

IV.10 PALEONTOLOGICAL RESOURCES

IV.10.1 Approach to Impact Analysis

This programmatic analysis discusses the potential impacts to paleontological resources from implementation of the Desert Renewable Energy Conservation Plan (DRECP) and Bureau of Land Management (BLM) Land Use Plan Amendment (LUPA). As noted in Volume III, Chapter III.10, significant paleontological resources within the DRECP area (and for transmission, also outside the DRECP area) are, with certain exceptions, primarily pre-Holocene (older than 10,000 years) geologic units of sedimentary origin.

Appendix R2.10 presents six tables to support this chapter's impact analysis. These tables show the impact acreage for each DRECP alternative according to the Potential Fossil Yield Classification (PFYC) of geologic units on BLM-administered lands. For more detail refer to Volume III, Chapter III.10.

IV.10.1.1 Terms and Definitions

There are several important terms used throughout this chapter. Their definitions are derived from the federal Paleontological Resources Preservation Act (Title VI, Subtitle D of the Omnibus Public Land Management Act of 2009) and from implementing guidelines developed by BLM (Instruction Memorandum [IM] 2009-011):

- The term *paleontological resource (or fossil)* means “any fossilized remains, traces, or imprints of organisms, preserved in or on the earth’s crust, that are of paleontological interest and that provide information about the history of life on earth” (16 U.S.C. 470aaa).
- *Paleontological locality, location, or site* refers to a “geographic area where a paleontological resource is found. Localities, locations, and sites may be as small as a single point on the ground or as large as the area of an outcrop of a formation in which paleontological resources are found” (BLM IM 2009-011).
- A *significant paleontological resource* is a paleontological resource that is scientifically important for one or more of the following reasons: “(1) It is a rare or previously unknown species, (2) it is of high quality and well-preserved, (3) it preserves a previously unknown anatomical feature or other characteristic, (4) it provides new information about the history of life on earth, or (5) it has identified educational or recreational value” (BLM IM 2009-011).
- A *geologic unit*, as used in this chapter, refers to rocks or loose sedimentary deposits that can be grouped based on common characteristics, such as age, physical

characteristics, and origin. Geologic units may be delineated at a statewide, regional, or local scale and may refer to sedimentary, igneous, or metamorphic rocks.

- A *fossiliferous (or fossil-bearing) geologic unit* refers to any geologic material, unit, or formation known to contain fossils based on museum collection records, published scientific literature, and/or other maps and reports.
- The *fossil-yield potential* of a geologic unit or formation is a measure of the likelihood that a specific geologic unit or formation will contain paleontological resources.
- *Taphonomy* is the study of the processes such as burial, decay, and preservation that affect animal and plant remains as they become fossilized.

It is possible for fossils not to have scientific importance, especially if they “lack provenience or context, lack physical integrity because of decay or natural erosion, are overly redundant, or otherwise not useful for research” (BLM IM 2009-011). Fossils and paleontological localities associated with any cultural item or archeological site are more appropriately considered and analyzed in the context of cultural resources (i.e., under the National Historic Preservation Act and the Archaeological Resources Protection Act).

IV.10.1.2 Analysis Approach

This chapter qualitatively analyzes potential impacts to paleontological resources based on:

- The general distribution of known fossil localities and the fossil-yield potential of the geologic units underlying the DRECP area.
- The location, extent, and depth of construction-related land disturbances from development of solar, wind, geothermal, and transmission renewable energy projects.
- How increased public access may increase following the construction of access roads and transmission infrastructure, which could encourage unauthorized collection activities, theft, or vandalism.
- The effectiveness of resource avoidance and minimization measures proposed under both the Proposed LUPA and other existing regulations.

These factors are examined together to describe the context (e.g., localized, regional, or subregional), intensity (e.g., negligible, minor, moderate, or severe), duration (e.g., short-term, long-term, or permanent), and type (e.g., beneficial or adverse) of impact. The intensity of impacts depends on the quantity and significance of paleontological resources. Because fossils are primarily underground, the intensity of impacts may not be known until construction activities reveal them.

Determinations of the uniqueness or significance of paleontological resources can only be made by qualified, trained paleontologists familiar with the fossil under consideration. Therefore, in circumstances where no significant fossil localities are already known within the physical footprint of development (either through museum-collections records, published scientific literature, or preconstruction surveys), actual impacts may only truly be known once a fossil is uncovered and identified. The definition of a significant paleontological resource has one basic assumption: that the fossil in question has been identified to a reasonably precise level, preferably to the level of genus or species. All fossils newly uncovered on a site must be treated as potentially significant until they are determined to be otherwise following examination by a qualified paleontologist (Scott and Springer 2003). This important caveat is the reason that development activities under the DRECP (and particularly activities involving subsurface disturbance) are discussed in this document in terms of their *potential* to impact paleontological resources.

