels of flux would likely cause damage to soft tissues. However, given the large, almost-level areas required to site a power tower, such solar facilities are unlikely to be developed within the development focus areas in rugged terrain where California condors are likely to occur. Additionally, the Bureau (2015c, BIO-LUPA-13 and LUPA-BIO-IFS-15) has included conservation and management actions that address the siting of renewable energy projects to minimize impacts to California condors.

Generator-tie lines associated with solar facilities would have similar effects to California condors as those associated with wind facilities. We expect that the degree of effect would be less because California condors are not as likely to visit generator-tie lines in the lower, flatter areas where solar projects would be sited in comparison with those associated with wind projects.

The Bureau (2015a, pages 213 and 214) estimates that approximately 7,498 acres within the Western Mojave and Eastern Slopes Ecoregion (an area that overlaps, at least in part, modeled habitat of the California condor) may be developed as solar facilities. Such areas would be unavailable to California condors as foraging habitat. These potentially developed areas would comprise a small portion of the approximately 250,000 acres of modeled foraging habitat in the action area; we also expect that most of the developed areas would occur in the lower, less rugged terrain where California condors are less likely to forage. For these reasons, we conclude that the potential loss of approximately 7,498 acres of modeled foraging habitat will not result in a measurable effect to the California condor.

The Bureau (2015a, DFA-BIO-ICS-2) will also require solar projects to be set back 1.5 miles from California condor nest sites and out of their direct line of sight. This measure will likely prevent any disruption of nesting. Additionally, we expect that large solar facilities are unlikely

to be proposed in the development focus areas where California condors would likely nest (i.e., west of Jawbone Canyon) because of the rugged terrain. Conversely, the development focus areas where solar development would be most likely (i.e., the Antelope Valley) do not provide suitable nesting habitat for California condors.

Activities Common to Wind and Solar Energy

Decommissioning. We anticipate that decommissioning of both wind and solar facilities would affect California condors in much the same manner as construction; the primary difference for wind projects would be that the number of large structures would decrease during the decommissioning phase. As we have discussed previously, we do not expect California condors to collide with large stationary structures, such as cranes and non-operating turbines. The increased activity in the area may result in the potential for the generation of additional microtrash; because the Bureau would continue to implement controls on microtrash, we do not expect any additional effects to California condors from decommissioning.

CUMULATIVE EFFECTS

As we discussed in the Cumulative Effects section for the desert tortoise, the proposed action has no cumulative effects.

CONCLUSION FOR THE CALIFORNIA CONDOR

In determining whether a proposed action is likely to jeopardize the continued existence of a species, we consider the effects of the action with respect to the reproduction, numbers, and distribution of the species. We also consider the effects of the action on the recovery of the species. In that context, the following paragraphs summarize the effects of the proposed action on the California condor.

Reproduction

We have no information to indicate that the development and operation of renewable energy facilities would affect the reproductive capacity of California condors in any manner.

Numbers

The Bureau estimated that up to three California condors may be struck by turbine blades over the life of the proposed action; we consider that estimate to be reasonable. Our analysis also considers the reasonable scenario that one of the birds struck by a turbine blade may have been caring for an egg or young nestling that would subsequently perish. Our analysis also acknowledged that the proposed action had the potential to kill or injure California condors as a result of their collision with or electrocution by generator-tie lines; we consider the likelihood that California condors would be killed or injured in this manner low. For the purposes of this analysis, we will include injury or mortality associated with generator-tie lines as part of the

overall estimate that the proposed action is likely to kill or injure four California condors (Through the remainder of this biological opinion, when we refer to four California condors being killed or injured as a result of renewable energy facilities, we are referring to three birds directly interacting with a facility and a fourth that perishes in the nest because of a lost parent).

The loss of four California condors over the life of the land use plan amendment and issued right-of-way grants would have a negligible effect on the overall population. We have reached this conclusion for two reasons. First, the loss of four birds would not affect the genetic diversity of the population because the genetic representation of the 14 founders in the wild populations has been managed by annually assessing each population's genetic makeup and selecting the most appropriate offspring from the captive flock for each release. Second, the Service and its partners in the recovery of the California condor will continue to augment the wild population through the release of captive-bred birds (at least until the wild population is self-sustaining).

Between 1992 and 2010, Rideout *et al*. (2012) noted that 135 of 352 released California condors died. Even with these mortalities, the number of California condors in the wild has increased because of the augmentation program.

Eventually, the Service intends to cease augmenting the wild population when it becomes self-sustaining. The loss of four individuals over 30 years from a self-sustaining wild population would have a negligible effect on the California condor. For these reasons, we conclude that the proposed land use plan amendment would not appreciably diminish the number of California condors in the wild.

Distribution

The Bureau's use of setbacks from nest sites will prevent the loss of nest sites. The loss of 264 acres of foraging habitat resulting from the development of wind facilities would have no effect on the California condor because of its extensive range. The development of solar facilities within approximately 7,498 acres of foraging habitat of the California condor would preclude its use of these areas but have a negligible effect on the species because of its extensive range. For these reasons, we conclude that the proposed action will not measurably affect the distribution of the California condor.

Effects on Recovery

The number of California condors in the wild continues to increase, primarily through the release of captive-bred birds but also through a low level of natural recruitment. The goal of the recovery program is to reduce the amount of augmentation as the number of birds fledged in the wild increases and the number of birds killed by human activities decreases.

Rideout *et al*. (2012) state "The mortality factors thought to be important in the decline of the historic California (c)ondor population, particularly lead poisoning, remain the most important

documented mortality factors today. Without effective mitigation, these factors can be expected to have the same effects on the sustainability of the wild populations as they have in the past."

The Bureau has proposed to mitigate the loss of up to four individuals by requiring the proponents of projects that have the potential to kill or injure a California condor to contribute to the recovery of the species. This contribution, made at the time of construction of a project, will be used to address the issues that continue to hamper the recovery of the California condor. At this time, the Service considers the most crucial issue to be lead in the environment within the range of the species; funding provided to date by wind companies has funded outreach and education that addresses the lead issue (Kuhlman and Garcelon 2015). If other issues compromising the recovery of the California condor increase in importance over time, the funding can be used to address those issues.

The deaths of up to four California condors over the life of the land use plan amendment and issued right-of-way grants as a result of being struck by turbine blades or collisions with or electrocutions by generator-tie lines would not hinder the growth of the wild population in California. We expect that these losses would comprise a negligible fraction of the California condors that will die during this time frame as a result of anthropogenic causes. Conversely, the contributions to the recovery of the species that the Bureau proposes will benefit the California condor. At this time, reducing the prevalence of lead, the most widespread and ongoing impediment to the recovery of the species, within the habitat of the California condor is the most important recovery task; in the future, the Bureau's requirement to contribute to the recovery of the California condor may address other needs.

Conclusion

After reviewing the current status of the California condor, the environmental baseline for the action area, the effects of the proposed land use plan amendment, and the cumulative effects, it is the Service's biological opinion that the Bureau's land use plan amendment, as proposed, is not likely to jeopardize the continued existence of the species. We have reached this conclusion because:

> Project activities are reasonably likely to result in the death of no more than four California condors over the life of the land use plan amendment and issued right-of-way grants because of the numerous conservation and management actions that the Bureau will implement. These actions include avoiding nesting areas, the use of detection and curtailment systems, and adaptive management to address unforeseen circumstances.
>
> The proposed land use plan amendment will not adversely affect the reproductive capacity of the California condor.
>
> The loss of up to four California condors is unlikely to affect measurably the trajectory of population trends range wide because the number of wild birds is continuing to increase through both captive breeding and reproduction in the wild.

The loss of foraging habitat that may result from the proposed action will not measurably affect the distribution of the California condor.

The Bureau will require the proponents of projects that may kill or injure a California condor to contribute to recovery actions that will result in benefits to the California condor by addressing existing threats within its range, including the presence of lead in the environment.

INCIDENTAL TAKE STATEMENT FOR THE CALIFORNIA CONDOR

The information regarding the legal authorities, mandatory requirements, and implementing regulations regarding incidental take statements is contained in the Incidental Take Statement for the Desert Tortoise. That information applies to the remaining incidental take statements in this biological opinion. Please refer to that section for information.

We anticipate that four California condors are likely to be taken within the Western Mojave and Eastern Slopes Subregion. We anticipate that up to three California condors may be struck and killed by turbine blades, fly into power lines and tall structures, become entangled in wires, or be electrocuted. The potential exists that one of these birds may have an egg or young nestling in a nest that would likely die because a single parent would be unable to raise it. In such a case, Service staff may rescue the nestling and bring it into captivity where it would either be used in the breeding program or raised for release into the wild when it is older.

REASONABLE AND PRUDENT MEASURES AND TERMS AND CONDITIONS

The conservation and management actions proposed by the Bureau include numerous measures to minimize the take of California condors. Additionally, when proponents propose specific renewable energy facilities, the Bureau has proposed to coordinate with the Service, as described in the Description of the Proposed Action section of this biological opinion, to adapt the appropriate conservation and management actions for that activity. Consequently, we have not identified any reasonable and prudent measures or terms and conditions that we consider necessary or appropriate to minimize take of California condors at this time.

STATUS OF AND ENVIRONMENTAL BASELINE FOR THE WESTERN YELLOW-BILLED CUCKOO, SOUTHWESTERN WILLOW FLYCATCHER, AND LEAST BELL'S VIREO

Western yellow-billed cuckoos, southwestern willow flycatchers, and least Bell's vireos breed in riparian habitat within or adjacent to the action area and winter far to its south. Individuals of all three species migrate though the action area. Because of these factors, the proposed land use plan amendment is likely to affect individuals of all three species in the same manner.

For this reason, we have formatted the biological opinion to provide information on the range-wide status and environmental baseline regarding each species and then analyzed the overall effects of

renewable energy facilities on the three species as a whole. Following the general analysis of the effects of the proposed action on the three species, we then applied the core criteria for the jeopardy analysis and provided an incidental take statement for each species individually.

Status of the Western Yellow-Billed Cuckoo

The Service listed the western distinct population segment of the yellow-billed cuckoo as endangered in 2014 (79 FR 59991). Unless stated otherwise, the information in this section is from the proposed rule to list the western yellow-billed cuckoo as endangered (78 FR 61662). The number of western yellow-billed cuckoos in the western United States has declined substantially over the past 100 years, coincident with the widespread loss of riverine riparian woodlands as a result of the construction of dams, mining of groundwater, and development of urban and agricultural areas.

The Service has not yet developed a recovery plan for the western yellow-billed cuckoo and a 5-year review is not due until 2019. Therefore, we are appending the proposed and final rules to this biological opinion and are incorporating them by reference (Appendices 4 and 5).

The proposed rule does not discuss renewable energy with regard to the threat it may pose to western yellow-billed cuckoos. In the final rule (79 FR 59991), the Service stated that the development of renewable energy facilities "would not result in significant direct impacts on the species, as these projects typically do not occur in riparian corridors." In discussing collisions with communication towers, wind turbines, solar power towers, and other tall structures, the Service stated that "(w)ithout further study, we anticipate [collisions with power towers] to be a minor, but ongoing, effect …" that "… in combination with all the other effects to this species, … mortality from collision would have an additive effect to the threats facing the western yellow-billed cuckoo."

At the time the Service published the final rule, information on the effects of renewable energy facilities on the western yellow-billed cuckoo was scant; it remains so at the time of this writing. To date, we are aware that two western yellow-billed cuckoos have been found dead at solar facilities (Ivanpah Solar Electric Generating System [Davis 2015b] and Genesis Solar Project [Beeler 2015, Western EcoSystems Technology 2016a]) in California. The birds may have collided with a fence (Ivanpah in 2012) or a power block (Genesis in 2015). We do not know the cause of death of either bird.

Table IV.25-1 of the final environmental impact statement (Bureau 2015c) lists renewable energy projects on public and other lands that are operational, under construction, and have been approved within the plan area as of July 2015. We do not have similar information regarding the status of renewable energy facilities or mortalities of western yellow-billed cuckoos for the remainder of the species' range (i.e., California outside the plan area, Idaho, Nevada, Wyoming, Utah, Colorado, Arizona, New Mexico, Texas, Mexico, and Central and South America). No mortalities of western yellow-billed cuckoos have been reported from renewable energy facilities in Nevada (Nicolai 2015).

Core Criteria for the Jeopardy Determination

We have explained the relationship of these core criteria to our jeopardy determination in the Status of the Desert Tortoise section of this biological opinion.

Reproduction

Compared to other birds that nest in open cups, nesting success is high. Birds do not necessarily return to the same breeding areas in successive years and may make long-distance flights from one nesting area to another during the breeding season.

The proposed rule described a study along the Snake River in Idaho and noted that, "compared to habitat patches surrounded by natural habitat, patches near agricultural lands supported more avian nest predators that prosper in human-altered landscapes and have a greater effect on the smaller, fragmented habitats." The increase in predators can result in an increase in the loss of nests; repeated nest failures may cause western yellow-billed cuckoos to abandon suitable habitat.

Pesticides, whether applied directly onto riparian habitat or sprayed on adjacent agricultural areas, may affect the reproductive success of the western yellow-billed cuckoo. This species preys on katydids, caterpillars, cicadas, and other large insects. A reduction in the availability of suitably sized prey may lead to the abandonment of nesting areas.

Numbers

The proposed listing rule states that population of the western yellow-billed cuckoo "has declined by several orders of magnitude over the past 100 years" and that this decline is continuing. Surveys over the past 15 years (since the Service placed the western yellow-billed cuckoo on the candidate list [66 FR 38611]) have documented losses of breeding pairs in smaller isolated sites and at core breeding areas. The Service estimated the current breeding population at 680 to 1,025 pairs, with 350 to 495 pairs north of the Mexican border and the remainder in Mexico. Because western yellow-billed cuckoos move between nesting areas during the breeding season and may have been counted twice during surveys, these numbers may overestimate the number of breeding pairs.

Distribution

The western yellow-billed cuckoo formerly bred in California, Arizona, New Mexico, Oregon, Washington, western Colorado, western Wyoming, Idaho, Nevada, Utah, and probably southern British Columbia, Canada. The species' current breeding range reaches its northwestern limit in the Sacramento Valley, California (although a small, potentially breeding population exists in coastal northern California on the Eel River). The northeastern portion of the breeding range is in southeastern Idaho. They breed at several sites in California, Nevada, Arizona, and New Mexico.

We do not have extensive information on the winter range of the western yellow-billed cuckoo.

A single western yellow-billed cuckoo from the breeding population on the middle Rio Grande River in New Mexico wintered in eastern Bolivia, southwestern Brazil, Paraguay, and northeastern Argentina, spending 5 months from late November through late April moving around an area 1,243 miles in length and 373 miles in width.

Environmental Baseline for the Western Yellow-Billed Cuckoo

Previous Consultations in the Action Area

The Service issued previous biological opinions regarding the Bureau's land use plan amendments prior to the listing of the western yellow-billed cuckoo.

Status of the Western Yellow-billed Cuckoo in the Action Area

To the best of our knowledge, western yellow-billed cuckoos do not breed within the action area. These birds breed in extensive riparian areas. The action area supports few such areas, such as the Amargosa River. Bird watchers frequent these areas and report sightings of uncommon birds. If western yellow-billed cuckoos were breeding in the action area, we would likely be aware of it.

We are aware that bird watchers occasionally observe western yellow-billed cuckoos in the action area (e.g., Big Morongo Canyon, Amargosa River) and within the California desert outside of the action area (e.g., Anza Borrego Desert State Park, Whitewater Preserve, Piute Ponds, California City) (eBird 2016). The Colorado River supports numerous breeding western yellow-billed cuckoos and lies just outside the plan area. We are unaware of any sightings of western yellow-billed cuckoos within development focus areas.

We are aware that western yellow-billed cuckoos migrate across the desert and use scrub habitat during migration. Appendix 10 contains maps that depict the sightings of western yellow-billed cuckoos in the California desert and surrounding vicinity from 2000 to the present (eBird 2016); the appendix contains similar maps for the Yuma Ridgway's rail, willow flycatcher, southwestern willow flycatcher, and least Bell's vireo.

Dead western yellow-billed cuckoos have been found in or adjacent to desert scrub habitat in the Ivanpah Valley and eastern Riverside County (Davis 2015b, Beeler 2015).

Status of the Southwestern Willow Flycatcher

The Service listed the southwestern willow flycatcher as endangered in 1995 (60 FR 10694). Large-scale loss of habitat has reduced the number of sites where it breeds and curtailed its numbers; nest parasitism by the brown-headed cowbird (*Molothrus ator*) reduced nesting success within much of the remaining breeding habitat. At the time of listing, the Service estimated that 300 to 500 nesting pairs remained.

Recovery Plan

The recovery plan for the southwestern willow flycatcher describes a strategy for attaining a population level and an amount, quality, and distribution of habitat sufficient to provide for the long-term persistence of spatially separated, but interacting individuals (metapopulations), even in the face of local losses (Service 2002e). The criteria for reclassifying the bird from endangered to threatened include protecting enough breeding habitat to support either a minimum of 1,950 territories, geographically distributed to allow proper functioning as metapopulations, or increasing the total known population to a minimum of 1,500 territories, geographically distributed among management units and recovery units. The criteria for delisting the species includes meeting and maintaining, at a minimum, the population levels and geographic distributions specified above and providing protection from threats. Securing and managing riparian habitat within its historical breeding range, annual monitoring and range-wide surveys, and research activities necessary to monitor and guide the survival and recovery of the southwestern willow flycatcher range wide are key components of the recovery strategy.

Five-Year Review

We are appending the 5-year review of the status of the southwestern willow flycatcher (Service 2014f, Appendix 6) to this biological opinion and incorporating it by reference to provide most of the information relevant to the status of the species. The following paragraphs provide a summary of the relevant information in the 5-year review; unless otherwise noted, all of the following information is from the 5-year review.

In our 5-year review, we recommended retention of the endangered status of the southwestern willow flycatcher due to ongoing and anticipated threats. Although we are now aware of more southwestern willow flycatchers than we were at the time of its listing because of improved surveys, studies, and conservation, declines have begun to occur across broad portions of its range. Threats associated with ongoing water and land management (such as dams, groundwater pumping, water diversions, development, and cattle grazing), exacerbated by the potential impacts from climate change, will influence and limit the expansion of southwestern willow flycatcher habitat and populations.

Additional threats affecting breeding habitat identified in our 5-year review include the introduction of tamarisk leaf beetles (*Diorhabda carinulata*) and climate change. From their initial release, tamarisk leaf beetles have spread into the southwestern willow flycatcher's breeding range in southern Nevada, southern Utah, northern Arizona, and northern New Mexico. Leaf beetles defoliate tamarisk (*Tamarix* spp.) during the early portion of the breeding season, likely causing or contributing to nesting failure. Defoliation of suitable breeding habitat dominated by tamarisk could reduce the annual breeding productivity of southwestern willow flycatchers by between 40 and 80 percent, depending on the timing of defoliation and the start of nesting activity. Approximately 50 percent of all known territories contain tamarisk and tamarisk leaf beetles may affect tamarisk across the southwestern United

States; consequently, the tamarisk leaf beetle poses a substantial threat to habitat of the southwestern willow flycatcher habitat.

Climate projections predict warmer, drier, and more drought-like conditions in the southwest United States. Because a warmer, drier climate is likely to adversely affect riparian habitat, we expect climate change to be a substantial threat to the southwestern willow flycatcher and its recovery. We do not know how climate change may affect specific areas, although receding water levels in reservoirs has increased the size of riparian areas with suitable breeding habitat at the water's edge; this effect may be short-lived as waters recede even further.

The 5-year review also contained several recommendations for future management of the southwestern willow flycatcher. These recommendations include protecting habitat; improving statewide and range-wide data management collection, entry, and reporting; collecting and analyzing essential genetic information; and conducting studies of migrating and wintering birds to determine habitat selection and use and foraging ecology to identify conservation and management activities aimed at increasing survivorship on wintering sites and during migration.

The 5-year review for the southwestern willow flycatcher does not mention renewable energy facilities as a threat to the species. To date, we are aware that two willow flycatchers have been found dead at solar facilities; both were identified as subspecies *brewsteri* and found under generator-tie lines (Guigliano 2015, Dietsch 2015a; Dietsch 2015b). Six willow flycatchers that were not identified to subspecies were found under a transmission line over a 3-year period (EDM International 2016). The deaths that likely occurred along the generator-tie lines occurred in a little under a year; by mid-2015, approximately 25,000 acres of solar facilities had been developed on public lands.

Table IV.25-1 of the final environmental impact statement (Bureau 2015c) lists renewable energy projects and other lands that are operational, under construction, and have been approved within the plan area as of July 2015. We do not have similar information regarding the status of renewable energy facilities for the rest of the southwestern willow flycatcher's range (i.e., California outside of the plan area, Nevada, Utah, Colorado, Arizona, New Mexico, Mexico, and Central and South America). No mortalities of southwestern willow flycatchers have been reported from renewable energy facilities in Nevada (Nicolai 2015).

Core Criteria for the Jeopardy Determination

We have explained the relationship of these core criteria to our jeopardy determination in the Status of the Desert Tortoise section of this biological opinion.

<u>Reproduction</u>

The primary impediment to successful reproduction of southwestern willow flycatchers is the availability of suitable breeding habitat. Since listing, the Service has identified the tamarisk leaf beetle and climate change as new threats that could reduce suitable breeding habitat and

compromise successful reproduction. The 5-year review describes two instances where southwestern willow flycatchers experienced low nesting success (2 of 3 and 13 of 15 nesting attempts failing) in tamarisk being defoliated by tamarisk leaf beetles; at this time, we do not have information on the range-wide effects of tamarisk leaf beetles on nesting success.

Similarly, we do not have information that correlates climate change with the reproductive success of southwestern willow flycatchers.

Numbers

From 2002 to 2007, the overall estimated number of breeding territories range-wide increased from 986 to 1,299. The 5-year review notes that the numbers of breeding territories and breeding sites have increased over time but it also states that at least part of the increase is likely due to improved survey effort. The Service has not conducted range-wide surveys since 2007.

The following table, which we derived from the 5-year review, provides a summary of the subspecies' status in 2007, the most recent year for which range-wide data are available.

Recovery Unit	**Number of Known Territories in 2007**	**Number of Territories Recommended in the Recovery Plan**
Basin and Mojave	51	200
Coastal California	120	275
Gila	659	650
Lower Colorado	150	525
Rio Grande	309	250
Upper Colorado	10	50
Total	1,299	1,950

Since 2007, survey data from various breeding sites suggest that the number of territories has declined in areas where surveys efforts can be compared. In California, along the Kern, Santa Ana, and Santa Margarita rivers, the number of territories declined from 31 in 2007 to 10 in 2014; the number of territories declined from 36 in 2007 to 22 in 2013 along the San Luis Rey River (Howell 2015). The number of breeding sites has increased or remained stable for some of the larger populations in Arizona and New Mexico.

In the Basin and Mojave Recovery Unit, the number of known territories in the Owens Management Unit increased from 28 in 2007 to 47 in 2014; we do not know if this increase represents an actual change in the status of the taxon or is a result of improved survey efforts (California Department of Fish and Wildlife 2014).

Distribution

The 5-year review notes that the current distribution of the southwestern willow flycatcher is similar to that at the time of listing with regard to its breeding range. The amount of breeding habitat within that area has been reduced from historical levels.

Environmental Baseline for the Southwestern Willow Flycatcher

Previous Consultations in the Action Area

The biological opinions for the Bureau's previous land use plan amendments are the principal consultations regarding the southwestern willow flycatcher that we have conducted within the action area. We have described those biological opinions in the Consultation History section of this biological opinion.

The Service (2005b) issued a biological opinion to the Bureau regarding the removal of tamarisk and the restoration of riparian habitat within the Amargosa River drainage. The Service concluded that the proposed action was not likely to jeopardize the continued existence of the southwestern willow flycatcher.

The Service (2006b) also issued a biological opinion for the Bureau's draft management plan for the Amargosa River Area of Critical Environmental Concern; we concluded that the Bureau's proposed management direction for the area was not likely to jeopardize the continued existence of the southwestern willow flycatcher. However, the Bureau has not completed this planning effort. Because the Amargosa River has since been designated a Wild and Scenic River, the Bureau will prepare a comprehensive management plan for that designation and revise and update the area of critical environmental concern plan concurrently. It has not set a date for completion of this effort (Otahal 2015).

Status of the Southwestern Willow Flycatcher in the Action Area

Most of the action area lies within the Basin and Mojave Recovery Unit, which includes five management units (Service 2002e); the Owens, Amargosa, and Salton management units occur within the action area. The Amargosa Management Unit is contained entirely within the action area. Portions of the Owens and Salton management units are outside the action area, including all of the breeding territories within these units. The westernmost portion of the Lower Colorado Recovery Unit overlaps the action area; however, the known territories are along the Colorado River and outside of the action area.

Within the action area, suitable breeding habitat for the southwestern willow flycatcher occurs along the Owens and Amargosa rivers and adjacent to the Salton Sea. The following table, which we derived from the 5-year review (Service 2014f), provides a summary of the subspecies' status within the action area in 2007, the most recent year for which range-wide data are available. The

territories within the Owens Management Unit are located north of the action area; at most, a few territories may occur within the northernmost portion of the action area.

Basin and Mojave Management Unit	Number of Territories	
	2007	2014
Amargosa	1	0
Salton	4	No data
Total	5	0

McCreedy and Warren (2015a, b) did not detect any southwestern willow flycatcher territories along the Amargosa River in 2014 or 2015, although they observed willow flycatchers during spring migration.

Southwestern willow flycatchers migrate through the action area; the other two subspecies of willow flycatcher (i.e., *adastas* and *brewsteri*) also migrate through the area. Craig and Williams (1998) note that willow flycatchers use a "much wider" range of habitats during migration than for breeding, including narrow, linear riparian strips and shrubs and trees in parks and gardens. Garrett and Dunn (1981) label the willow flycatchers as a "fairly common to common transient" with "the largest numbers pass(ing) through the deserts." See Appendix 10 for maps that depict the records of sightings of willow and southwestern willow flycatchers in the California desert and vicinity (eBird 2016).

We are aware that willow flycatchers have been found dead at solar facilities and transmission and generator-tie lines in the California desert. None of these birds were identified as the federally listed subspecies. The Status of the Southwestern Willow Flycatcher and the Effects of the Action on the Western Yellow-Billed Cuckoo, Southwestern Willow Flycatcher, and Least Bell's Vireo sections of this biological opinion contain more detail on these mortalities.

Status of the Least Bell's Vireo

The Service listed the least Bell's vireo as endangered in 1986 (51 FR 16474). Large-scale loss of habitat reduced the number of sites where it breeds and curtailed its numbers; nest parasitism by the brown-headed cowbird (*Molothrus ater*) reduced nesting success within much of the remaining breeding habitat. At the time of listing, the Service estimated that 300 territorial males remained in the United States.

Recovery Plan

The draft recovery plan for the least Bell's vireo (Service 1998) describes a strategy for securing and managing riparian habitat within its historical breeding range; the Service also recommended annual monitoring, range-wide surveys, and research to monitor and guide recovery. Specifically, the draft recovery plan recommends the criteria for achieving threatened status as stable or increasing populations or metapopulations, each consisting of several hundred or more

breeding pairs that are protected and managed at 11 sites along the central and southern California coast and in the vicinity of Anza Borrego in the desert. Recommended delisting criteria include meeting the goal for threatened status, establishing increasing populations or metapopulations along the Salinas River and in the San Joaquin and Sacramento valleys, and a reduction or elimination of threats to the point where least Bell's vireo populations can persist without significant human intervention.

Five-Year Review

We are appending the 5-year review of the status of the least Bell's vireo (Service 2006c, Appendix 7) to this biological opinion and incorporating it by reference to provide additional information relevant to the status of the species. The following paragraphs provide a summary of the relevant information in the 5-year review; unless otherwise noted, all of the following information is from the 5-year review.

In our 5-year review, we recommended revising the status of the species from endangered to threatened because of a ten-fold increase in abundance since listing, expansion of breeding locations throughout southern California, and conservation and management of suitable breeding habitat throughout its range. By 2005, the Service was aware of approximately 2,968 known territories in the United States with the greatest increases in San Diego and Riverside counties. The number of pairs in Orange, Ventura, San Bernardino, and Los Angeles counties also increased substantially; a few isolated individuals and breeding pairs have also been observed in Kern, Monterey, San Benito, and Stanislaus counties. Since publication of our 5-year review, surveys have detected breeding territories along the Amargosa River in the northern Mojave Desert (McCreedy and Warren 2015a) and Whitewater Canyon, Chino Canyon, and Mission Creek in the Coachella Valley (Hargrove *et al*. 2014). The increase in the abundance of least Bell's vireos since the listing is primarily due to efforts to reduce threats such as loss and degradation of riparian habitat and parasitism by brown-headed cowbirds. The control of invasive plants has also increased the amount of suitable habitat available for nesting.

The 5-year review also contained several recommendations for future management of the least Bell's vireo. These recommendations are to finalize a recovery plan for the least Bell's vireo with realistic, objectively based recovery goals; provide funding and technical support for further studies investigating continuing threats from parasitism by brown-headed cowbirds and invasion of riparian habitats by exotic plants, and potentially elevated predation pressures due to habitat fragmentation or presence of exotic predators; develop and implement a systematic program to survey the Salinas, San Joaquin, and Sacramento Valleys and inform future management; and develop systematic survey programs for watersheds in southern California that are not regularly surveyed within a given 5-year period.

Since the completion of the 5-year review, the Service has issued numerous biological opinions that addressed effects of Federal actions on the least Bell's vireo; the biological opinions concluded that the actions were not likely to jeopardize the continued existence of the least Bell's vireo primarily due to avoidance of construction impacts during the breeding season. Most

of these biological opinions addressed effects from urban development, transportation, military readiness, and utility transmission projects. Five biological opinions addressed regional-scale habitat conservation plans regarding urban development and conservation of listed species using an ecosystem-level planning approach. These regional plans identify conservation targets, monitoring needs, and adaptive management strategies for the least Bell's vireo. These plans are expected to provide long-term protection, monitoring, and management of core occurrences of vireos in Kern, Riverside, Orange, and San Diego counties.

The 5-year review does not discuss renewable energy with regard to the threat it may pose to least Bell's vireos. To date, we do not know of any least Bell's vireos that have been found dead at renewable energy facilities. Table IV.25-1 of the final environmental impact statement (Bureau 2015c) lists renewable energy projects that are operational, under construction, and have been approved in the plan area as of July 2015. We do not have similar information regarding the status of renewable energy facilities for the remainder of the range of the least Bell's vireo (i.e., California outside of the plan area and Baja California).

West Nile virus may affect some groups of birds disproportionally, either temporarily or persistently (George *et al*. 2015). For example, George *et al*. (2015) found that red-eyed vireos (*Vireo olivaceus*) "experienced significant declines in survival associated with the arrival of [West Nile virus], followed by recoveries to pre-[West Nile virus] levels. Conversely, warbling vireos (*Vireo gilvus*) experienced smaller annual declines in survival than red-eyed vireos after the arrival of West Nile virus but the survival rate continued to decline in subsequent years. We do not know how West Nile virus would affect the least Bell's vireo over time.

Core Criteria for the Jeopardy Determination

We have explained the relationship of these core criteria to our jeopardy determination in the Status of the Desert Tortoise section of this biological opinion.

Reproduction

The main impediments to successful reproduction for least Bell's vireos are nest parasitism by brown-headed cowbirds and availability of suitable breeding habitat. We expect that the continued management of brown-headed cowbirds and restoration of riparian habitat is likely to allow for the continued successful reproduction of the least Bell's vireo.

Numbers

The Service does not conduct regular surveys throughout the range of the least Bell's vireo. The U.S. Geological Survey collects data from biologists conducting surveys for the least Bell's vireo; various workers survey some areas regularly and other results are acquired from surveys that are conducted in support of other activities (e.g., monitoring, preparation of environmental documents for development reviews, etc.). Additionally, not all sites are surveyed every year and the precise locations of surveys may vary from year to year. Consequently, the numbers of

territorial males in the following table (adapted from Kus *et al*. 2014) do not represent a trend; they do, however, indicate that least Bell's vireos have greatly increased in abundance since the time of listing.

Year	Number of Territorial Males
2003	1,604
2004	2,098
2005	2,068
2006	1,823
2007	2,088
2008	2,521
2009	3,075
2010	3,280
2011	2,917
2012	2,455
2013	2,597
2014	2,477

Distribution

The distribution of the least Bell's vireo has increased to some degree since its listing in 1986, although it remains absent from large parts of its former range in the Central Valley. Least Bell's vireos have spread through riparian habitat in southern California and small numbers of birds have begun to venture into central coastal California, the southern Central Valley, and the Mojave Desert. We expect that the distribution of least Bell's vireos is likely to continue to increase slowly in the future.

Environmental Baseline for the Least Bell's Vireo

Previous Consultations in the Action Area

The biological opinions for the Bureau's previous land use plan amendments are the principal consultations regarding the least Bell's vireo that we have conducted within the action area. We have described those biological opinions in the Consultation History section of this biological opinion.

The Service (2005b) issued a biological opinion to the Bureau regarding the removal of tamarisk and the restoration of riparian habitat within the Amargosa River drainage. The Service concluded that the proposed action was not likely to jeopardize the continued existence of the least Bell's vireo.

The Service (2006b) also issued a biological opinion for the Bureau's draft management plan for the Amargosa River Area of Critical Environmental Concern; we concluded that the Bureau's

proposed management direction for the area was not likely to jeopardize the continued existence of the least Bell's vireo. However, the Bureau has not completed this planning effort. Because the Amargosa River has since been designated a Wild and Scenic River, the Bureau will prepare a comprehensive management plan for that designation and revise and update the area of critical environmental concern plan concurrently. It has not set a date for completion of this effort (Otahal 2015).

Status of the Least Bell's Vireo in the Action Area

Within the action area, suitable breeding habitat for the least Bell's vireo occurs along the Owens and Amargosa rivers and at Big Morongo Canyon. Least Bell's vireos have bred in small numbers along the Owens River; they occasionally breed at Big Morongo Canyon. From 2009 to 2015, McCreedy and Warren (2015b) observed 18, 20, 21 or 22, 16, 10, 19, and 25, respectively, fledglings along the Amargosa River at Shoshone and the northern section of Amargosa Canyon (The Shoshone section may be on private land and is near but not within the action area).

In 2015, McCreedy and Warren (2015b) observed only two unmated males along the northern section of Amargosa Canyon. The entire survey plot in the northern section of Amargosa Canyon burned in an arson-caused fire in 2002; much of the plot burned again in 2010. The lack of breeding in the canyon is likely due to riparian habitat that has not recovered sufficiently.