The quantitative analysis of potential impacts presented in Section IV.10.3, Impact Analysis by Alternative, is based on a preliminary assessment of the PFYCs of geologic units underlying the DRECP area. The sources consulted, methods used, and results of the preliminary PFYC ratings are described in detail in Volume III, Chapter III.10. Definitions for individual PFYCs are provided in Volume III, Table III.10-1. For purposes of this analysis, PFYCs are grouped into three categories based upon the level of management concern and the type of assessment and mitigation actions that could be required:

- **Low/Very Low (LVL):** PFYC Classes 1 and 2. Management concern is low, and assessment and mitigation are only required in rare circumstances. Even in such cases, the estimated PFYC must be confirmed, at a local level (e.g., record searches, literature review), and it must be demonstrated that there are no known paleontological localities in the area.
- **Moderate/Unknown (MU):** PFYC Class 3. Management concern is either moderate or cannot be determined from existing data. A written assessment would be required; depending upon the impact potential, a paleontological field survey and report could also be needed. Further action, including project redesign or a monitoring and mitigation plan, may be required depending on the results of the written assessment and field survey. Because of the initial lack of information, areas of unknown potential may be reassigned to a different PFYC after further investigation.
- **High/Very High (HVH):** PFYC Classes 4 and 5. Management concern is high to very high. The probability of impacts to significant paleontological resources is moderate to high, depending on the proposed action (i.e., extent and depth of disturbance). A field survey by a qualified paleontologist is probably needed to assess local conditions, and special management actions may be needed.

Using a Geographic Information System, Development Focus Areas (DFAs) on BLM-administered lands proposed for each alternative were evaluated according to how much they intersect geologic units with various PFYCs. DFAs covering more area underlain by geologic units with an HVH PFYC are presumably more likely to adversely impact significant paleontological resources than those underlain by geologic units with an LVL PFYC. This quantitative impact analysis was performed for all BLM-administered lands, by ecoregion subarea. Ecoregion subareas are appropriate geographic units for paleontological resource evaluation because their boundaries generally coincide with important geologic and geomorphic transitions.

IV.10.1.3 Scope of Analysis

The Proposed LUPA broadly defines DFAs for each of the alternatives but does not identify specific locations or detailed designs for their renewable energy development. Accordingly, this analysis presents a broad-level view of potential impacts on paleontological resources, based on a preliminary coarse-scale estimate of the PFYCs of the geologic units underlying the DRECP area, as well as the general location and significance of known paleontological resources (see Volume III, Chapter III.10). As they are proposed, individual renewable energy projects seeking approval from land management agencies would be required to re-evaluate paleontological resources at a project level of detail. Project-specific impacts would be assessed during the permitting process and in supplemental National Environmental Policy Act (NEPA) documents, including re-evaluation of the PFYC of underlying geologic units.

The presence (or the potential presence) of paleontological resources within the DRECP area is highly variable and depends upon numerous factors most appropriately examined at local levels. Collected site-specific information should define paleontological resources and their significance for individual locations and project proposals, including: (1) the nature and distribution of geologic units and their general fossil-yield potential, (2) whether institutional collections have recorded fossil specimens on the site (or regionally within the same geologic units), (3) whether there is published scientific literature pertaining to the site or its underlying formations, and (4) whether preconstruction surveys of the site or similar geologic units have yielded fossils. In addition, the probability for individual renewable energy projects to have adverse impacts on paleontological resources, and the extent and magnitude of those impacts, depends upon the specific location, layout, technology, and design of the projects, as well as the effectiveness of required avoidance and minimization measures.

IV.10.2 Typical Impacts Common to All Action Alternatives

The following general discussion identifies typical impacts on paleontological resources within the DRECP area that are common to all alternatives. An adverse impact on paleontological resources would occur if renewable energy development results in the loss, damage, or destruction of any unique or significant paleontological resource. This includes any fossil that has one or more of the following characteristics:

- It is a rare or previously unknown species,
- It is of high quality and well preserved,
- It preserves a previously unknown anatomical feature or other characteristic,
- It provides new information about the history of life on earth, or
- It has identified educational or recreational value.