Least Bell's vireos also breed in other portions of the plan area but outside of the action area. For example, they are uncommon breeders along the Mojave River near Victorville and at Anza Borrego Desert State Park.

Least Bell's vireos migrate through the action area; however, we have little information on their migratory routes or use of stopover habitat. Garrett and Dunn (1981) state that "The Bell's vireo is very rarely noted in migration…" and note that they were aware of few records of spring or fall vagrants or transients. We expect that they would rely on patches of riparian habitat of any size and may also use upland scrub habitat. See Appendix 10 for a map that depicts the records of sightings of least Bell's vireos in the California desert and vicinity (eBird 2016).

We are unaware of any least Bell's vireos being found dead or injured at renewable energy facilities.

EFFECTS OF THE ACTION ON THE WESTERN YELLOW-BILLED CUCKOO, SOUTHWESTERN WILLOW FLYCATCHER, AND LEAST BELL'S VIREO

Most western yellow-billed cuckoos, southwestern willow flycatchers, and least Bell's vireos breed and winter outside of the action area for this consultation. A few individuals breed on lands managed by the Bureau within the action area but not within development focus areas; a few others breed within the boundaries of the planning area but not on public lands. Many individuals of these species migrate through the action area between their wintering and breeding areas within or outside the planning area.

During migration, individuals of these species may fly over or stop within development focus areas to rest and forage. They do not breed or winter within the development focus areas because suitable habitat is not present. Because these three species may migrate through but do not breed or winter within scrub habitat, where the development focus areas would be located, we expect that the proposed land use plan amendment will affect these species in the same manner. Therefore, we will conduct our analysis of effects regarding the western yellow-billed cuckoo, southwestern willow flycatcher, and least Bell's vireo by first considering how the proposed action may affect riparian-nesting migratory birds and then examining how the proposed action may affect the reproduction, numbers, distribution, and recovery of the species individually.

Because of activities associated with renewable energy within the development focus areas, individuals of these species have the potential to collide with turbines, solar panels and heliostats, meteorological towers, power lines, other equipment, and fences; be struck by turbine blades; be electrocuted; and be entangled in netting. They may also die in evaporation ponds. Development of renewable energy facilities may result in the loss of non-breeding habitat.

The Bureau will require the proponents of projects that kill or injure individuals of these species to restore breeding habitat for the species or otherwise implement recovery actions. We will analyze these potential effects in relation to wind, solar, and geothermal power.

The detection of carcasses of birds that die as a result of interaction with renewable energy facilities, at any stage of construction, operation, or decommissioning, will be limited, at least to some degree. Birds may be injured but die outside of a project's boundaries. Scavengers and wind move carcasses from the point where death occurred. Not all areas of project sites will be monitored. The Bureau will work with the Service to determine the level of monitoring that adequately covers the project area and will use the evidence of absence model to predict the level of undetected mortality based on the efficiency of the monitors.

We do not have extensive information on the migratory paths that these species use. Based on the known distribution of their breeding and wintering areas, we assume that they may migrate through all of the ecoregions in the planning area.

Wind Energy

<u>Construction</u>

The potential effects associated with construction would be short term, relative to the operational life of a wind facility. Individuals of these species have some potential to collide with large cranes, meteorological towers, pre-operational turbines, fences, and other equipment. Birds may also become entangled in netting. Construction may cause the loss of a small amount of habitat. The Bureau is not proposing to require systematic monitoring during construction but will require that all mortalities be reported; it will require the project proponent to compensate for any mortality.

Collisions. Birds may collide with stationary objects, either while in flight during migration or during stop overs to rest and forage. Birds that are startled or being pursued by a predator may fly into a fence or other piece of equipment; such collisions may occur more frequently when birds are in unfamiliar habitat while foraging or resting during migration. The Bureau's (2015a, page 209) proposal to monitor mortality at wind facilities and use adaptive management to try to protect birds may reduce the frequency of such collisions. With our current level of knowledge, we expect that riparian birds will continue to collide with structures in the desert, albeit possibly at lower rates, regardless of any protective measures.

Meteorological towers may have guy wires; these wires likely pose a greater degree of threat because they are less visible than cranes or turbines. The Bureau would require any structures with guy wires to be marked with recommended bird deterrent devices at the appropriate spacing intervals (LUPA-BIO-IFS-17). These devices should increase the visibility of the guy wires. Additionally, guy wires used during construction would be in place for a relatively short period of time.

Entanglement in Netting. Project proponents occasionally cover equipment with netting to prevent migratory birds from nesting on it while it lies idle. We are aware of instances where netting that has been placed loosely over equipment has resulted in the entanglement and mortality of migratory birds (Baird 2014). The Bureau's (2015a, page 209) proposal to monitor mortality at wind facilities and use adaptive management to try to protect birds may reduce the likelihood that netting would be used inappropriately.

Loss of Habitat. We are unaware of the presence of any of the listed riparian birds breeding within development focus areas. These species nest in well-developed riparian areas and such areas are generally absent from the development focus areas; therefore, the proposed land use plan amendment will not result in the loss of breeding habitat.

The Bureau (2015a, page 208) estimates that the proposed action may result in the loss of less than 100 acres of riparian or wetland habitat as a result of activities proposed under the proposed land use plan amendment when renewable energy facilities have minor incursions in such habitat. If a facility was proposed within 0.25 mile of riparian or wetland habitat, the Bureau would require that the project proponent to conduct a pre-activity survey for sensitive nesting bird species according to Service-approved protocols and to implement appropriate setbacks, based on the results of the survey. Therefore, if the listed species were present, the Bureau will require setbacks to avoid impact to the species and its habitat. If the species were absent, a small amount of habitat would be lost during construction of the facility; in this case, the Bureau will require that the project proponent compensate for the impact through acquiring land or restoring or enhancing habitat (COMP-BIO-1, 2, and 6).

The Bureau (2015a, pages 213 and 214) estimates that the construction of wind facilities would eliminate approximately 3,239 acres of non-breeding habitat within the action area as a result of activities approved under the land use plan amendment. Individuals of the listed riparian species may use this habitat to stop over during migration to rest or forage. This loss of resting and

foraging habitat will not have a measurable effect on the ability of these species to migrate through the California desert because the Bureau manages approximately 10,869,000 acres of land occur within the action area; the loss of 3,239 acres from this total would have an insignificant effect on the ability of the birds to rest and forage during migration.

Monitoring. The Bureau has proposed to systematically monitor operational wind facilities to estimate the number of birds that are killed or injured. Systematic monitoring is generally not possible during construction for two reasons. First, as construction proceeds, the type of activities (and threats to the target species) change fairly rapidly over time and in location; these changing conditions render the procedures necessary for systematic monitoring (random sampling, carcass removal studies, tests of observer qualifications) difficult. Second, the presence of heavy equipment can pose a threat to the monitors, who need to be focused on carefully examining the ground for small carcasses.

Because systematic monitoring is difficult during construction, the Bureau will require all workers and monitors to report the carcasses of all birds found onsite during construction. Although this methodology will not detect every bird that died or is injured during construction, it will provide some information on the effects of construction. For example, biologists and other workers routinely found bird carcasses through incidental monitoring during construction of the Ivanpah Solar Electric Generating System (a power tower); incidental monitoring continues to detect carcasses during operation even while systematic monitoring is occurring (Weise 2015).

We acknowledge that incidental monitoring will not detect the carcass of every listed riparian bird that dies during construction; additionally, absent systematic monitoring, the U.S. Geological Survey's evidence of absence calculation would not be able to provide an estimate of mortality. We expect that few individuals of listed species are likely to die during this phase of projects because construction would occur over a relatively short period of time relative to the operational life of a wind facility. Additionally, because relatively few individuals of these listed species migrate through the action area (they are less abundant than most non-listed species), we expect that few individuals are likely to be killed during construction of wind facilities.

Compensation. The Bureau will require that project proponents compensate for the loss of habitat associated with the construction of wind facilities according to the ratios described under LUPA-BIO-COMP-1 and other conservation and management actions that address specific situations or habitat types (Note that compensation for all habitat loss is nested; that is, if a proposed action affected both desert tortoises and listed riparian birds, the ratio would not be additive). Because the Bureau will generally avoid wetland and riparian habitat during construction and would direct compensation towards offsetting the specific habitat losses, we expect that compensation for habitat loss would occur within upland habitat. The acquisition of private lands will not, in and of itself, replace habitat that is lost during construction; it would render those lands more secure in terms of preventing future private development that would result in the loss of additional resting and foraging habitat for migrating birds. The enhanced management of previously disturbed upland habitat would benefit the listed riparian birds to the extent that it would improve habitat that they could use for resting and foraging during migration.

The Bureau will also require project proponents to compensate for the loss of riparian habitat. The acquisition, restoration, or creation of riparian and wetland would provide relatively greater benefit to individuals of the listed riparian species because of the importance of these habitat types; however, the small amount of habitat involved (less than 100 acres as a result of the development of renewable energy under the land use plan amendment) would not appreciably alter conditions in the action area.

We will discuss the effects of compensation for the loss of individual birds during construction in the Operations – Compensation section of this biological opinion. If individuals of the listed riparian species are killed during construction, the Bureau may require the proponent to include additional compensation for individuals if the compensation required for the operational life of the project did not adequately cover the effects of construction.

Operation

The potential effects associated with the operation of wind facilities would occur over many years. Individuals of these species have some potential to collide with meteorological towers, operational turbines, fences, generator-tie lines, and other equipment; they may also be struck by moving turbine blades. Birds may also become entangled in netting and be electrocuted. The Bureau proposes to monitor the operation of wind facilities to assess its effects on listed riparian birds and require the project proponent to compensate for any mortality.

Collisions. Individuals of the listed riparian species may collide with turbines, meteorological towers, fences, and other equipment during operation of wind facilities; individuals that strike generator-tie lines may die as a result of electrocution or blunt-force trauma. The effects of collisions during operations would be similar to those during construction, although they would persist for a longer period of time.

Permitting agencies, such as the Federal Aviation Administration, will require project proponents to install aviation safety lighting on turbines and meteorological towers to make them more visible to aircraft. Evans *et al*. (2007) note that "birds have long been observed to aggregate in flight around isolated bright light sources during nights with low cloud ceiling or with light to moderate rain" and that "large bird kills (have occurred) at airport ceilometers, tall television towers, smokestacks, and tall buildings…." The Bureau (2015a, LUPA-BIO-13) will require proponents to avoid the use of constant-burn lighting, which attracts more birds than flashing lights. Additionally, the Bureau's monitoring and use of adaptive management over the life of the proposed action will allow it to adopt additional protective measures if they become available and are necessary to reduce the number of birds that are killed or injured.

We are unaware of any of the listed riparian species colliding with fences, turbines, or buildings at wind facilities; the potential exists that such collisions have occurred but the carcasses were not detected. We are aware of two instances where willow flycatchers (*Empidonax traillii brewsteri*) were found dead under generator-tie lines (Guigliano 2015, Dietsch 2015a; Dietsch 2015b). Because the areas where they were found lacked riparian vegetation, these individuals

were likely migrating through the area. We are also aware that willow flycatchers have collided with transmission lines (EDM International 2016); dead willow flycatchers have been found along other transmission lines although the report did not provide a cause of the mortalities (Baird 2013). To reduce the likelihood of collisions, the Bureau (2015c, TRANS-BIO-2, 3, and 4) has proposed to require project proponents to install flight diverters on all transmission activities spanning or within 1,000 feet of water bodies, avoiding (where possible) siting transmission lines across canyons or on ridgelines, and siting of transmission activities within designated utility corridors.

The Avian Power Line Interaction Committee (2012) discusses the risks that transmission lines pose to birds and concludes that flight diverters have the potential to reduce collisions. However, based on the research cited in the report, the effectiveness of flight diverters in reducing avian collisions is most pronounced for water-associated birds and other large birds (e.g., raptors). Furthermore, the report notes that, in at least one study, the installation of flight diverters did not reduce the number of mortalities of America coots (*Fulica americana*), likely because they migrate at night and could not see the type of visual markers used. We currently do not have information regarding the effectiveness of markers for protecting nocturnally migrating passerines.

At this time, we are unable to determine whether the lack of mortalities of willow flycatchers at solar facilities (excluding collisions with generator-tie lines) when compared with the number found dead under transmission and generator-tie lines is a sampling artifact or a real difference in the level of threat posed by the latter. If collisions with transmission and generator-tie lines occur because willow flycatchers are migrating at night, we expect these lines would pose a threat to migrating individuals over the life of the proposed action despite the Bureau's proposal to install flight diverters. Additionally, the willow flycatcher mortalities of which we are aware did not occur near water; therefore, placing flight diverters only on transmission activities spanning or within 1,000 feet of water bodies would not be fully protective of at least this species. The requirement for project proponents to bury collector lines (Bureau 2015c, TRANS-BIO-1) will eliminate this collision threat to the listed riparian birds. Siting transmission activities within designated utility corridors and avoiding (where possible) siting transmission lines across canyons or on ridgelines would likely reduce collisions to some degree.

Moving Turbine Blades. Moving turbine blades may strike individuals of the listed riparian birds; the attraction of birds to aviation safety lights may exacerbate this threat.

The potential exists that project operators could shut down turbines during migration if they are aware of large flocks of birds approaching. To the best of our knowledge, these listed species of riparian birds do not migrate in such large flocks; consequently, this potential measure may not be useful for these species.

To date, none of the existing wind facilities has reported killing or injuring any individuals of these species. Potential reasons for the lack of reported mortalities include the lack of thorough monitoring or the lack of mortalities of these species. We are unaware of any facility that has applied the evidence of absence model to its monitoring results.

Netting. We expect that bird-deterrent netting used on equipment is likely to kill or injure few birds because it is generally not used extensively during operations.

Electrocution. Generally, small birds are less likely to be electrocuted than larger birds because of their shorter wing spans (Avian Power Line Interaction Committee 2006). We expect that a small number of individuals of the listed riparian birds are likely to be electrocuted in towers associated with generator-tie lines or possibly in other equipment. The Avian Power Line Interaction Committee (2006) notes that such events are more likely in wet or windy situations.

Climate Effects. Refer to the previous discussion with regard to climate effects on desert tortoises for background on research conducted by Zhou *et al*. (2012). The Bureau (2015c, Table IV.7-27) estimates that 704 wind turbines are likely to be developed within development focus areas under this land use plan amendment.

The 704 turbines that may be constructed as a result of the proposed land use plan amendment are unlikely to cause measurable warming of the local area because of the low number of turbines compared to those in the study area in Texas (i.e., 704 turbines compared to 2,358); additionally, the wind turbines in the action area would be spread over a much larger area than those in Texas (Zhou *et al*. 2012). Given this information, we do not expect any local warming to occur.

Monitoring. We have described the Bureau's proposed methodology for determining the effects of the operation of wind facilities in the Description of the Proposed Action section of this biological opinion. The Service understands finding every bird that is killed as a result of the operation of a wind facility is not possible. We are confident that application of the Huso *et al*. (2015) model to the collected data will allow the Bureau to reasonably account for individuals that are not detected during monitoring.

As we noted in the Description of the Proposed Action section of this biological opinion, the Bureau will convene a quarterly meeting of a technical advisory group (which includes the Service) to review the results of monitoring and implement adaptive management, if necessary. This quarterly assessment will allow the Service to determine whether the project-specific protective measures are functioning correctly and the allocation of mortality for the project is not being exceeded.

The Bureau will also review the overall results of monitoring of renewable energy facilities approved under the land use plan amendment with the Service every 5 years. This longer-term tracking will allow the Service to assess the aggregative effects of renewable energy facilities that are approved under the land use plan amendment, assess the number on individuals of lusted riparian birds that have been killed, and recommend that the Bureau re-initiate consultation, if appropriate.

Compensation. At this time, we do not have technology to prevent all mortality of these species at wind facilities; the potential exists that individuals of the listed species will continue to die at

wind facilities no matter the technology. However, because habitat loss and degradation are contributing factors to the decline of all three species, the Bureau's proposal to create or restore additional breeding habitat is a reasonable way to offset the adverse effects of the loss of individuals. The Bureau will determine the amount of habitat to be created or restored through use of the resource equivalency analysis described in Appendix H of the draft environmental impact report and environmental impact statement (California Energy Commission *et al*. 2014).

The Bureau has proposed to create or restore habitat for the listed riparian species where the compensation would provide the greatest benefit to the species; such areas may be outside of the action area for this consultation. All three riparian bird species are migratory and travel large distances between wintering and breeding grounds. Additionally, Paxton *et al*. (2007) found that the generally high survival rates of southwestern willow flycatchers on their winter and breeding grounds seem to indicate that most mortality probably occurred during migration. To the best of our knowledge, researchers have not conducted similar research on least Bell's vireos and western yellow-billed cuckoos; however, given that these species also migrate, we expect that they also have relatively high rates of mortality during migration. Migration places physiological stress on birds; they may also cross large areas of inhospitable terrain and visit unfamiliar areas during stop overs where they may be more vulnerable to predators and other hazards. Finally, because of the myriad of factors that can affect birds during migration and the dispersed nature of their migratory pathways, attempting to reduce mortality during migration is impractical. Consequently, the Bureau's focus on attempting to enhance reproduction is an appropriate strategy to offset the loss of individuals during migration.