Because the distribution of known fossil localities and the fossil-yield potential of the geologic setting is site specific, this discussion focuses on the nature and magnitude of ground-disturbing activities for both various phases of renewable energy development and different types of renewable energy technology. The fossil-yielding potential of geologic units underlying DFAs and the planned distribution of renewable energy technologies will be the focus of the alternative-specific analyses.

Paleontological resources are nonrenewable and, once damaged or destroyed, cannot be recovered or replaced. Therefore, if development activities result in the loss, damage, or destruction of a significant paleontological resource, it is irretrievable. Data recovery and resource removal are two ways that at least some information can be salvaged should a paleontological resource or site be affected, but certain contextual data would invariably be lost. The discovery of otherwise unknown fossils is beneficial to science and the public good for only as long as sufficient data (including stratigraphic and taphonomic information and high quality and representative specimens) can be collected and recorded. Ultimately, the extent and magnitude of potential impacts to paleontological resources depend upon the resources discovered and the effectiveness of project-specific mitigation measures.

IV.10.2.1 Impacts of Renewable Energy and Transmission Development

IV.10.2.1.1 Impacts of Site Characterization

Preconstruction site characterization activities—including installation of meteorological towers, completion of soil borings, and installation of temporary access roads—generally create the same types of impacts as those described for the construction and decommissioning phases (see Section IV.10.2.1.2, Impacts of Construction and

Decommissioning). However, site characterization activities have a lower probability of adversely impacting paleontological resources because of the temporary, minor, and dispersed nature of ground disturbance that would be required, especially when compared with construction and decommissioning activities.

Site reconnaissance, survey activities, and geotechnical exploration are required for all development activities regardless of project technology. The potential impacts of those activities are therefore similar across technologies. Potential impacts from ground-disturbing activities can typically be reduced by first producing pedestrian surveys. Pedestrian surveys for paleontological resources identify and collect data for both known and previously unknown fossils. Site characterization activities that do not disturb subsurface geologic materials include site reconnaissance, species-specific surveys, and, if on flat ground, establishment of temporary unpaved access routes. Because exposure of paleontological resources is usually limited to rock outcrops or stream-cut slopes, the potential for these types of activities to adversely impact paleontological resources would be minimal.

Geotechnical testing activities common to all alternatives would vary in scope, and specific techniques used would depend upon the size of the facility and its technology. Since the goal of geotechnical exploration is to identify geologic materials and their properties, it is favorable to use techniques that minimize disturbance to the soil and subsurface stratigraphy (so that drill cores can be adequately observed or tested). These techniques typically include use of small-diameter direct-push borings or hollow stem augers, especially for sites that are underlain by poorly consolidated sediments (which describes most DFAs in all alternatives). The retrieval of significant paleontological resources from geotechnical borings is extremely unlikely since the boreholes are usually just several inches in diameter and in the tens of feet deep. However, in the unlikely event these borings encounter a fossil, it is possible that stratigraphic and taphonomic information would be preserved due to the nondestructive nature of the sampling. Paleontological monitoring of geotechnical activities could provide additional information about the depth and extent of subsurface fossil-bearing geologic units and thus could be used to focus the scope of construction-phase monitoring and mitigation activities.

There are certain site characterization activities uniquely associated with wind energy generation projects, including installation of temporary meteorological stations and construction and use of temporary access roads, which could require a somewhat greater degree of land disturbance and excavation compared with other technologies. This is because areas favorable for wind energy generation are more hilly. Temporary access roads within hills are more likely to be longer and require greater excavation volumes since those roads must navigate the topography and make cuts into sloped areas to maintain a flat surface. Such cut slopes tend to create fresh exposures of previously subsurface geologic units.

Geothermal energy project characterization activities involve well-field testing. Well-field testing is necessary to determine resource viability and optimally site geothermal production and injection wells. Geothermal test wells (e.g., temperature gradient wells or stratigraphic wells) typically require use of boreholes that are much larger in diameter than geotechnical borings, and must therefore utilize truck-mounted rotary or diamond core rigs. These drilling techniques are destructive from a paleontological resource perspective because they tend to pulverize the soil or rock and use fluids to lubricate the drill head. For these reasons, paleontological monitoring of such activities is impractical because it is nearly impossible to recover intact fossils during geothermal well testing.

IV.10.2.1.2 Impacts of Construction and Decommissioning

The bulk of potential impacts to paleontological resources for all technologies would typically occur during the excavation and earth-moving phases of construction. The greatest degree of excavation would be from site preparation, including installation of access roads and spur roads, installation of utility and drainage infrastructure, and grading and excavation for facility foundations. Drainage and flood control features could include ditches, canals, detention and evaporation ponds, and other structures necessary to divert or direct flows across a site. Installation of subsurface utilities involves linear trenching, and construction of aboveground transmission and power lines would require large-diameter auguring. Transportation, utility, and drainage infrastructure are all essential elements of facility construction regardless of the renewable energy resource developed, and all involve excavations with the potential to unearth paleontological resources.

The volume of earth moving required for site preparation generally depends upon the size of the site, how flat it needs to be to support the specific energy technology, and the foundation requirements needed for operation and maintenance buildings and production facilities. Solar energy technologies require level terrain, so the volume of grading and earth moving can be substantial if, for example, solar facilities are proposed on sites that are not already flat. Excavations for wind turbine foundations are also substantial, as are excavations for motor-pier foundations, transmission mono-pole foundations, pylons, and certain solar array construction pads. Such excavations tend to be highly localized compared with the widespread grading used for general site preparation, but such excavations penetrate the ground surface more deeply. Deeper excavations (beyond 1 or 2 feet) could encounter fossil-yielding units even if the surface is mapped as having a low paleontological potential.

For the most part, construction activities can be accomplished using conventional earth-moving equipment (e.g., tractors, backhoes, and graders), which allows for mitigation of potential impacts to below a level of significance through monitoring. Professional paleontologists and approved paleontological monitors typically carry out mitigation

programs by examining new exposures of soil and rock created during excavation, grading, and trenching. Monitoring of conventional excavations can result in the identification and salvage of fossils that may otherwise not have been unearthed or discovered as the result of natural processes. With typical mitigation, newly exposed fossils become available for scientific research, education, display, and preservation into perpetuity at museums. It is important to recognize that in addition to potential adverse impacts on paleontological resources, renewable energy and transmission development in the DRECP area can result (and has resulted) in beneficial gains in specimen collections and scientific research that would not have otherwise occurred.

Similar to certain site characterization activities (e.g., geothermal well testing), certain construction methodologies preclude the possibility of adequately identifying, evaluating, and recovering fossils, if present. These include pile driving, destructive boring, and possibly blasting. Pile driving can range in intensity from simple installation of a fence post to emplacement of deep load-bearing foundations. All of these activities could crush or otherwise disturb subsurface fossils. Placing deep foundations can also involve large-diameter rotary borings that can pulverize subsurface soil and rock and render pre-existing fossils unrecognizable. In certain cases, however, these large-diameter borings can also generate large intact blocks of sedimentary rock matrix that can and often do contain intact fossils. The most prominent examples of destructive boring techniques that exhume large volumes of soil and rock would be the construction of power tower foundations (which must support a structure hundreds of feet tall) and the installation of deep geothermal injection and production wells. Wind towers also require deeply augured foundations due to the height and wind-loading requirements of modern wind turbines. The destructive auguring required for solar photovoltaic and solar thermal technologies (other than power tower) is comparatively minor.

Construction activities could indirectly impact paleontological resources through hydrologic effects and increased public access. These are the same types of impacts as described for the construction and decommissioning phases (see Section IV.10.2.1.2); the only difference is that the duration of impact would be short term and restricted to the construction phase.

The decommissioning phase of renewable energy and transmission projects would generally result in the same types of impacts as discussed for construction, but the impacts would be lesser in magnitude for two reasons. First, the ground disturbance required to decommission a site is generally significantly reduced compared with installation requirements, in part because certain underground components can be abandoned in place as long as surface soils are restored. Second, decommissioning activities would occur in areas previously disturbed and within soils previously reworked for original facility

construction (e.g., trench backfills, foundational soils). The potential to uncover paleontological resources within these types of soils is negligible.

IV.10.2.1.3 Impacts of Operations and Maintenance

During long-term operation of energy projects, unintended increases to public accessibility can result from access roads, corridors, or facilities in otherwise intact and inaccessible areas. This access can increase unauthorized-collection activities, theft, and vandalism of resources. The passage of the Paleontological Resources Preservation Act in 2009 made theft of fossils from federal land a criminal offense. Increased human access (including off-highway vehicle [OHV] use) exposes paleontological sites to a greater probability of impact from a variety of stressors. Effective mitigation for the loss of paleontological resources by vandalism and unlawful poaching from increased accessibility to public lands can be difficult to implement. Such impacts can be greatly reduced by increasing public awareness about the scientific importance of paleontological resources through education, community partnerships, and interpretive displays, and by informing the public about penalties for unlawful destruction or unlawful collection of these resources.