Created or restored habitat may not immediately provide the necessary physical and biological features to support breeding individuals of the listed species. The numbers of individuals of the species and the quality and quantity of habitat elsewhere within their ranges will change over time and may influence the rate that these birds occupy created or restored habitat. However, the Bureau's requirement that the proponent restore or create habitat to compensate for the loss of individuals over the life of the project upon the project's approval is likely to reduce this potential delay in the productivity of the restored or created habitat. Even if created or restored habitat is not used immediately for breeding, the presence of high-quality riparian habitat will benefit these species during migration by providing them with additional areas to rest and forage. Additionally, once breeding pairs begin to use restored or created habitat, that habitat is likely to continue to provide individuals to the species' population over time.

As additional information becomes available on other sources of mortality of the listed riparian species, the Bureau (after coordination with the Service) may direct compensation at reducing these threats. The Service considers the Bureau's proposal to compensate for the loss of individuals of the listed bird species as a result of the operation of wind facilities by creating or restoring breeding habitat and reducing other threats to the species to be appropriate and an important component of the land use plan amendment.

Solar Energy

Construction

The potential effects associated with construction would be short term, relative to the operational life of a solar facility. Based on observations to date, individuals of these species collide with fences, solar panels, heliostats, towers, generator-tie lines, and other equipment. Birds may also become entangled in netting. Construction would result in the loss of non-breeding habitat.

Collisions. The construction of solar facilities would affect the listed riparian bird species with regard to collisions with fences, other structures, and equipment in the same manner as would the construction of wind facilities. With solar facilities, generator-tie lines, solar panels, and heliostats would be present although tall cranes and towers would not, except in the case of power towers.

Netting. Netting used during construction of solar facilities would affect the listed riparian bird species in the same manner as during the construction of wind facilities.

Loss of Habitat. The Bureau (2015a, pages 213 and 214) estimates that approximately 38,366 acres of habitat would be developed for solar facilities as a result of the land use plan amendment; only the Piute Valley and Sacramento Mountains Ecoregion do not contain a development focus area. The Bureau's conservation and management actions (LUPA-BIO-13 and 16, LUPA-BIO-RIPWET-1 and 3) will prohibit the development of solar facilities in breeding habitat of these species; consequently, development of solar facilities would occur in desert scrub habitat that individuals of these species may use for stop overs to rest and forage during migration.

The loss of approximately 38,366 acres of resting and foraging habitat would not affect the ability of these species to migrate through the action area. We have reached this conclusion for several reasons. First, the Bureau manages approximately 10,869,000 acres of land within the action area. The loss of 38,366 acres of resting and foraging habitat as a result of the proposed action, combined with 25,720 acres of solar facilities previously approved on public land (see Appendix 1), comprises 0.59 percent from this total land base (That is, [[38,366 + 25,720] / 10,869,000] x 100 = 0.5896.).

Second, public lands within the California Desert Conservation Area and areas managed by the Bakersfield and Bishop field offices within the planning area are intermingled with millions of acres of lands owned by other agencies and private parties. Some of these lands, such as State and national parks provide important habitat to migratory birds in general and, most likely, also to individuals of the listed riparian species; large acreages of privately owned lands also remain available for migrating birds.

Third, the Bureau's commitment to avoid the vast majority of riparian areas (it anticipates the loss of less than 100 acres) will ensure that these areas remain available for the listed riparian

species to use for foraging and resting. These areas provide the highest quality resting and foraging habitat; consequently, their avoidance during the development of solar facilities is important in providing stop over areas for the listed species.

Finally, although individual solar facilities may cause the removal of up to 38,366 acres of foraging and resting habitat, the distribution of the facilities within the development focus areas would not impose a substantial barrier to individuals of the listed riparian species during migration. Given the distances individuals of these species fly, even large solar facilities will not preclude their movement across the desert.

Monitoring. The Bureau will employ the same approach to monitoring the construction of solar facilities that we described in the earlier section of this biological opinion regarding monitoring of the construction of wind facilities. That is, it will require proponents to report any dead birds that are found incidentally.

We analyzed the efficacy of this approach in our discussion of the monitoring of the construction of wind facilities. Please refer to that discussion for details.

Compensation. The Bureau will require that project proponents compensate for the loss of habitat associated with construction of solar facilities according to the ratios described under LUPA-BIO-COMP-1 and other conservation and management actions that address specific situations or habitat types. We analyzed the effectiveness of this approach in our discussion regarding the construction of wind facilities. We will not repeat that analysis here except to note that, because of the larger amounts of habitat that would be disturbed by solar development (relative to the construction of wind facilities), much more upland habitat would be secured or enhanced for resting and foraging by individuals of the listed riparian species. Please refer to that discussion for details.

Operation

The potential effects associated with the operation of solar facilities would occur over many years. Individuals of the listed riparian species may collide with power towers, solar panels, heliostats, fences, generator-tie lines, and other equipment. Birds may also become entangled in netting, be electrocuted, or die in evaporation ponds, or as a result of solar flux. The Bureau proposes to monitor the operation of solar facilities to assess its effects on listed riparian birds and require the project proponent to compensate for any mortality.

Collisions. Individuals of the listed riparian species may collide with power towers, solar panels, heliostats, fences, generator-tie lines, and other structures and equipment during operation of solar facilities. The effects of collisions during operations would be similar to those during operations, although they would persist for a longer period of time.

The effects of aviation safety lights on power towers and generator-tie lines on the listed riparian species would be the same as we discussed in the section regarding the impacts of wind facilities.

The Bureau (2015c, LUPA-BIO-13) will require that all long-term nighttime lighting be directed away from riparian and wetland vegetation, occupied habitat, and suitable habitat areas for these species. It will also require long-term nighttime lighting to be directed and shielded downward to avoid interference with the navigation of night-migrating birds and to minimize the attraction of insects as well as insectivorous birds and bats to project infrastructure. This conservation and management action will reduce the likelihood for lighting to have a measurable effect on individuals of these species.

A western yellow-billed cuckoo was found dead within the power block of the Genesis Solar Project (Beeler 2015, Western EcoSystems Technology 2016a). At this time, we do not know the cause of death; the carcass did not show any obvious cause of death. Heat within the power block may have killed it; the bird may also have collided with a part of the power block. The potential also exists that the bird was under some form of stress before it reached the solar facility, took cover in the power block, and died of natural causes.

At the Ivanpah Solar Electric Generating System, various species of birds have most often collided with heliostats, although a few have collided with fences, vehicles, and a trailer (Weise 2015). Davis (2015b) reported that biologists found a dead western yellow-billed cuckoo near a fence at this site. The carcass showed no evidence of trauma and the power towers were not operational at the time of its death. The bird was a young of the year and may have died of causes unrelated to the solar project.

From March 1, 2015 to February 28, 2016 at the Genesis Solar Energy Project, Western EcoSystems Technology attributed 43 of 240 deaths (18 percent) of non-water birds to collisions with various facilities of the project; it listed the cause of death for 75.8 percent of the deaths as "unknown." (See tables 2 and 3 in Western EcoSystems Technology 2016a). Western EcoSystems Technology (2016a, table 14) calculated the area sampled, observer efficiency, and the rate at which carcasses were removed and adjusted the fatality estimate to a total of 1,126 non-water birds this estimate acknowledges that not all carcasses are detected during surveys.

At the Desert Sunlight Solar Farm Project from February 2, 2015 to February 28, 2016, Western EcoSystems Technology attributed 23 of 83 deaths (27.7 percent) of non-water birds to collisions with various facilities of the project; it listed the cause of death for 73.8 percent of all deaths (including water birds) as "unknown." (See tables 4, 5, and 6 in Western EcoSystems Technology 2016b). The adjusted fatality estimate for this project was 946 non-water birds (Western EcoSystems Technology 2016b, table 16).

Numerous species of birds have died at photovoltaic or solar trough facilities; one theory for these deaths is that some species mistake the numerous solar panels for water and either crash into fences or panels or cannot take flight once they have landed on solid ground. The listed riparian bird species may be subject to this attraction if they associate large water bodies with riparian vegetation. At the Genesis Solar Project, 18 of the 182 carcasses of identifiable non-water birds found between March 1, 2015 to February 28, 2016, were warblers and flycatchers (table 2 in Western EcoSystems Technology 2016a), species that are somewhat similar to least

Bell's vireos and southwestern willow flycatchers in their habitat affinities, insectivorous diets, and size. Consequently, photovoltaic or solar trough facilities would seem to pose a threat to individuals of the listed riparian species.

We are unaware of any willow flycatchers or least Bell's vireos colliding with fences, power blocks, or buildings at solar facilities; the potential exists that such collisions have occurred but the carcasses were not detected. We are aware of eight willow flycatchers that have died probably as a result of colliding with generator-tie or transmission lines. We discussed this threat in the Wind Energy – Operations – Collisions section of this biological opinion; generator-tie lines associated with solar facilities pose the same threat as do those associated with wind facilities.

Flux. Power towers, with solar flux extending hundreds of feet above the ground, would likely pose a risk to individuals of the listed riparian species. Flux would singe their feathers and possibly damage their eyes; exposure to high levels of flux would likely cause damage to soft tissues. To date, although we are aware that the carcasses of warblers, flycatchers, and a single vireo (not least Bell's) have been found with evidence of damage by flux, no individuals of the listed riparian species have been found (Weise 2015).

We are aware that Solar Partners, the operators of the Ivanpah Solar Electric Generating System, are experimenting with technologies to reduce the mortalities associated with flux. If a method is developed that reduces the number of fatalities caused by flux, the Bureau would require the adoption of appropriate measures at facilities approved as a result of the land use plan amendment (LUPA-BIO-17).

Netting. We expect that bird-deterrent netting used on equipment is likely to kill or injure few birds because it is generally not used extensively during operations.

Electrocution. We expect that electrocution during operations at solar facilities would pose the same threat to the listed riparian species as that of wind facilities.

Evaporation Ponds. Solar facilities may have evaporation ponds to provide for the disposal of process water from photovoltaic facilities and to store cooling water for solar thermal plants. Both types of ponds may contain brines or chemicals (such as algaecides) that could kill or injure individuals of listed riparian species if they landed in the ponds. We are also aware that smaller birds have been trapped by nets covering ponds to prevent wildlife from entering.

The Bureau (2015c, LUPA-BIO-9) will prohibit the use of evaporation ponds when the water quality would be harmful to wildlife; it will also employ adaptive management to require the adjustment of netting. For these reasons, we expect that few, if any individuals of the listed riparian species are likely to be killed or injured by evaporation ponds.

Climate Effects. In the section of this biological opinion that addressed desert tortoises, we discussed Millstein and Menon's (2011) model regarding the potential warming effects of large areas of solar panels in the desert. Because the modeled solar facilities that Millstein and Menon

predicted would increase local temperatures and regional wind patterns are so large and concentrated compared to those reasonably certain to occur under the land use plan amendment, we expect that the proposed action is unlikely to alter local temperatures or regional wind patterns in a manner that would affect the listed riparian species.

Monitoring. The Bureau will implement the same monitoring procedures during the operation of solar facilities that we described for wind energy projects; it will also conduct reviews of the monitoring results at quarterly and 5-year intervals. Although an evidence of absence model is not yet available for solar facilities, the Bureau has contracted with the U.S. Geological Survey to develop such a model; the Bureau and U.S. Geological Survey expect that it will be completed prior to the onset of construction of any solar facilities that may result from the proposed land use plan amendment. As for wind facilities, the Bureau's proposed action also includes a commitment to implement adaptive management if it determines that its methods require adjustment over time.

Compensation. At this time, we do not have technology to effectively minimize or avoid all mortality of these species at solar facilities; the potential exists that individuals of the listed species will continue to die at these facilities no matter the technology. The Bureau will create or restore habitat for the listed riparian species to compensate for the mortality of listed riparian birds in the same manner as it proposed for wind facilities. As we discussed previously, the Bureau's proposal to create or restore additional breeding habitat addresses known threats to all three species of listed riparian birds and is a reasonable means offsetting the adverse effects of the loss of individuals.

Geothermal Energy

The Bureau expects up to 6,814 acres of geothermal facilities may be built within the action area as a result of the proposed land use plan amendment. The construction and operation of geothermal facilities would have the same types of effects on the listed riparian species as wind and solar facilities with regard to birds colliding with fences, equipment, or generator-tie lines or being electrocuted. The Bureau would implement similar protective and adaptive management measures and require that project proponents monitor and mitigate impacts to these species. We are unaware of any instance where geothermal facilities have killed or injured individuals of the listed riparian species; we acknowledge that extensive and species-specific monitoring has likely not occurred at most geothermal facilities. Also, the Bureau has not proposed to develop evidence of absence modelling for geothermal plants.

Given the lack of obvious threats related to geothermal facilities and the relatively small area that is likely to be developed for geothermal resources, we expect that these facilities will result in the death or injury of few, if any, individuals of the listed riparian species.

CUMULATIVE EFFECTS

As we discussed in the Cumulative Effects section for the desert tortoise, the proposed action has no cumulative effects.

CONCLUSION FOR THE WESTERN YELLOW-BILLED CUCKOO

In determining whether a proposed action is likely to jeopardize the continued existence of a species, we consider the effects of the action with respect to the reproduction, numbers, and distribution of the species. We also consider the effects of the action on the recovery of the species. In that context, the following paragraphs summarize the effects of the proposed action on the western yellow-billed cuckoo.

Reproduction

We have no information to indicate that the development and operation of renewable energy facilities would affect the reproductive capacity of western yellow-billed cuckoos in any manner.

Numbers

The Bureau estimated that one western yellow-billed cuckoo may die or be injured every 3 years for each 10,000 acres of renewable energy facilities developed as a result of the land use plan amendment. The number of western yellow-billed cuckoos that die at renewable energy facilities will be a function of the numbers of birds that migrate through the action area. That number will vary depending on the number of birds in the overall population and where they are breeding; for example, western yellow-billed cuckoos that breed along the Colorado River may not migrate across the action area, although individuals that breed along the Kern River likely would. We are also aware of western yellow-billed cuckoos that have crossed the action area more than once in a single breeding season.

The location of the renewable energy facilities would also influence how likely western yellow-billed cuckoos are to be killed. For example, western yellow-billed cuckoos are more likely to encounter solar facilities near the Colorado River, where they are relatively common, than in the western Mojave Desert, where only a few individual birds have been observed in scattered locations.

Finally, one type of renewable energy facility may pose more of a threat than others. Advances in reducing the mortality of migratory birds may also occur over time.

To date, we are aware that two western yellow-billed cuckoos have been found dead at solar facilities (Ivanpah Solar Electric Generating System [Davis 2015b] and Genesis Solar Project [Beeler 2015]). The birds may have collided with a fence (Ivanpah in 2012) or a power block (Genesis in 2015). The deaths occurred in a little over 3 years; by mid-2015, approximately 25,000 acres of solar facilities had been developed on public lands. With that information, the

Bureau's estimate seems appropriate. However, monitoring to date has not been consistent and we have not applied the evidence of absence model to the data that have been collected; that information would support the contention that more western yellow-billed cuckoos have died at renewable energy facilities than have been detected. Conversely, the potential exists that neither of these deaths were caused by the solar facilities.

Paxton *et al*. (2007) concluded that the survival rates of southwestern willow flycatchers are lowest during migration; the same is likely true for western yellow-billed cuckoos because they also migrate over long distances. The presence of renewable energy facilities in the desert may add some degree of threat to birds during migration; we do not know at this time whether the presence of renewable energy facilities along migration routes will affect their rate of survival.

In its proposed listing rule (78 FR 61622, October 3, 2013), the Service estimated that between 350 and 495 pairs of western yellow-billed cuckoos resided in the United States; we also estimated that that 330 to 1,025 pairs may occur in Mexico. The Service noted in the proposed rule that these numbers may overestimate the size of the breeding population because some birds move between different breeding areas and may have been counted twice during surveys. Conversely, these estimates do not include non-breeding individuals.

For the purposes of this analysis, we will assume that all 48,419 acres of renewable energy facilities are developed in the first year after the land use plan amendment is adopted and that all right-of-way grants are for 30 years. This level of development is unlikely to occur but the assumption allows us to present a worst-case analysis. The Bureau estimated that a single western yellow-billed cuckoo would die every 3 years for each 10,000 acres; the Bureau's estimate is based on its observations and is the best available information at this time. One bird every 3 years equals 0.33 bird in one year; 48,419 divided by 10,000 equals 4.8419; 4.8419 times 0.33 equals 1.597827 birds for all 48,419 acres in the first year. We then multiplied the 1.597827 birds per year by 30 years (the standard life of right-of-way grants), which equals 47.93481; we will round this to 48 birds over the 30-year lives of 48,419 acres of right-of-way grants.
The loss of two birds comprises 0.30 percent of the number of breeding birds in the United States (We rounded the estimated annual mortality of 1.597827 to two birds and divided two by the lower range of a partial population estimate [i.e., the 330 pairs or 660 birds that breed in the United States, not including non-breeders]).

We expect that the numbers of western yellow-billed cuckoos will change over time and that the numbers of birds that die at renewable energy facilities is likely to be related to the number migrating through the action area. That is, more western yellow-billed cuckoos are likely to die if the overall population of the species increases; the converse is also true.

Other factors will likely affect the number of western yellow-billed cuckoos that die at renewable energy facilities. For example, changes in technology and the adoption of measures to reduce mortality may alter mortality rates but we have no ability to predict that at this time. The locations of the renewable energy facilities are likely to be factors in mortality rates. Changes in weather patterns may affect survival rates during migration. Birds that begin the northern

migration to breeding habitat after a winter of low prey availability may be more likely to die; the converse may also be true. Storm fronts may cause birds to follow specific routes that avoid or bring them into contact with renewable energy facilities.