Operations and maintenance of renewable energy projects can also cause the loss, damage, or destruction of near-surface paleontological resources and their stratigraphic context to the extent that existing patterns of erosion and sedimentation can be changed, accelerating the natural rate of erosion and soil loss. Such degradation occurs both within the project footprint and in areas downslope or downstream. Agents of erosion and sedimentation include wind, water, and downslope movements by gravity, all of which are naturally occurring but can be influenced by development. In most cases, such adverse effects cannot be entirely avoided but can be substantially minimized through proper drainage design; installation of temporary and permanent water quality best management practices; on-site retention of surface flows; and minimizing disturbance, clearance, or compaction of natural soils and vegetation to the maximum extent feasible (see also Chapter IV.4, Geology and Soils).

The extent to which erosion would impact paleontological resources could differ based on the renewable energy technology developed:

- Solar generation projects have the broadest range of potential impacts in terms of area needs and extent of ground disturbance, as well as concentrated effects since most projects require vegetation mowing, clearing, and possibly some grading for the solar collector arrays, which in some cases can approach or exceed one or more square miles. Within that large a project area, it would be difficult to avoid disturbance of washes and other hydrologic features. Indirect impacts to

paleontological resources would thus be more severe for solar energy development than for other renewable energy technologies.

- Wind energy projects typically require vast areas (for installation of roads, wind turbine towers, switchyards, and associated facilities), but the actual ground disturbance is less than that for solar energy projects. Wind energy development also may be more flexible when it comes to the project layout so can therefore more easily reduce flooding risk and avoid sensitive resources such as surface water bodies.
- Geothermal energy development affects a smaller area, so ground disturbance is less than for solar and wind energy development. Geothermal energy development is normally limited to the power plant site, roads, and linear facilities for steam and water supply, steam condensation reinjection, wastewater, and transmission lines. In addition, the linear facilities associated with such projects can follow alignments that minimize effects to sensitive resources, including surface water bodies and exposure to floods.

Cleaning, maintenance, repair, and replacement of access roads and spur roads for renewable energy technologies and transmission would all cause periodic, localized, and shallow soil disturbances. However, the potential impacts of access road maintenance on paleontological resources would be minimal for the same reason as discussed for decommissioning activities (see Section IV.10.2.1.2); namely, that such disturbance would occur in areas previously disturbed and within soils previously reworked for original road construction.

IV.10.2.2 Impacts of the Ecological and Cultural Conservation and Recreation Designations

Because the BLM LUPA land designations would be managed to protect ecological, historic, cultural, scenic, scientific, and recreation resources and values, they would also confer general protection for paleontological resources. While other land uses are allowed within these areas, other uses must be compatible with the resources and values that the land designation is intended to protect. Protective land use designations such as Areas of Critical Environmental Concern (ACECs), National Landscape Conservation System (NLCS) lands, wildlife allocations, and closed OHV management areas would all benefit from protecting known and unknown paleontological resources.

Expansion or designation of new ACECs, Special Recreation Management Areas (SRMAs), and National Scenic and Historic Trail (NSHT) management corridors, could increase public access to new or expanded open OHV areas, which could adversely impact paleontological resources. New and expanded SRMAs could expose fossil-bearing geologic units to adverse impacts from soil compaction, vehicle ground disturbance, or unauthorized collecting.

However, because land designation and management actions would be designed to consider many resource values, localized increases in potential paleontological resource impacts from new or expanded SRMAs would be countered by CMAs and protective designations elsewhere. Authorized recreation activities and trail management actions would occur in a manner that minimizes potential adverse effects to paleontological resources from soil erosion or disturbance. For example, SRMAs containing significant paleontological resources would continue to limit or prohibit OHV use or staging, provide interpretational and directional signage, and prohibit renewable energy development. Additionally, paleontology Conservation and Management Actions (CMAs) for BLM lands in the DRECP area would be appropriately implemented, by alternative, as discussed later in this chapter.

Known, nationally significant paleontological resource areas that would continue to be protected from any adverse impacts from development or uncontrolled public access include:

- The Mountain Pass dinosaur track way ACEC, which contains the only known occurrence of fossilized Mesozoic reptile tracks in California. Such tracks are a rare occurrence in the United States.
- The Yuha Basin ACEC, which contains eroded badlands exposing portions of the Imperial Formation known for its well-preserved Pliocene (4 to 5 million years old) oyster shell beds and other marine fossils.
- The Rainbow Basin ACEC, which has provided and continues to provide scientists with valuable fossil evidence of terrestrial life during the middle Miocene (12 to 16 million years ago).
- The Manix paleontological area ACEC, which contains extensive exposures of pluvial lake sediments deposited during the Pleistocene (20,000 to 1 million years ago) that preserve fossils of a wide variety of terrestrial and aquatic vertebrate animals.
- Coyote Mountains fossil site ACEC, which contains richly fossil-bearing marine strata of the Imperial Formation that document the initial flooding of the proto-Gulf of California during the late Miocene and early Pliocene (4 to 6 million years ago).
- The Marble Mountain fossil bed ACEC, which contains ancient Paleozoic (250 to 540 million years old) strata that preserves some of the earliest records of complex marine life in California, as well as a rich record of the subsequent diversification of marine ecosystems that occurred later in the Paleozoic Era.

Some of the alternative-specific conservation designations provide enhanced protection through their inclusion in NLCS lands, though none of the alternatives include actions that would increase the potential for impacts beyond existing conditions. Details on allowable uses and management within National Conservation Lands are presented in the Proposed LUPA

description in Volume II. Details on the goals, objectives, allowable uses, and management actions for each ACEC and SRMA unit are in the Special Unit Management Plans in Appendix L.

IV.10.3 Impact Analysis by Alternative

The following sections present impact analysis for the No Action Alternative, the Preferred Alternative, and Alternatives 1 through 4. Because this is a programmatic document, it does not evaluate site-specific impacts associated with particular projects. Project-specific impacts on paleontological resources would be assessed during the permitting process and in supplemental project-specific NEPA documents.

IV.10.3.1 No Action Alternative

This section presents the assessment of impacts and mitigation measures for renewable energy and transmission development for the No Action Alternative. The No Action Alternative assumes that California will achieve its renewable energy goals in support of greenhouse gas reduction targets. It further assumes that the contribution of the DRECP area to the state goals under the No Action Alternative would be similar to the Preferred Alternative and other alternatives. Unlike the Preferred Alternative and other alternatives, the No Action Alternative does not include an integrated, interagency conservation strategy for Covered Species and natural communities throughout the California deserts. It also does not include specific DFAs; instead, it assumes a future renewable energy technology mix and spatial distribution similar to current development patterns at the ecoregion subarea scale.

For the No Action Alternative, the ground disturbance and project area impacts from renewable energy and transmission development would occur on a project-by-project basis in a pattern similar to past and ongoing renewable energy development, as described in Volume II, Chapter II.2.

IV.10.3.1.1 Impacts of Renewable Energy and Transmission Development

Impact PR-1: Land disturbance could result in loss, damage, or destruction of significant paleontological resources.

Land disturbance associated with site characterization, construction, and decommissioning activities under the No Action Alternative would generally reflect a continuation of current trends and recent patterns of renewable energy development associated with existing and planned projects. For example, allowable development and policies under the Solar Programmatic Environmental Impact Statement (Solar PEIS) (e.g., Solar Energy Zones and Variance Lands) would continue; and renewable energy and transmission development outside of existing Legislatively and Legally Protected Areas and ACECs would continue on

an ad hoc, case-by-case basis in accordance with existing land management plans and policies. These include requirements to obtain local conditional use permits (terms vary), California Desert Conservation Area plan amendments, California Energy Commission conditions of certification, and other special authorizations. The analysis of potential impacts to paleontological resources under the No Action Alternative therefore considers all areas outside of Legislatively and Legally Protected Areas, ACECs, existing urban and built-up lands, military lands, and SRMAs as potentially developable. Wind energy generation is emphasized in the West Mojave and Eastern Slopes ecoregion subarea; solar energy generation is emphasized in the Cadiz Valley and Chocolate Mountains and Imperial Borrego Valley ecoregion subareas; and geothermal energy generation is emphasized in the Imperial Borrego Valley ecoregion subarea.

The nature and intensity of paleontological resource impacts from renewable energy and transmission development under the No Action Alternative would be the same as described in Section IV.10.2, but the location and extent of impacts would differ somewhat from the Preferred Alternative and Alternatives 1 through 4. Table R2.10-1, Appendix R2, presents the estimated paleontological resource impacts by ecoregion subarea, based on the general distribution of geologic formations (and their PFYCs) within developable areas, as well as the estimates of permanent disturbance presented in Volume II, Chapter II.2.

Key impacts include:

- The greatest degree of impact would be within the Cadiz Valley and Chocolate Mountains ecoregion subarea, where 40,000 acres could experience permanent disturbance, 28% of which (11,000 acres) could occur within areas with an HVH PFYC. This potential to impact sensitive units is also the greatest compared with all of the other ecoregion subareas.
- The ecoregion subarea with the next greatest impact to HVH PFYCs would be the Imperial Borrego Valley ecoregion subarea; ground disturbances in this region could affect 20,000 acres, 19% of which (4,000 acres) would be within HVH PFYCs.
- Approximately 21%, 61%, and 16% of all developable areas considered in aggregate are underlain by geologic formations with an HVH, MU, and LVL PFYC, respectively (The balance consists of water bodies.).