Based on the best available information, a conservative approach to analyzing the likely effects, and our comparison of the expected number of mortalities to the range-wide population, we conclude that the loss of fewer than 2 individuals per year and of 48 western yellow-billed cuckoos over 30 years of development of renewable energy facilities on 48,419 acres within the development focus areas is not likely to appreciably affect the numbers of individuals or population trends of the species. If the ongoing monitoring of mortality at the renewable energy facilities provides information that is inconsistent with this analysis, the Bureau will either reinitiate consultation or require the projects' operators to adopt additional protective measures to reduce mortality.

Distribution

The development of renewable energy facilities within the action area as a result of the land use plan amendment would not result in the loss of breeding habitat. During migration, western yellow-billed cuckoos may stop to rest and forage in the desert scrub habitat where renewable energy facilities could be located; the loss of this stop-over habitat will not have a measurable effect on the species. Consequently, the proposed land use plan amendment will not alter the distribution of the western yellow-billed cuckoo.

Effects on Recovery

The Bureau has proposed to require project proponents to offset the adverse effects of the loss of individuals and habitat by implementing actions to promote the recovery of the affected species in a manner where the mitigation is commensurate with the adverse effect. The Bureau has proposed to restore or create breeding habitat to offset the total loss of individuals predicted for the life of each project. As we stated previously, habitat loss and degradation are contributing factors to the decline of western yellow-billed cuckoo; consequently, the Bureau's proposal to create or restore additional breeding habitat is a reasonable means offsetting the adverse effects of the loss of individuals and will benefit the recovery of the western yellow-billed cuckoo.

Conclusion

After reviewing the current status of the western yellow-billed cuckoo, the environmental baseline for the action area, the effects of the proposed land use plan amendment, and the cumulative effects, it is the Service's biological opinion that the Bureau's land use plan amendment, as proposed, is not likely to jeopardize the continued existence of the species. We have reached this conclusion because:

The proposed land use plan amendment will not adversely affect the reproductive capacity of the western yellow-billed cuckoo.

Over the 30-year life of right-of-way grants for renewable energy facilities, we anticipate that 48 individuals are likely to be killed within renewable energy facilities in development focus areas; this loss is not likely to appreciably reduce the number of western yellow-billed cuckoos or affect population trends of the species over this time. We are not addressing an annual loss of western yellow-billed cuckoos because the number of individuals varies from year-to-year as a result of breeding success; such short-term variability is unlikely to have a measurable effect on the number of western yellow-billed cuckoos over the 30-year life of right-of-way grants for renewable energy facilities.

The proposed action will not result in the loss of breeding habitat of the species and the relatively minor loss of resting and foraging habitat (i.e., desert scrub) will not adversely affect the species' ability to migrate through the action area.

INCIDENTAL TAKE STATEMENT FOR THE WESTERN YELLOW-BILLED CUCKOO

As we discussed in the Numbers section for the western yellow-billed cuckoo, the number of western yellow-billed cuckoos that die at renewable energy facilities will be a function of the number of birds migrating through the action area (which is itself a function of the number of birds in the population), the types and locations of renewable energy facilities, protective measures, and local and range-wide weather patterns. We reached our conclusion that the proposed land use plan amendment is not likely to jeopardize the continued existence of the western yellow-billed cuckoo based upon the best available information and a worst-case analysis of that information.

Because we have accepted the Bureau's estimate of the number of western yellow-billed cuckoos that are likely to die at renewable energy facilities authorized under the land use plan amendment, we will use that estimate of the anticipated level of incidental take for this biological opinion. Based upon the best available information and this estimate, we anticipate that 48 western yellow-billed cuckoos are likely to be taken over the 30-year life of right-of-way grants for renewable energy facilities developed under the auspices of the land use plan amendment. Western yellow-billed cuckoos may be struck and killed by turbine blades; fly into structures, fences, wires, generator-tie lines, and solar panels; or be electrocuted. If more than 48 western yellow-billed cuckoos die as a result of renewable energy facilities that the Bureau authorizes within development focus areas as a result of this land use plan amendment, the Bureau would be required to re-initiate consultation.

We discussed the numerous variables involved that will likely result in different amounts of incidental take at specific renewable energy facilities previously in this biological opinion. Consequently, as the Bureau described as part of the proposed action, the Service will allocate a portion of the incidental take that we have anticipated for this biological opinion as a whole at the time the Bureau evaluates specific projects. If the amount of incidental take allocated for that specific renewable energy facility is exceeded, we would consider this to be new information revealing the effects of the action that may affect listed species in a manner or to an extent not

considered in this opinion (50 CFR 402.16) and the Bureau would be required to re-initiate consultation as related to the specific facility.

As we have discussed previously, the U.S. Geological Survey has developed a model to allow the Bureau to estimate the number of individuals of rare species, such as the western yellow-billed cuckoo, that are likely to be killed each year at specific wind energy facilities; the U.S. Geological Survey is in the process of developing a similar model for solar facilities. When the Bureau coordinates with the Service regarding the authorization of a specific renewable energy facility, it will apply the U.S. Geological Survey's model. If the outcome of the modeling effort exceeds the amount of incidental take that we have anticipated in this biological opinion, the Bureau would be required to re-initiate consultation. Monitoring and application of the U.S. Geological Survey model will occur for the life of the project.

In all cases where the Bureau would re-initiate consultation with the Service, we would evaluate the specific circumstances to determine the appropriate course of action. For example, the first course of action would likely be remediation of the threat that caused the mortality. If the complete removal of the threat is not possible and the best available information indicated that the range-wide status of the western yellow-billed cuckoo was stable or increasing, the Bureau will use the adaptive management provisions of the conservation and management actions in the land use plan amendment to increase the amount of compensatory mitigation. If neither option is available, the Service and Bureau would enter formal consultation to re-evaluate the effects of the land use plan amendment or specific facility, as appropriate, on the western yellow-billed cuckoo.

REASONABLE AND PRUDENT MEASURES AND TERMS AND CONDITIONS

The conservation and management actions proposed by the Bureau include numerous measures to minimize the take of western yellow-billed cuckoos. Additionally, the Bureau has proposed to coordinate with the Service, as described in the Description of the Proposed Action section of this biological opinion, when proponents propose specific renewable energy facilities to adapt the appropriate conservation and management actions for that activity. Consequently, we have not identified any reasonable and prudent measures or terms and conditions that we consider necessary or appropriate to minimize take of the western yellow-billed cuckoo at this time.

CONCLUSION FOR THE SOUTHWESTERN WILLOW FLYCATCHER

In determining whether a proposed action is likely to jeopardize the continued existence of a species, we consider the effects of the action with respect to the reproduction, numbers, and distribution of the species. We also consider the effects of the action on the recovery of the species. In that context, the following paragraphs summarize the effects of the proposed action on the southwestern willow flycatcher.

Reproduction

We have no information to indicate that the development and operation of renewable energy facilities would affect the reproductive capacity of southwestern willow flycatchers in any manner.

Numbers

The Bureau estimated that 3 willow flycatchers may die or be injured every year for each 10,000 acres of renewable energy facilities developed as a result of the land use plan amendment. The Bureau based its estimates on all willow flycatchers, not just the southwestern (*extimus*) subspecies, because all three subspecies migrate through the action area and they are indistinguishable, except by song or by an expert with the bird in hand (Song will not assist in the identification of the carcasses because dead birds do not sing). Given the likely similarities in behavior of the three subspecies during migration and the difficulties in distinguishing one subspecies from another, the use of the species as a surrogate for the listed subspecies is appropriate (50 CFR 402.14(i)(1)(i)).

The number of willow flycatchers that die at renewable energy facilities will be a function of the numbers of birds that migrate through the action area. That number will vary depending on the number of birds in the overall population and where they are breeding; for example, southwestern willow flycatchers that breed along the Colorado River may not migrate across the action area, although individuals that breed along the Kern and Owens rivers likely would.

The location of the renewable energy facility may also influence how likely southwestern willow flycatchers are to be killed. For example, southwestern willow flycatchers are more likely to encounter solar facilities near the Colorado River, where they are relatively common, than in the central Mojave Desert, which is not near any large breeding concentrations for this subspecies.

Finally, one type of renewable energy facility may pose more of a threat than others. Advances in reducing the mortality of migratory birds may also occur over time.

To date, we are aware that two willow flycatchers have been found dead at solar facilities; both were identified as subspecies *brewsteri*. Both were found under generator-tie lines (Guigliano 2015, Dietsch 2015a; Dietsch 2015b). Six willow flycatchers that were not identified to subspecies were found under a transmission line (EDM International 2016); although these mortalities were not associated with a renewable energy facility, we cite the incident because transmission lines, generator-tie lines, and collector lines may affect migratory birds in the same manner, albeit at different scales. The deaths occurred in a little over 3 years; by mid-2015, approximately 25,000 acres of solar facilities had been developed on public lands. With that information, the Bureau's estimate seems appropriate. However, monitoring to date has not been consistent and we have not applied the evidence of absence model to the data that have been collected; that information would support the contention that more willow flycatchers have died at renewable energy facilities than have been detected.

Paxton *et al*. (2007) concluded that the survival rates of southwestern willow flycatchers are lowest during migration; the same is likely true for all subspecies of willow flycatchers because they migrate long distances. The presence of renewable energy facilities in the desert may add some degree of threat to migration.

In its 5-year review, the Service (2014f) stated that the "most current estimated number of rangewide … territories is 1,299;" this estimate was based on literature published in 2008. The estimate does not include non-breeding southwestern willow flycatchers.

For the purposes of this analysis, we will assume that all 48,419 acres of renewable energy facilities are developed in the first year after the land use plan amendment is adopted and that each right-of-way grant would be for 30 years. This level of development is unlikely to occur but the assumption allows us to present a worst-case analysis. If full development occurs, according to the Bureau's estimate, 15 willow flycatchers are likely to die each year. This equals approximately 436 birds over the 30-year lives of 48,419 acres of right-of-way grants (Three birds every year for each 10,000 acres: 48,419 acres divided by 10,000 equals 4.8419; 4.8419 times 3 times 30 equals approximately 435.771 birds).

We do not know the size of the population of all three subspecies of willow flycatcher that may occur in the action area. The loss of 15 birds (of all 3 subspecies) would comprise 0.58 percent of the 2,598 breeding southwestern willow flycatchers in the United States, based on the most recent data, which is from 2007 (We assumed each territory supported 2 birds and divided the annual mortality estimate [i.e., 15 birds] by the number of birds in the territories [i.e., 2 times the 1,299 territories]). This calculation overestimates the number of southwestern willow flycatchers that are likely to die at renewable energy facilities because it compares the number of deaths of willow flycatchers to the estimated number of southwestern willow flycatchers; the overall number of southwestern willow flycatchers is a subset of that of willow flycatchers. It also overestimates the impact of these mortalities on the overall population of southwestern willow flycatchers because we did not include the number of non-breeding individuals in the calculation. We recognize that the total number of southwestern willow flycatchers may have decreased since the most recent assessment; however, those data are the best available information.

We expect that the numbers of southwestern willow flycatchers will change over time and that the numbers of birds that die at renewable energy facilities is likely to be related to the number migrating through the desert. That is, more willow flycatchers are likely to die if the overall population of the species increases; the converse is also true (Changes in technology and the adoption of measures to reduce mortality may change this relationship but we have no ability to predict that at this time).

Based on the best available information, a conservative approach to analyzing the likely effects, and our comparison of the expected number of mortalities to the range-wide population, we conclude that the loss of up to 15 willow flycatchers per year and of 436 willow flycatchers over 30 years of development of renewable energy facilities on 48,419 acres within the development focus areas is not likely to appreciably affect the number of individuals or population trends of

the southwestern willow flycatcher. If the ongoing monitoring of mortality at the renewable energy facilities provides information that is inconsistent with this analysis, the Bureau will either reinitiate consultation or require the projects' operators to adopt additional protective measures to reduce mortality.

Distribution

The development of renewable energy facilities within the action area as a result of the land use plan amendment would not result in the loss of breeding habitat. During migration, southwestern willow flycatchers may stop to rest and forage in the desert scrub habitat where renewable energy facilities could be located; the loss of this stop-over habitat will not have a measurable effect on the species. Consequently, the proposed land use plan amendment will not alter the distribution of the southwestern willow flycatcher.

Effects on Recovery

The Bureau has proposed to require project proponents to offset the adverse effects of the loss of individuals and habitat by implementing actions to promote the recovery of the affected species in a manner where the mitigation is commensurate with the adverse effect. The Bureau has proposed to restore or create breeding habitat to offset the total loss of individuals predicted for the life of each project. As we stated previously, habitat loss and degradation are contributing factors to the decline of southwestern willow flycatcher; consequently, the Bureau's proposal to create or restore additional breeding habitat is a reasonable means offsetting the adverse effects of the loss of individuals and may benefit the recovery of the southwestern willow flycatcher.

Conclusion

After reviewing the current status of the southwestern willow flycatcher, the environmental baseline for the action area, the effects of the proposed land use plan amendment, and the cumulative effects, it is the Service's biological opinion that the Bureau's land use plan amendment, as proposed, is not likely to jeopardize the continued existence of the species. We have reached this conclusion because:

The proposed land use plan amendment will not adversely affect the reproductive capacity of the southwestern willow flycatcher.

Over the 30-year life of right-of-way grants for renewable energy facilities, we anticipate that up to 436 willow flycatchers are likely to be killed within renewable energy facilities in development focus areas; this loss is not likely to appreciably affect population trends of the southwestern willow flycatcher over this time. We are not addressing an annual loss of willow flycatchers because the number of individuals varies from year-to-year as a result of breeding success; such short-term variability is unlikely to have a measurable effect on the number of southwestern willow flycatchers over the 30-year life of right-of-way grants for renewable energy facilities.

The proposed action will not result in the loss of breeding habitat of the species and the relatively minor loss of resting and foraging habitat (i.e., desert scrub) will not adversely affect the species' ability to migrate through the action area.

INCIDENTAL TAKE STATEMENT FOR THE SOUTHWESTERN WILLOW FLYCATCHER

As we discussed in the Numbers section, the number of southwestern willow flycatchers that die at renewable energy facilities will be a function of the number of birds migrating through the action area (which is itself a function of the number of birds in the population), the types and locations of renewable energy facilities, protective measures, and local and range-wide weather patterns. We reached our conclusion that the proposed land use plan amendment is not likely to jeopardize the continued existence of the southwestern willow flycatcher based upon the best available information and a worst-case analysis of that information.

Dead southwestern willow flycatchers can be distinguished from other subspecies of *Empidonax traillii* only by experts; in some cases of incidental take, we may be unable to identify willow flycatchers to the sub-specific level. Therefore, we will use the willow flycatcher as a surrogate for the southwestern willow flycatcher in this incidental take statement (50 CFR402.14(i)(1)(i)).

Because we have accepted the Bureau's estimate of the number of willow flycatchers that are likely to die at renewable energy facilities authorized under the land use plan amendment, we will use that estimate of the anticipated level of incidental take for this biological opinion. The Bureau estimated that 3 willow flycatchers would die every year for each 10,000 acres. Based on this estimate, we estimate that 436 willow flycatchers are likely to be killed at renewable energy facilities authorized under the auspices of the land use plan amendment.

Based upon the best available information and this estimate, we anticipate that 436 willow flycatchers are likely to be taken over the 30-year life of right-of-way grants for renewable energy facilities developed under the auspices of the land use plan amendment. Willow flycatchers may be struck and killed by turbine blades; fly into structures, fences, wires, generator-tie lines, and solar panels; or be electrocuted. If more than 436 willow flycatchers die as a result of renewable energy facilities that the Bureau authorizes within development focus areas as a result of this land use plan amendment, the Bureau would be required to re-initiate consultation.

We discussed the numerous variables involved that will likely result in different amounts of incidental take at specific renewable energy facilities previously in this biological opinion. Consequently, as the Bureau described as part of the proposed action, the Service will allocate a portion of the incidental take that we have anticipated for this biological opinion as a whole at the time the Bureau evaluates specific projects. If the amount of incidental take allocated for that specific renewable energy facility is exceeded, we would consider this to be new information revealing the effects of the action that may affect listed species in a manner or to an extent not

considered in this opinion (50 CFR 402.16) and the Bureau would be required to re-initiate consultation as related to the specific facility.

As we have discussed previously, the U.S. Geological Survey has developed a model to allow the Bureau to estimate the number of individuals of rare species, such as the southwestern willow flycatcher, that are likely to be killed each year at specific wind energy facilities; the U.S. Geological Survey is in the process of developing a similar model for solar facilities. When the Bureau coordinates with the Service regarding the authorization of a specific renewable energy facility, it will apply the U.S. Geological Survey's model. If the outcome of the modeling effort exceeds the amount of incidental take that we have anticipated in this biological opinion, the Bureau would be required to re-initiate consultation. Monitoring and application of the U.S. Geological Survey model will occur for the life of the project.

In all cases where the Bureau would re-initiate consultation with the Service, we would evaluate the specific circumstances to determine the appropriate course of action. For example, the first course of action would likely be remediation of the threat that caused the mortality. If the complete removal of the threat is not possible and the best available information indicated that the range-wide status of the southwestern willow flycatcher was stable or increasing, the Bureau will use the adaptive management provisions of the conservation and management actions in the land use plan amendment to increase the amount of compensatory mitigation. If neither option is available, the Service and Bureau would enter formal consultation to re-evaluate the effects of the land use plan amendment or specific facility, as appropriate, on the southwestern willow flycatcher.