Although these map-based findings are merely estimates based on coarse-scale regional geologic data, they are consistent with recent fossil discoveries associated with current renewable energy development within both ecoregion subareas. Examples of existing projects that have been approved or are under construction include the Palen Solar Electric Generating System (solar power tower), Genesis Solar Power Project (solar trough), Desert

Sunlight Solar Farm Project (solar photovoltaics), Ocotillo Wind Energy Facility (wind), and the East Brawley Geothermal Facility.

New information about the distribution and significance of paleontological resources in the Mojave and Colorado deserts has been focused on several areas (California Energy Commission 2013), as described in the following paragraphs.

Chuckwalla Valley and the Palo Verde Mesa. There has been an influx of paleontological information associated with the large renewable energy projects proposed and under construction in the Chuckwalla Valley and the Palo Verde Mesa area. Originally, the low number of fossil discoveries in the project vicinity was interpreted as an indication of low paleontological potential. However, paleontological field surveys and construction monitoring in these large projects in the past decade have consistently identified significant paleontological resources in both surface and subsurface contexts. For example, during construction of the Genesis Solar Energy Project, paleontological monitors discovered multiple occurrences of vertebrate fossils, primarily tortoise carapaces and limb bones.

Similarly, initial studies conducted for the nearby Desert Sunlight Project originally deemed the site to be of low probability for encountering vertebrate fossils (low potential). However, with commencement of construction-related excavation work, several specimens (identifiable fragments or individual bones) and numerous unidentifiable fragments have been discovered. The identifiable species include bones of saber tooth cat (*Smilodon* sp.), deer (*Cervidae*), camel (*Camelidae*), and rodents (*Rodentia*), as well as desert tortoise (*Gopherus* sp.). The results of these recent studies suggest that the Chuckwalla Valley has greater paleontological potential than originally thought (BLM 2013).

Multiple studies have identified paleosols (ancient soil horizons) within the Quaternary alluvium of the region. These horizons formed slowly through mechanical and chemical erosion and weathering in the Colorado Desert during wetter periods of the Late Pleistocene (~13,000 years ago). These conditions are favorable for the preservation of fossils, especially short-lived species such as rodents. These paleosols have been identified below desert pavement in the southern Chuckwalla Valley, south of Interstate 10 (I-10) near State Route 177 (SR-177) (BLM 2013), and at the Rio Mesa Solar Energy Generating Facility site (no longer proposed). In the paleontological assessment prepared for the former Rio Mesa project, it was found that at least two paleosols occur between 6 and 7 feet below the modern ground surface of the Palo Verde Mesa. Survey-related fieldwork resulted in the discovery of several rare, unique, and well preserved vertebrate fossil specimens, including a clutch of unhatched desert tortoise eggs intact in a burrow accompanied by an adult tortoise; the specimen may be the only such fossil ever found in California (URS 2011, 2012).

Borrego Valley and Salton Trough. Fieldwork associated with assessment of the paleontological resource potential of the Ocotillo Wind Project resulted in the discovery of vertebrate fossil remains of camel (*Camelidae*) and pond turtle (*Emydidae*), now curated in the Colorado Desert District Stout Research Center collection, and several recorded fossil sites where specimens were not collected (Aaron and Kelley 2011). Where exposed on the margins of the Salton Trough, like the deposits near Salt Creek and west of SR-86 (Jefferson 2005), or encountered in excavations, like those at La Quinta and Indio (Whistler et al. 1995[a] [b], Paleo Environmental Associates Inc. 2010), later Pleistocene and Holocene deposits of ancient Lake Cahuilla have yielded significant invertebrate and vertebrate fossils in this region (Bowersox 1972). Other examples of specific geologic units known to have yielded significant paleontological resources include late Miocene to early Pliocene (~4 to 6 million years old) marine strata of the Imperial Group, as well as Pliocene to early Pleistocene (~4 to 1.5 million years old) terrestrial strata within sedimentary rocks of the Palm Spring Group.