REASONABLE AND PRUDENT MEASURES AND TERMS AND CONDITIONS

The conservation and management actions proposed by the Bureau include numerous measures to minimize the take of southwestern willow flycatchers. Additionally, the Bureau has proposed to coordinate with the Service, as described in the Description of the Proposed Action section of this biological opinion, when proponents propose specific renewable energy facilities to adapt the appropriate conservation and management actions for that activity. Consequently, we have not identified any reasonable and prudent measures or terms and conditions that we consider necessary or appropriate to minimize take of the southwestern willow flycatcher at this time.

CONCLUSION FOR THE LEAST BELL'S VIREO

In determining whether a proposed action is likely to jeopardize the continued existence of a species, we consider the effects of the action with respect to the reproduction, numbers, and distribution of the species. We also consider the effects of the action on the recovery of the species. In that context, the following paragraphs summarize the effects of the proposed action on the least Bell's vireo.

Reproduction

We have no information to indicate that the development and operation of renewable energy facilities would affect the reproductive capacity of least Bell's vireos in any manner.

Numbers

The Bureau estimated that three least Bell's vireos may die or be injured every year for each 10,000 acres of renewable energy facilities developed as a result of the land use plan amendment. The number of least Bell's vireos that die at renewable energy facilities will be a function of the numbers of birds that migrate through the action area. That number will vary depending on the number of birds in the overall population. Additionally, one type of renewable energy facility may pose more of a threat than others. Advances in reducing the mortality of migratory birds may also occur over time.

To date, we are unaware of any least Bell's vireos that have been killed or injured at renewable energy facilities. With that information, the Bureau's estimate seems high. Although least Bell's vireos are smaller than western yellow-billed cuckoos or southwestern willow flycatchers and would seemingly be more difficult to find during monitoring, surveyors are finding numerous warblers, which are similarly sized but far more abundant. Monitoring to date has not been consistent and we have not applied the evidence of absence model to the data that have been collected; that information would support the contention that at least some least Bell's vireos have died at renewable energy facilities but not been detected.

We also note that most least Bell's vireos nest along the coast of southern California and winter in southern Baja California, Mexico (Service 1998). Relatively few nest within the plan area. Consequently, we expect that relatively few least Bell's vireos will migrate through the action area and be exposed to renewable energy facilities. This factor also seems to render the Bureau's estimate high.

Paxton *et al*. (2007) concluded that the survival rates of southwestern willow flycatchers are lowest during migration. The same may be true for least Bell's vireos; however, we have no information regarding this aspect of their life history. The presence of renewable energy facilities in the desert may pose some degree of threat to least Bell's vireos during migration.

In its 5-year review, the Service (2006c) estimated that 2,968 territories were present between 2001 and 2005; this estimate is based on "a composite of surveys" and represents the number present in a given year. In 2014, surveyors detected 2,477 territorial males (Kus *et al*. 2014). These numbers do not necessarily represent a trend because not all locations are surveyed every year; however, these estimates represent a substantial increase from the number of least Bell's vireos at the time of listing. The estimates do not include non-breeding individuals or those breeding in Baja California, Mexico.

For the purposes of this analysis, we will assume that all 48,419 acres of renewable energy facilities are developed in the first year after the land use plan amendment is adopted and that each right-of-way grant would be for 30 years. This level of development is unlikely to occur but the assumption allows us to present a worst-case analysis. Because we consider the Bureau's estimate of three birds every year for each 10,000 acres to be too high, we will use an estimate of one bird per year. If full development occurs, according to the Bureau's estimate, five least Bell's vireos are likely to die each year (One bird every year for each 10,000 acres: 48,419 acres divided by 10,000 equals 4.8419; 4.8419 times 1 equals approximately 4.8419 birds; 4.8419 times 30 equals 145.257 birds).

The loss of 5 birds would comprise 0.10 percent of the 4,954 breeding least Bell's vireos in the United States (We assumed each territory supported 2 birds and divided the annual mortality estimate [i.e., 5 birds] by the number of birds in the territories [i.e., 2 times the 2,477 territories]; we then multiplied by 100 to determine the percentage). This calculation overestimates the percentage of the population of least Bell's vireos likely to die each year because the annual surveys do not cover the entire range of the taxon; additionally, the calculation does not include individuals in Baja California and non-breeding birds.

We expect that the numbers of least Bell's vireos will change over time and that the numbers of birds that die at renewable energy facilities is likely to be related to the number migrating through the desert. That is, more least Bell's vireos are likely to die if the overall population of the species increases; the converse is also true (Changes in technology and the adoption of measures to reduce mortality may change this relationship but we have no ability to predict that at this time).

Based on the best available information, a conservative approach to analyzing the likely effects, and our comparison of the expected number of mortalities to the range-wide population, we conclude that the loss of up to 5 individuals per year and of 146 least Bell's vireos over 30 years of development of renewable energy facilities on 48,419 acres within the development focus areas is not likely to appreciably affect the numbers of individuals or population trends of the species. If the ongoing monitoring of mortality at the renewable energy facilities provides information that is inconsistent with this analysis, the Bureau will either reinitiate consultation or require the projects' operators to adopt additional protective measures to reduce mortality.

Distribution

The development of renewable energy facilities within the action area as a result of the land use plan amendment would not result in the loss of breeding habitat. During migration, least Bell's vireos may stop to rest and forage in the desert scrub habitat where renewable energy facilities could be located; the loss of this stop-over habitat will not have a measurable effect on the species. Consequently, the proposed land use plan amendment will not alter the distribution of the least Bell's vireo.

Effects on Recovery

The Bureau has proposed to require project proponents to offset the adverse effects of the loss of individuals and habitat by implementing actions to promote the recovery of the affected species in a manner where the mitigation is commensurate with the adverse effect. The Bureau has proposed to restore or create breeding habitat to offset the total loss of individuals predicted for the life of each project. As we stated previously, habitat loss and degradation are contributing factors to the decline of least Bell's vireo; consequently, the Bureau's proposal to create or restore additional breeding habitat is a reasonable means offsetting the adverse effects of the loss of individuals and may benefit the recovery of the least Bell's vireo.

Conclusion

After reviewing the current status of the least Bell's vireo, the environmental baseline for the action area, the effects of the proposed land use plan amendment, and the cumulative effects, it is the Service's biological opinion that the Bureau's land use plan amendment, as proposed, is not likely to jeopardize the continued existence of the species. We have reached this conclusion because:

> The proposed land use plan amendment will not adversely affect the reproductive capacity of the least Bell's vireo.
>
> Over the 30-year life of right-of-way grants for renewable energy facilities, we anticipate that 146 least Bell's vireos are likely to be killed within renewable energy facilities in development focus areas; this loss is not likely to appreciably affect population trends of the least Bell's vireo over this time. We are not addressing an annual loss of least Bell's vireos because the number of individuals varies from year-to-year as a result of breeding success; such short-term variability is unlikely to have a measurable effect on the number of least Bell's vireos over the 30-year life of right-of-way grants for renewable energy facilities.
>
> The proposed action will not result in the loss of breeding habitat of the species and the relatively minor loss of resting and foraging habitat (i.e., desert scrub) will not adversely affect the species' ability to migrate through the action area.

INCIDENTAL TAKE STATEMENT FOR THE LEAST BELL'S VIREO

As we discussed in the Numbers section, the number of least Bell's vireos that die at renewable energy facilities will be a function of the number of birds migrating through the action area (which is itself a function of the number of birds in the population), the types and locations of renewable energy facilities, protective measures, and local and range-wide weather patterns. We reached our conclusion that the proposed land use plan amendment is not likely to jeopardize the continued existence of the least Bell's vireo based upon the best available information and a worst-case analysis of that information.

We revised the Bureau's estimate of the number of least Bell's vireos that are likely to die at renewable energy facilities authorized under the land use plan amendment; we will use the revised estimate of the anticipated level of incidental take for this biological opinion. We estimated that 1 least Bell's vireo would die every year for each 10,000 acres. Based on this estimate, we estimate that 146 least Bell's vireos are likely to be killed at renewable energy facilities authorized under the auspices of the land use plan amendment. That is, 48,419 divided by 10,000 equals 4.8419; 4.8419 times 1 equals 4.8419 birds for all 48,419 acres in the first year. We then multiplied the 4.8419 birds per year by 30 years (the standard life of right-of-way grants), which equals 145.257; we will round this to 146 birds over the 30-year lives of right-of-way grants.

Based upon the best available information and this estimate, we anticipate that 146 least Bell's vireos are likely to be taken over the 30-year life of right-of-way grants for renewable energy facilities developed under the auspices of the land use plan amendment. Least Bell's vireos may be struck and killed by turbine blades; fly into structures, fences, wires, and solar panels; or be electrocuted. If more than 146 least Bell's vireos die as a result of renewable energy facilities that the Bureau authorizes within development focus areas as a result of this land use plan amendment, the Bureau would be required to re-initiate consultation.

We discussed the numerous variables involved that will likely result in different amounts of incidental take at specific renewable energy facilities previously in this biological opinion. Consequently, as the Bureau described as part of the proposed action, the Service will allocate a portion of the incidental take that we have anticipated for this biological opinion as a whole at the time the Bureau evaluates specific projects. If the amount of incidental take allocated for that specific renewable energy facility is exceeded, we would consider this to be new information revealing the effects of the action that may affect listed species in a manner or to an extent not considered in this opinion (50 CFR 402.16) and the Bureau would be required to re-initiate consultation as related to the specific facility.

As we have discussed previously, the U.S. Geological Survey has developed a model to allow the Bureau to estimate the number of individuals of rare species, such as the least Bell's vireo, that are likely to be killed each year at specific wind energy facilities; the U.S. Geological Survey is in the process of developing a similar model for solar facilities. When the Bureau coordinates with the Service regarding the authorization of a specific renewable energy facility, it will apply the U.S. Geological Survey's model. If the outcome of the modeling effort exceeds the amount of incidental take that we have anticipated in this biological opinion, the Bureau would be required to re-initiate consultation. Monitoring and application of the U.S. Geological Survey model will occur for the life of the project.

In all cases where the Bureau would re-initiate consultation with the Service, we would evaluate the specific circumstances to determine the appropriate course of action. For example, the first course of action would likely be remediation of the threat that caused the mortality. If the complete removal of the threat is not possible and the best available information indicated that the range-wide status of the least Bell's vireo was stable or increasing, the Bureau will use the

adaptive management provisions of the conservation and management actions in the land use plan amendment to increase the amount of compensatory mitigation. If neither option is available, the Service and Bureau would enter formal consultation to re-evaluate the effects of the land use plan amendment or specific facility, as appropriate, on the least Bell's vireo.

REASONABLE AND PRUDENT MEASURES AND TERMS AND CONDITIONS

The conservation and management actions proposed by the Bureau include numerous measures to minimize the take of least Bell's vireos. Additionally, the Bureau has proposed to coordinate with the Service, as described in the Description of the Proposed Action section of this biological opinion, when proponents propose specific renewable energy facilities to adapt the appropriate conservation and management actions for that activity. Consequently, we have not identified any reasonable and prudent measures or terms and conditions that we consider necessary or appropriate to minimize take of the least Bell's vireo at this time.

STATUS OF THE YUMA RIDGWAY'S RAIL

The Service listed the Yuma clapper rail as endangered in 1967 (32 FR 4001). Since that time, Chesser *et al*. (2014) revised the check-list of North American birds to replace *Rallus longirostris* (clapper rail) with *R. obsoletus* (Ridgway's rail); this revision of the name of the species did not affect the taxon with regard to its listing as endangered.

We summarized the following information regarding threats to the Yuma Ridgway's rail from the draft revised recovery plan (Service 2009). Dams have substantially altered the hydrographic regime of the lower Colorado River. The absence of normal flood events has reduced the cycle of flooding and marsh building that provided habitat for the Yuma Ridgway's rail along large areas of the Colorado River. Channelization, bank stabilization, levee construction, and control of water flows have disconnected marsh habitats associated with backwaters and riparian areas from the river and allowed for the development of large areas of agriculture within the remaining floodplain.

Recovery Plan

We summarized the following information from the draft revised recovery plan (Service 2009). We would consider proposing reclassification of the Yuma Ridgway's rail to threatened when:

> Annual surveys document a stable or increasing trend in population based on a minimum of 824 rails in the United States for at least 5 consecutive years.
>
> All important Federal and State-owned habitat areas have management plans in place. For the lower Colorado River, these areas are the Havasu, Bill Williams, Cibola, and Imperial national wildlife refuges, Mittry Lake State Wildlife Area, and lands within the Bureau's Imperial Division. For the Salton Sea, the important areas are the Sonny Bono Salton Sea National Wildlife Refuge and Imperial State Wildlife Area.

Long-term contracts providing for a quality and quantity of water to support Yuma Ridgway's rail habitats at the Salton Sea are in place.

The Service would consider proposing delisting of the Yuma Ridgway's rail when the previous three criteria are met and:

Annual surveys document a stable or increasing trend in population based on a desired population of 824 individuals (or a higher minimum population size established through research and modeling) in the United States for at least 5 years beyond that needed for reclassification to threatened status.

The amount of habitat needed to support a minimum population size (see previous criterion) is established, protected, and managed to ensure adequate breeding and wintering habitat in the United States.

An assessment of the degree of threat from existing and predicted selenium levels to adult rails and recruitment of young rails is completed, and, if necessary, management actions to control this potential threat in Yuma Ridgway's rail habitats are implemented.

An evaluation is completed of potential migration pathways between the lower Colorado River, Salton Sea, and core habitat areas in Mexico that provide for connectivity that supports population viability; if appropriate, management plans should be developed to protect stopover habitats.

A water supply of sufficient quantity and quality to assure the continuation of current levels of habitat for the Yuma Ridgway's rail has been secured for the long term for the Cienega de Santa Clara, Mexico.

Five-Year Review

We are appending the 5-year review of the status of the Yuma Ridgway's rail (Appendix 8; Service 2006d) to this biological opinion and are incorporating it by reference to provide most of the information needed for this section of the biological opinion. The Service (2006d) completed the most recent 5-year review of the status of the Yuma Ridgway's rail prior to the developing the draft revision of the recovery plan; the following information is from that 5-year review.

The Service concluded that endangered status of the Yuma Ridgway's rail did not warrant change due to continuing threats. The 5-year review included five recommendations for future actions to move recovery of the species forward. Briefly, to work towards the recovery of the Yuma Ridgway's rail, the Service should:

Revise the action plan in the 1983 recovery plan to reflect being completed;

Identify any new tasks to achieve recovery;

Be involved in the Bypass Flow Restoration or Replacement Program to work toward a secure, dedicated water source for the Cienega de Santa Clara;

Implement a new survey protocol and train all cooperating agency personnel;

Develop management plans for Federal and State lands supporting significant populations of breeding Yuma Ridgway's rails; and

Develop information on the effects of selenium on the Yuma Ridgway's rail.

The Service initiated efforts to implement these recommendations in 2007. Because of the age of the original recovery plan (1983) and the abundance of new information obtained since 1981 (the last year of data used in the original recovery plan), the Service decided to revise the entire recovery plan (Service 2009).

Neither the draft revised recovery plan nor the 5-year review discuss renewable energy with regard to the threat it may pose to Yuma Ridgway's rails. At the time of these documents (2006 and 2009), information on the effects of renewable energy facilities on the Yuma Ridgway's rail was scant; it remains so at the time of this writing. We are aware of two Yuma Ridgway's rails that were found dead at solar facilities. Biologists could not determine the cause of death of the bird at the Desert Sunlight Solar Project (Johnson 2015). The bird was found near a solar panel, which suggests that it died as a result of collision. The Yuma Ridgway's rail at the Solar Gen 2 Project in Imperial County likely collided with a chain-link fence (Ortega 2014); this facility is located to the southeast of the Salton Sea on non-federal land.

Table IV.25-1 of the final environmental impact statement (Bureau 2015c) lists renewable energy projects on public and other lands that are operational, under construction, and have been approved within the plan area as of July 2015. We are aware of a single large solar facility in Arizona; no mortalities of Yuma Ridgway's rails have been reported from that facility (Fitzpatrick 2015b). We do not have similar information regarding the status of renewable energy facilities for the remainder of the species' range (i.e., Nevada and Mexico); no mortalities of Yuma Ridgway's rails have been reported from renewable energy facilities in Nevada (Nicolai 2015).

Core Criteria for the Jeopardy Determination

We have explained the relationship of these core criteria to our jeopardy determination in the Status of the Desert Tortoise section of this biological opinion.

Reproduction

The following information is from the draft revised recovery plan (Service 2009). High levels of selenium can result in acute toxicity, chronic poisoning, tissue damage, and reproductive impairment (developmental abnormalities, embryo mortality, and reduced survival or growth of young). The levels of selenium in Yuma Ridgway's rail habitats along the lower Colorado River may have increased due to water use for agriculture and high evaporation rates. We do not have historical data on pre-development selenium levels; therefore, we do not know past levels.

Measurements from sediment, vegetation, invertebrates, fish, and surrogate bird species indicated that selenium levels in those studies were high enough to indicate the potential for exposure and adverse effects to Yuma Ridgway's rails. Preliminary information from one study on selenium in Yuma Ridgway's rails at Salton Sea and the lower Colorado River indicated that selenium concentrations in eggs, blood, and feathers were well above suggested "no effect concentrations." Although the available data suggest a potentially significant effect of selenium on Yuma Ridgway's rails, no documented evidence of reproductive impairment exists.

Numbers

The revised draft recovery plan (Service 2009) describes early efforts to ascertain the abundance of Yuma Ridgway's rails. The Service notes that "one constant over the 1969-2008 periods … is that the annual report always reflected the minimum number of (Yuma Ridgway's) rails present in the habitat." Changes in the numbers of Yuma Ridgway's rails over time may reflect "changes to habitat, efficiency of surveyor, and local weather conditions" (Service 2009). The differences may also reflect actual changes in the number of birds present. The numbers of Yuma Ridgway's rails reported from 1969 to 2008 varied between 50 in 1977 to 1,076 in 1993.

In 2006, the Service began to use a consistent and improved methodology during surveys for Yuma Ridgway's rails. The following table depicts the results of those surveys (Fitzpatrick 2015a). All numbers are for actual birds; we have not extrapolated these numbers to provide a population estimate.

Location	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
Mohave Division	-	-	-	-	-	-	-	-	-
Big Bend, CA						0	0	0	0
Havasu NWR									
Topock Marsh	46	42	31	45	42	42	33	26	40
Topock Gorge	31	61	58	57	59	76	54	62	82
Beal Lake, CA						-	2	0	3
Willow Marsh							0	0	0
Havasu Division	0	0	-	-	-	-	-	-	-
Bill Williams River NWR	14	7	6	11	17	15	11	11	9
Parker Division	0	-	-	-	-	-	-	-	-

Palo Verde Division	0	-	-	-	-	-	-	-	3
Cibola NWR	42	33	17	34	6	45	20	25	13
Hart Mine, CA						7	4	6	7
Imperial Division	29	11	23	26	17	8	17	20	
Imperial NWR	47	21	19	43	23	34	16	30	29
Laguna Division	91	95	83	106	90	96	75	58	37
Hidden Shores	17	29	40	27	34	26	11	8	4
River Channels	12	3	7	7	9	12	15	16	11
Mittry Lake	8	7	8	12	4	14	4	1	5
Teal Alley	21	27	14	16	11	18	16	14	6
YPG Slough	33	29	14	34	32	36	19	19	11
Yuma Division	0	1	2	1	3	1	0	2	1
Yuma East Wetlands, CA	0	1	0	3	5	5	4	3	6
Limitrophe Division	0	-	-	-	0	-	0	-	-
Hunters Hole, CA									1
Lower Gila River	23	13	23	24	20	18	13	11	13
Phoenix Area	23	37	26	28	15	16	6	17	9
Picacho Reservoir	-	-	0	-	-	1	-	-	-
Imperial Wildlife Area	310	398	226	191	132	111	101	57	67
Salton Sea NWR	95	102	126	96	135	84	72	90	75
Salton Sea area	2	0	1	0	0	-	-	-	-
Southern Nevada	-	1	4	6	6	6	4	13	13
Total	753	823	645	671	570	565	432	431	401

Key: CA – California; NWR – National Wildlife Refuge

From 2006 to 2013 or 2014, the number of Yuma Ridgway's rails declined at 14 of the 15 sites with 10 or more birds; the number of birds at one site increased greatly. A large portion of the decline from 823 in 2007 to 401 in 2014 occurred at the Imperial Wildlife Area where the number of individuals dropped from 398 to 67; these declines were due largely to deterioration of breeding habitat. The California Department of Fish and Wildlife manages the Imperial Wildlife Area; for various reasons, the California Department of Fish and Wildlife could not always afford sufficient water and was unable to conduct necessary routine maintenance to maintain suitable conditions for breeding (Riesz 2015).

Hinojosa-Huerta *et al*. (2013) conducted surveys for the Yuma Ridgway's rail in the Cienega de Santa Clara and other wetlands in Mexico in 2010 and 2011. They detected hundreds of Yuma Ridgway's rails. Based on the amount of available habitat (approximately 22.4 square miles), they used a probability of detection model to estimate that 8,642 Yuma Ridgway's rails resided in the area in 2011; the 95 percent confidence intervals are 7,714 to 9.686. Although the birds in Mexico are not listed, the potential exists that individuals from this area disperse into the United States.

Distribution

The following information is from the draft revised recovery plan (Service 2009). Populations of Yuma Ridgway's rails occur in three core areas: lower Colorado River, Salton Sea, and Cienega de Santa Clara. Habitat along the lower Colorado River extends for several hundred miles but the three core areas are isolated from each other by extensive deserts. We know that Yuma Ridgway's rails disperse over long distances but do not know if they move regularly between these core areas.

ENVIROMENTAL BASELINE FOR THE YUMA RIDGWAY'S RAIL

Previous Consultations in the Action Area

The Bureau and Service have not conducted any formal consultations regarding the effects of land use plan amendments on the Yuma Ridgway's rail. We have concurred with the Bureau's determinations that the proposed land use plan amendments were not likely to adversely affect the species.

Status of the Yuma Ridgway's Rail in the Action Area

The only suitable habitats supporting breeding Yuma Ridgway's rails within the action area occur at the Dos Palmas Area of Critical Environmental Concern in Riverside County and within seep marshes between the All American Canal and Mexico in Imperial County. At the Dos Palmas Area of Critical Environmental Concern, between 8 and 17 birds have been detected between 2006 and 2013. The Bureau of Reclamation has withdrawn the seep wetlands along the All American Canal as mitigation for a canal-lining project; we do not know the number of birds in this area due a lack of recent surveys.

Yuma Ridgway's rails have been periodically documented in the California desert far from their breeding areas (e.g., Harper Dry Lake, East Cronese Dry Lake, Desert Center; McCaskie 1977, 1979, 1992, respectively). These birds were likely dispersing. We are aware that Yuma Ridgway's rails migrate across the desert. See Appendix 10 for a map that depicts the records of sightings of Yuma Ridgway's rails in the California desert and vicinity (eBird 2016).

One Yuma Ridgway's rail was found dead at the Desert Sunlight Solar Project, which is within the action area; biologists could not determine the cause of death (Johnson 2015). A second Yuma Ridgway's rail likely collided with a chain-link fence at the Solar Gen 2 Project in Imperial County (Ortega 2014); this facility is located to the southeast of the Salton Sea outside of the action area.

EFFECTS OF THE ACTION ON THE YUMA RIDGWAY'S RAIL

Most Yuma Ridgway's rails reside along the Colorado River, which is outside of the action area for this consultation. Additional breeding occurs along the Salton Sea. We are unaware of any

breeding occurring within development focus areas. Yuma Ridgway's rails do not migrate but they occasionally make "erratic" dispersal movements, before and after nesting (Rush *et al*. 2012).

During these dispersal movements, Yuma Ridgway's rails may fly over or stop in development focus areas in subunit 2 of the Cadiz Valley and Chocolate Mountains Ecoregion and subunits 1 and 2 of the Imperial Borrego Valley Ecoregion. These subunits border the areas where most Yuma Ridgway's rails breed; birds would be mostly likely to encounter renewable energy facilities in these locations. Therefore, we have based our analysis for Yuma Ridgway's rails on activities within these subunits.

Yuma Ridgway's rails have been periodically documented in the California desert far from their breeding areas (e.g., Harper Dry Lake, East Cronese Dry Lake, Desert Center; McCaskie 1977, 1979, 1992, respectively. McCaskie considered the Desert Center individual to be subspecies *levipes*, which breeds in salt marshes along the Pacific coast). Although this demonstrates that Yuma Ridgway's rails can move long distances across desert scrub habitat (Harper Dry Lake is approximately 150 miles from the Colorado River) and that they could possibly interact with renewable energy facilities throughout the desert, we restricted our analysis to the subunits mentioned in the previous paragraph because of the paucity of records outside of these areas.

The Bureau's conservation and management actions will prohibit the development of renewable energy facilities in wetland habitat where Yuma Ridgway's rails breed. We expect that the proposed land use plan amendment will affect the Yuma Ridgway's rail in the generally same manner as it would the western yellow-billed cuckoo, southwestern willow flycatcher, and least Bell's vireo. The primary differences are that Yuma Ridgway's rails inhabit wetlands and are more restricted in their distribution in the action area.

Because of the similarities in the manner that the proposed action is likely to affect the Yuma Ridgway's rail, we will not repeat the entire analysis. Instead, we will discuss the likely differences between the Yuma Ridgway's rail and the listed riparian species and then examine how the proposed action may affect the reproduction, numbers, distribution, and recovery of the species.

Because of activities associated with renewable energy within the development focus areas, individuals of these species have the potential to collide with turbines, meteorological towers, power lines, other equipment, and fences; be struck by turbine blades; be electrocuted; and be entangled in netting. They may also die in evaporation ponds.

We are unaware of any Yuma Ridgway's rails that have been killed by wind facilities. Ridgway's rails generally disperse at night; other species of rails fly at low altitudes (Rush *et al*. 2012). If Yuma Ridgway's rails behave in the same manner, they would be susceptible to interactions with wind facilities.

We are aware of two Yuma Ridgway's rails that were found dead at solar facilities. Biologists could not determine the cause of death of the bird at the Desert Sunlight Solar Project (Johnson 2015). The Yuma Ridgway's rail at the Solar Gen 2 Project in Imperial County likely collided

with a chain-link fence (Ortega 2014); this facility is located to the southeast of the Salton Sea on non-federal land.

We are also aware of a live Yuma Ridgway's rail that was found at the Blythe Solar Project during construction. The bird spent part of the day in the shade of vehicles; biologists lost sight of it at dusk and assumed it either flew away or was captured by a predator. We do not know why the Yuma Ridgway's rail landed at the site; it did not seem to be injured (Ortega 2015).

Surveyors have also found the carcasses of numerous Virginia rails (*Rallus limicola*) and soras (*Porzana carolina*) at these facilities; these species occupy similar habitat as the Yuma Ridgway's rail but are more abundant and tend to be observed farther from breeding habitat because they are migratory. Most causes of death are unknown, although one Virginia rail apparently died after colliding with a heliostat (Weise 2015); another died after colliding with a transmission line (Donohue 2015).

We are unaware of Yuma Ridgway's rails dying at geothermal sites. Geothermal facilities at the southern end of the Salton Sea currently operate within a short dispersal distance from breeding habitat of the Yuma Ridgway's rail. The lack of reported mortalities may be the result of a lack of monitoring or a lack of mortalities.

In general, individuals of smaller species (e.g., sparrows, wrens) that were likely seeking food, shelter, or nesting sites in idle equipment have become stuck in netting and died. Yuma Ridgway's rails breed, shelter, and forage in marsh plants and generally do not enter small crevices; therefore, they are not likely to seek food, shelter, or nesting sites in idle equipment. Consequently, netting is likely to pose less of a threat to Yuma Ridgway's rails than to the listed riparian species.

Yuma Ridgway's rails are highly unlikely to perch on generator-tie lines or poles; they are highly secretive birds that generally do not rest in exposed places (Service 2009), such as generator-tie lines or poles. Consequently, they are unlikely to be electrocuted as a result of perching on generator-tie lines or poles.

Yuma Ridgway's rails are likely vulnerable to collisions with generator-tie lines because of their tendency to disperse at night and the likelihood that, like other species of rails, they fly at low altitudes (Rush *et al*. 2012).

Yuma Ridgway's rails may have a greater tendency to land at solar facilities than the listed riparian species because they may mistake the numerous solar panels for water; the marshes in which Yuma Ridgway's rails live frequently border large bodies of water. Yuma Ridgway's rails are able to take flight from solid ground; therefore, they are unlikely to be stranded at solar facilities. However, landing at a solar facility would increase the threat of their crashing into fences or panels; they may also be at risk of dehydration, hyperthermia, and predation.

The proposed action will not result in the loss of breeding habitat for the Yuma Ridgway's rail. Individuals of this species do not forage in desert scrub habitat. Additionally, the Bureau's commitment to avoid occupied habitat specifically and the vast majority of wetland areas in general (it anticipates the loss of less than 100 acres as a result of activities approved under the land use plan amendment) will ensure that these areas remain available for the Yuma Ridgway's rail.

The Bureau will employ the same approach to the monitoring of and compensating for the effects renewable energy facilities that we described previously in this biological opinion with regard to the listed species of riparian birds. The primary difference for the Yuma Ridgway's rail is that habitat creation and restoration would focus on wetlands, rather than riparian woodlands. As we discussed previously in this biological opinion, the number of Yuma Ridgway's rails at the Imperial Wildlife Area declined from 398 in 2007 to 67 in 2014; this decline occurred because the California Department of Fish and Wildlife could not always afford sufficient water and was unable to conduct necessary routine maintenance to maintain suitable conditions for breeding (Riesz 2015). The restoration of habitat at such areas as a result of the compensation required by the Bureau is likely to substantially increase the number of breeding Yuma Ridgway's rails; such increases may more than offset the loss of birds at renewable energy facilities.

CUMULATIVE EFFECTS

As we discussed in the Cumulative Effects section for the desert tortoise, the proposed action has no cumulative effects.

CONCLUSION FOR THE YUMA RIDGWAY'S RAIL

In determining whether a proposed action is likely to jeopardize the continued existence of a species, we consider the effects of the action with respect to the reproduction, numbers, and distribution of the species. We also consider the effects of the action on the recovery of the species. In that context, the following paragraphs summarize the effects of the proposed action on the Yuma Ridgway's rail.

Reproduction

We have no information to indicate that the development and operation of renewable energy facilities would affect the reproductive capacity of Yuma Ridgway's rails in any manner.

Numbers

The Bureau estimated that one Yuma Ridgway's rail may die or be injured every 3 years for each 10,000 acres of renewable energy facilities developed as a result of the land use plan amendment. The number of Yuma Ridgway's rails that die at renewable energy facilities will be a function of the numbers of birds that disperse through the action area within subunit 2 of the Cadiz Valley and Chocolate Mountains Ecoregion and subunits 1 and 2 of the Imperial Borrego Valley Ecoregion. That number will vary depending on the number of birds in the overall population.

Additionally, one type of renewable energy facility may pose more of a threat than others. Advances in reducing the mortality of migratory birds may also occur over time.

We acknowledge that Yuma Ridgway's rails may occasionally disperse through other ecoregions within the action area, encounter renewable energy facilities, and die. Based on the paucity of sightings of the species in those areas, we have not included those areas in this analysis. Limiting our evaluation to subunit 2 of the Cadiz Valley and Chocolate Mountains Ecoregion and subunits 1 and 2 of the Imperial Borrego Valley Ecoregion provides a more realistic analysis of likely mortalities.

To date, we are aware of one Yuma Ridgway's rail found dead at a solar facility on public land (Johnson 2015); this mortality occurred in 2013 while the project was under construction. The Service has issued biological opinions for approximately 18,637 acres of solar facilities on public lands within the three subunits where Yuma Ridgway's rails are most likely to occur, although we have not calculated the rate of the development over time (See Appendix 1, specifically for the Colorado Desert Recovery Unit). The Bureau's estimate of one Yuma Ridgway's rail every 3 years for every 10,000 acres of development corresponds with the number of Yuma Ridgway's rails found dead at solar facilities within the action area; that is; the Bureau estimated that a Yuma Ridgway's rail would be killed once every 3 years for every 10,000 acres of development and we have detected one carcass in 3 years with close to 20,000 acres of development on public lands. However, the 18,637 acres of renewable energy development was not completely in place 3 years ago; also, monitoring to date has not been consistent and we have not applied the evidence of absence model to the data that have been collected.

For these reasons, we will assume that one Yuma Ridgway's rail is likely to die at renewable energy facilities each year for every 10,000 acres of development. Assuming that renewable energy facilities are developed on all 33,454 acres of the development focus areas within the 2 ecoregions within the first year of approval of the land use plan amendment, we estimate that 3 Yuma Ridgway's rails are likely to die per year; this equals up to 100 birds over the 30-year lives of 33,454 acres of right-of-way grants (That is, 33,454 divided by 10,000 equals 3.3454; 3.3454 multiplied by 1 equals 3.3454 times 30 equals 100.362).

In 2014, the Service detected 401 Yuma Ridgway's rails surveyed marshes in the United States (Fitzpatrick 2015a); this number is not a population estimate because we do not know the response rate to vocal surveys. We expect that additional individuals reside in the surveyed marshes and in locations that were not surveyed. Conservatively, therefore, the proposed action may result in the loss of up to approximately 0.75 percent of the Yuma Ridgway's rails per year (3 divided by 401 equals approximately 0.00748; 0.00748 multiplied by 100 equals 0.748 percent).

We expect that the numbers of Yuma Ridgway's rails will change over time and that the numbers of birds that die at renewable energy facilities is likely to be related to the number migrating through the desert. That is, more Yuma Ridgway's rails are likely to die if the overall population of the species increases; the converse is also true (Changes in technology and the

adoption of measures to reduce mortality may change this relationship but we have no ability to predict that at this time).

Based on the best available information and our comparison of the expected number of mortalities to the range-wide population, we conclude that the loss of three individuals per year at full development of renewable energy facilities within the development focus areas in subunit 2 of the Cadiz Valley and Chocolate Mountains Ecoregion and subunits 1 and 2 of the Imperial Borrego Valley Ecoregion is not likely to appreciably reduce the number of Yuma Ridgway's rails. We expect most of the individuals that are likely to die at renewable energy facilities are dispersing subadults and unpaired males; we expect that at least some of these dispersing individuals would perish absent the presence of renewable energy facilities or relocate to small marshes where they may not find mates. Yuma Ridgway's rails may also disperse because the marshes in which they have resided have become unsuitable; the ability of these individuals to find suitable, unoccupied habitat may be limited.

Finally, the restoration or creation of suitable breeding habitat should stabilize the number of Yuma Ridgway's rails in the United States. The Service has identified the Sonny Bono and Imperial national wildlife refuges and the California Department of Fish and Wildlife's Imperial Wildlife Area as important areas for restoration; Additional areas may be available within the Imperial Irrigation District and at the Bureau's Dos Palmas Area of Critical Environmental Concern.

Based on the best available information, a conservative approach to analyzing the likely effects, and our comparison of the expected number of mortalities to the range-wide population, we conclude that the loss of 100 Yuma Ridgway's rails over 30 years of development of renewable energy facilities on 33,454 acres within the development focus areas (i.e., 3.35 Yuma Ridgway's rails per year at maximum development over 30 years) is not likely to appreciably affect the numbers of individuals or population trends of the species. If the ongoing monitoring of mortality at the renewable energy facilities provides information that is inconsistent with this analysis, the Bureau will either reinitiate consultation or require the projects' operators to adopt additional protective measures to reduce mortality.

Distribution

The development of renewable energy facilities within the action area as a result of the land use plan amendment would not result in the loss of breeding habitat. Yuma Ridgway's rails do not use desert scrub habitat for stop overs during dispersal. Consequently, the proposed land use plan amendment will not alter the distribution of the Yuma Ridgway's rail.

Effects on Recovery

The Bureau has proposed to require project proponents to offset the adverse effects of the loss of individuals and habitat by implementing actions to promote the recovery of the affected species in a manner where the mitigation is commensurate with the adverse effect. The Bureau has

proposed to restore or create breeding habitat to offset the total loss of individuals predicted for the life of each project. As we stated previously, habitat loss and degradation are contributing factors to the decline of Yuma Ridgway's rail; consequently, the Bureau's proposal to create or restore additional breeding habitat is a reasonable means offsetting the adverse effects of the loss of individuals and may benefit the recovery of the Yuma Ridgway's rail.

Conclusion

After reviewing the current status of the Yuma Ridgway's rail, the environmental baseline for the action area, the effects of the proposed land use plan amendment, and the cumulative effects, it is the Service's biological opinion that the Bureau's land use plan amendment, as proposed, is not likely to jeopardize the continued existence of the species. We have reached this conclusion because:

The proposed land use plan amendment will not adversely affect the reproductive capacity of the Yuma Ridgway's rail.

Over the 30-year life of right-of-way grants of renewable energy facilities, we also conclude that the loss of 100 Yuma Ridgway's rails is not likely to appreciably affect population trends of the species. We are not addressing an annual loss of Yuma Ridgway's rails because the number of individuals varies from year-to-year as a result of breeding success; such short-term variability is unlikely to have a measurable effect on the number of Yuma Ridgway's rails over the 30-year life of right-of-way grants for renewable energy facilities.

The proposed action will not result in the loss of breeding habitat of the species and the construction and operation of renewable energy facilities will not adversely affect the species' ability to disperse through the action area.

INCIDENTAL TAKE STATEMENT FOR THE YUMA RIDGWAY'S RAIL

As we discussed in the Numbers section, the number of Yuma Ridgway's rails that die at renewable energy facilities will be a function of the number of birds migrating through the action area (which is itself a function of the number of birds in the population), the types and locations of renewable energy facilities, protective measures, and local and range-wide weather patterns. We reached our conclusion that the proposed land use plan amendment is not likely to jeopardize the continued existence of the Yuma Ridgway's rail based upon the best available information and a worst-case analysis of that information.

The Bureau estimated that one Yuma Ridgway's rail may die or be injured every 3 years for each 10,000 acres of renewable energy facilities developed as a result of the land use plan amendment; we will use that estimate as the anticipated level of incidental take for this biological opinion. As we discussed previously, because Yuma Ridgway's rails occur only rarely within the action area away from the Colorado River and Salton Sea, we have used only

subunit 2 of the Cadiz Valley and Chocolate Mountains Ecoregion and subunits 1 and 2 of the Imperial Borrego Valley Ecoregion in our analysis; the development focus areas in these subunits cover 33,454 acres. Based on this estimate, we estimate that Yuma Ridgway's rails are likely to be killed at renewable energy facilities authorized under the auspices of the land use plan amendment. That is, 33,454 divided by 10,000 equals 3.3454; 3.3454 times 1 equals 3.3454 birds for all 33,454 acres in the first year. We then multiplied the 3.3454 birds per year by 30 years (the standard life of right-of-way grants), which equals 100.362; we will round this to 100 birds over the 30-year lives of right-of-way grants.

Based upon the best available information and this estimate, we anticipate that 100 Yuma Ridgway's rails are likely to be taken over the 30-year life of right-of-way grants for renewable energy facilities developed under the auspices of the land use plan amendment. Yuma Ridgway's rails may be struck and killed by turbine blades; fly into structures, fences, wires, and solar panels; or be electrocuted. If more than 100 Yuma Ridgway's rails die as a result of renewable energy facilities that the Bureau authorizes within development focus areas as a result of this land use plan amendment, the Bureau would be required to re-initiate consultation.

We discussed the numerous variables involved that will likely result in different amounts of incidental take at specific renewable energy facilities previously in this biological opinion. Consequently, as the Bureau described as part of the proposed action, the Service will allocate a portion of the incidental take that we have anticipated for this biological opinion as a whole at the time the Bureau evaluates specific projects. If the amount of incidental take allocated for that specific renewable energy facility is exceeded, we would consider this to be new information revealing the effects of the action that may affect listed species in a manner or to an extent not considered in this opinion (50 CFR 402.16) and the Bureau would be required to re-initiate consultation as related to the specific facility.

As we have discussed previously, the U.S. Geological Survey has developed a model to allow the Bureau to estimate the number of individuals of rare species, such as the Yuma Ridgway's rail, that are likely to be killed each year at specific wind energy facilities; the U.S. Geological Survey is in the process of developing a similar model for solar facilities. When the Bureau coordinates with the Service regarding the authorization of a specific renewable energy facility, it will apply the U.S. Geological Survey's model. If the outcome of the modeling effort exceeds the amount of incidental take that we have anticipated in this biological opinion, the Bureau would be required to re-initiate consultation. Monitoring and application of the U.S. Geological Survey model will occur for the life of the project.

In all cases where the Bureau would re-initiate consultation with the Service, we would evaluate the specific circumstances to determine the appropriate course of action. For example, the first course of action would likely be remediation of the threat that caused the mortality. If the complete removal of the threat is not possible and the best available information indicated that the range-wide status of the Yuma Ridgway's rail was stable or increasing, the Bureau will use the adaptive management provisions of the conservation and management actions in the land use plan amendment to increase the amount of compensatory mitigation. If neither option is

available, the Service and Bureau would enter formal consultation to re-evaluate the effects of the land use plan amendment or specific facility, as appropriate, on the Yuma Ridgway's rail.

REASONABLE AND PRUDENT MEASURES AND TERMS AND CONDITIONS

The conservation and management actions proposed by the Bureau include numerous measures to minimize the take of Yuma Ridgway's rails. Additionally, the Bureau has proposed to coordinate with the Service, as described in the Description of the Proposed Action section of this biological opinion, when proponents propose specific renewable energy facilities to adapt the appropriate conservation and management actions for that activity. Consequently, we have not identified any reasonable and prudent measures or terms and conditions that we consider necessary or appropriate to minimize take of the Yuma Ridgway's rail at this time.

REPORTING REQUIREMENTS

The Bureau must provide an annual report to the Service by January 31 of each year after it signs the record of decision for the land use plan amendment. The report must include information regarding the relevant listed species for each facility that is being constructed, operated, or decommissioned.

Specifically, the reports must include information on any instances when any individuals of listed species are killed or injured, the circumstances of such incidents, and any actions undertaken to prevent similar mortalities or injuries from re-occurring.

If desert tortoises are moved from harm's way or translocated during the reporting period, the Bureau must include that information in the report and any other information required by the activity-specific plan.

The Bureau must condition its right-of-way grants to require project proponents to provide as much detail as possible as to the cause of mortality or injury of individuals of listed species. This information will assist the Bureau and Service in developing more efficient means of reducing future impacts. With regard to willow flycatchers, the Bureau must require project proponents to provide carcasses to the Service or other appropriate authority, as determined by the Service (or the Bureau if staff from the Service cannot be contacted), to allow for identification of the bird to subspecies.

The reports must also include a description of any monitoring efforts that the Bureau implements.

In addition, within 60 days of the completion of the proposed action (i.e., at the conclusion of all activities related to decommissioning), the Bureau must provide final report to the Service with this information.

DISPOSITION OF DEAD OR INJURED SPECIMENS

For California condors, the Bureau must condition right-of-way grants as follows:

The project proponent must notify the Service and the Bureau within 24 hours of locating a dead California condor during construction, operation, maintenance, or decommissioning of the project.

If an injured California condor is found, the proponent must immediately contact the Service's California Condor Recovery Program staff at (805) 644-5185 and the Palm Springs Fish and Wildlife Office at (760) 322-2070 at the numbers below. The California Condor Recovery Program staff will respond, assess the injury, and determine the next course of action.

If a dead California condor is found or a mortality signal is detected, the proponent must contact the California Condor Recovery Program and the Palm Springs Fish and Wildlife Office. The carcass must be left in place and secured, to the degree possible, to deter scavengers. The Service will provide further direction at the time of or soon after notification.

For all other listed species, within 24 hours of locating any dead individuals of listed species, you must notify the Palm Springs Fish and Wildlife Office by telephone (760 322-2070) and by facsimile or electronic mail. The report must include the date, time, and location of the carcass, a photograph, cause of death, if known, and any other pertinent information.

Please notify us immediately of any individual of a listed species is found injured. If the injured animal has the potential to survive, the Bureau must ensure that it is taken to a qualified veterinarian for treatment. If any injured individual of a listed species survives, the Bureau must contact the Service regarding its final disposition.

The Bureau must ensure that the applicant takes care in handling dead specimens to preserve biological material in the best possible state for later analysis, if such analysis is needed. The Service will make this determination when the Bureau provides notice that a desert tortoise has been killed by project activities.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Endangered Species Act directs Federal agencies to use their authorities to further its purposes by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

We offer the following conservation recommendations for your consideration:

1. In the past, project proponents have worked, at least to some degree, independently of the Federal agencies to develop the types of compensation for their projects. We recommend

that the Bureau work with us to develop a mechanism whereby the Bureau, in coordination with the Service and other agencies as appropriate, directs compensation towards the highest-priority tasks identified by the Recovery Implementation Teams. Where compensation from a single project is insufficient to complete such a task, we also recommend that the Bureau pool compensation from additional projects. In light of the continued decline of desert tortoises, this approach to compensation would begin to meet the "need for more aggressive and better prioritized recovery implementation," as recommended by the Service (2015c) in its annual report on range-wide monitoring.

2. We also recommend that the Bureau work with the Service, and other agencies as appropriate, to develop a strategy to translocate desert tortoises from project sites in the development focus areas to appropriate augmentation areas whenever appropriate. Although desert tortoises generally adapt more quickly to translocation when moved short distances, we consider longer-distance translocations to be appropriate when the translocated animals are from areas where their current densities are below those that can support a viable population in the long term. The coordinated augmentation of populations in conservation areas would do more to further the recovery of the desert tortoise than moving a few individuals from a project site into adjacent habitat where the agencies are not managing the landscape for the long-term conservation of the species.

3. We recommend that the Bureau work with the Service to develop a programmatic consultation for other activities in the California Desert Conservation Area. We recommend revising the small projects and small mining biological opinions, incorporating other activities, and incorporating a compensation process similar to the one discussed in our first conservation recommendation. Our goal would be to ensure that future activities receive an appropriate level of section 7(a)(2) review in a more efficient time frame. This approach will allow our agencies to focus more staff time and other resources on recovery of the desert tortoise.

4. We recommend that the Bureau work with the Service and other partners, such as the Sonoran Joint Venture and the California Department of Fish and Wildlife, to implement programs and activities that benefit migratory birds, including the species considered in this biological opinion, on a regional basis. These programs and activities could include, but are not be limited to, leveraging compensation funds to expand habitat restoration and creation for riparian and marsh species, monitoring of use of the Pacific Flyway within the action area, and remediation of threats to migratory birds.

5. We recommend that the Bureau coordinate with the Service's recovery program for the California condor to ascertain the most up-to-date and high-priority tasks to advance recovery of this species. These tasks could include, but are not be limited to, working with other partners to advance various methods of protecting California condors from threats, coordinating in the management of rangelands to increase foraging opportunities, and eliciting proposals to develop research projects that would promote the recovery of the species.

RE-INITIATION NOTICE

This concludes formal consultation on the Bureau's proposal to adopt the proposed land use plan amendment. As provided in 50 CFR402.16, re-initiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take specified in the incidental take statement is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action.

In instances where the amount or extent of incidental take is exceeded, the exemption issued pursuant to section 7(o)(2) may lapse and any further take may be a violation of section 4(d) or 9. Consequently, we recommend that any operations causing such take cease pending re-initiation.

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Appendices

1. Solar projects for which the U.S. Fish and Wildlife Service has issued biological opinions or incidental take permits (attached)

2. Conservation and management actions (complete list)

3. Desert tortoise, 5-year review

4. Western yellow-billed cuckoo, proposed listing rule

5. Western yellow-billed cuckoo, final listing rule

6. Southwestern willow flycatcher, 5-year review

7. Least Bell's vireo, 5-year review

8. Yuma Ridgway's rail, 5-year review

9. California condor, 5-year review

10. eBird records for the Yuma Ridgway's rail, southwestern willow flycatcher, willow flycatcher, least Bell's vireo, and western yellow-billed cuckoo for the action area and vicinity.

Appendices 2 through 10 are available on disk or hard copy by request; you may also download them at www.drecp.org. The biological opinion is also available at this site.

Appendix 1.
Solar projects for which the U.S. Fish and Wildlife Service has issued biological opinions or incidental take permits.

The following table summarizes information regarding the solar projects that have undergone formal consultation with regard to the desert tortoise. In the Citations column, a single reference indicates that the acres of desert tortoise habitat and number of desert tortoises are estimates from the biological opinion; when the column includes two citations, the first is for the acreage of habitat and the estimated number of desert tortoises from the biological opinion and the second is for number of desert tortoises that were found onsite prior to or during construction.

Project and Recovery Unit	Acres of Desert Tortoise Habitat	Desert Tortoises Estimated[1]	Desert Tortoises Observed[2]	Citations[3]
Eastern Mojave				
Ivanpah Solar Electric Generating System	3,582	1,136	175[7]	Service 2011a, Davis 2014
Stateline	1,685	947	55	Service 2013a; Ironwood 2014
Silver State North – NV	685	14[6]	4	Service 2010a, Cota 2013
Silver State South – NV	2,427[4]	1,020[4]	152	Service 2013a, Cota 2014
Amargosa Farm Road – NV	4,350	4[6]	-	Service 2010e
Nevada Solar One - NV	400	[5]	[5]	Burroughs 2012, 2014
Copper Mountain North - NV	1,400	30[5]	30[5]	Burroughs 2012, 2014
Copper Mountain - NV	380	[5]	[5]	Burroughs 2012, 2014
Townsite - NV	936	2[8]	-	Burroughs 2015
Techren Boulder City - NV	2,304	10	-	Burroughs 2015
Western Mojave				
Abengoa Harper Lake	Primarily in abandoned agricultural fields	4[6]	-	Service 2011b
Chevron Lucerne Valley	516	10	-	Service 2010b
Cinco	500	53	2	Service 2015a, Daitch 2015
Soda Mountain	1,726	78	-	Service 2015b
Northeastern Mojave				
Res Americas Moapa Solar Energy Center - NV	951	95	-	Burroughs 2015
Moapa K Road Solar - NV	2,141	186	157	Service 2012, Burroughs 2013

Colorado				
Genesis	1,774	8	0	Service 2010c, Fraser 2014a
Blythe	6,958	30	0	Service 2010d, Fraser 2014b
Desert Sunlight	4,004	56	7	Service 2011c, Fraser 2014a
McCoy	4,533	15	0	Service 2013b, Fraser 2014b
Desert Harvest	1,300	5	-	Service 2013c
Rice	1,368	18	1	Service 2011d, Fraser 2014a
Total	43,920	3,721	583	

[1] The numbers in this column are not necessarily comparable because the methodologies for estimating the numbers of desert tortoises occasionally vary between projects. When available, we included an estimate of the numbers of small desert tortoises.
[2] This column reflects the numbers of desert tortoises observed within project areas. It includes translocated animals and those that were killed by project activities. Project activities may result in the deaths of more desert tortoises than are found. Dashes represent projects for which we have no information at this point; some projects had not broken ground at the time of this biological opinion.
[3] The first citation in this column is for both the acreage and the estimate of the number of desert tortoises. The second is for the number of desert tortoises observed during construction of the project; where only one citation is present, construction has not begun or data are unavailable at this time.
[4] These numbers include Southern California Edison's Primm Substation and its ancillary facilities.
[5] These projects occurred under the Clark County Multi-species Habitat Conservation Plan; the provisions of the habitat conservation plan do not require the removal of desert tortoises. We estimate that all three projects combined will affect fewer than 30 desert tortoises.
[6] These estimates do not include smaller desert tortoises.
[7] In the table attached to the electronic mail, the number of desert tortoises translocated from the project site is represented by the total number of translocated animals minus the number of animals born in the holding pens.
[8] The estimate of the number of desert tortoises is from the portion of the project on Bureau land (52 acres). The remaining lands are covered by the Clark County Multi-species Habitat Conservation Plan; see footnote 5.
[9] The estimate of the number of desert tortoises is from both Bureau (104 acres) and private (2,200 acres) land. The remaining lands are covered by the Clark County Multi-species Habitat Conservation Plan; see footnote 5.

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