Renewable energy and transmission development under the No Action Alternative could continue to impact sensitive formations in a manner consistent with the projects just discussed. As discussed in Section IV.10.2, certain excavation activities that disturb, damage, or destroy fossils without providing an opportunity to identify, study, or salvage them, cannot always be mitigated using standard monitoring programs. These include pre-drilling and vibratory pedestal insertion, large-diameter boring with diamond cores, and other destructive excavation techniques, primarily associated with installation of deep pylons, piles, and shafts. Should such activities penetrate fossiliferous geologic formations, the potential for substantial adverse impacts on paleontological resources is greatly increased.

Impact PR-2: Construction and operations activities could increase the rate of erosion or alter drainage patterns removing significant paleontological resources from their context.

Construction and operations activities under the No Action Alternative could increase the rate of erosion or soil loss, or alter drainage patterns and result in impacts to paleontological resources. Without implementation of regulatory programs and implementation of proper design measures and best management practices, renewable energy and transmission development could exacerbate flooding, disrupt natural stream processes, and result in the erosion and downstream transportation of soils (and any paleontological resources contained within them). The nature of these effects is described in greater detail in Section IV.10.2.

The potential for this type of impact to occur within the DRECP area would be proportional to the severity of hydrologic impacts discussed in Chapter IV.5, Flood, Hydrology and Drainage. The analysis presented indicates that solar energy development would have the greatest potential for adverse hydrologic and erosion impacts. Therefore, indirect impacts to paleontological resources may be greater in areas emphasizing solar

development, such as the Cadiz Valley and Chocolate Mountains ecoregion subarea, when compared with the West Mojave and Eastern Slopes and the Imperial Borrego Valley ecoregion subareas, which emphasize wind and geothermal. Substantial adverse impacts can be avoided or sufficiently minimized by compliance with applicable laws, ordinances, regulations, and standards. These include implementation of stormwater pollution prevention plan design criteria, monitoring water quality and wastewater management, and Clean Water Act and related state and local agency compliance. To the extent that these actions reduce impacts on hydrology, drainage, and erosion, they would also reduce impacts to paleontological resources.

Impact PR-3: Increased human access to significant paleontological resources could result in unauthorized collection or vandalism.

Construction and operations activities under the No Action Alternative that allow increased public access to significant paleontological resources could result in indirect adverse impacts due to unauthorized collection, looting, or vandalism. The nature and intensity of paleontological resource impacts from renewable energy and transmission development under the No Action Alternative would be the same as described in Section IV.10.2.

There is no concrete evidence that existing renewable energy development has increased unauthorized fossil collection; nevertheless, the continued development of access roads and transmission corridors associated with all renewable energy technologies could increase public access to previously inaccessible areas. The areas currently being developed for renewable energy are already accessible by local roads and, largely, by unpaved OHV routes and maintenance roads that parallel overhead transmission lines. The potential for these impacts would be greatest where transmission corridors forge new paths into currently inaccessible terrain. However, because the No Action Alternative would maintain a development pattern consistent with what is already occurring, the extent to which new areas would become accessible is minor compared with the other alternatives.

Furthermore, because renewable energy and transmission development would not generally provide public access (unless it interferes with an existing OHV route or other trail), individual projects would prevent public access by installing perimeter fencing and signage. To restrict public access along private roads or transmission corridors, gates could be installed and signage could be posted to inform the public to remain on public roads and open OHV routes. Generally, those hobbyists and enthusiasts intent on collecting fossils would carry out such unauthorized activities regardless of the location and extent of renewable energy development. In the event fossils are actually uncovered as a result of construction, grading, and excavation, they would be protected under monitoring and mitigation programs, provided such a program has been implemented for project-specific mitigation.

Impact Reduction Strategies

Laws and Regulations

Existing laws and regulations may reduce the impacts of renewable energy development projects in the absence of the DRECP Proposed LUPA and Final EIS. Relevant regulations are presented in Volume III, Section III.10.1. Because this EIS addresses amendments to BLM's land use plans, these plans are addressed separately and are not included in this section. The requirements of relevant regulations may reduce impacts through the following mechanisms:

- *The Paleontological Resource Preservation Act* provides for (1) criminal and civil penalties for illegal sale, transport, theft, and vandalism of fossils from federal lands; (2) uniform minimum requirements for paleontological resource-use permit issuance (terms, conditions, and qualifications of applicants); (3) uniform definitions for "paleontological resources" and "casual collecting"; and (4) uniform requirements for curation of federal fossils in approved repositories. Federal legislative protections for scientifically significant fossils apply to projects on federal lands (with certain exceptions such as the Department of Defense, which continues to protect paleontological resources under the Antiquities Act), involve federal funding, require a federal permit, or cross state lines.
- *The Federal Land Policy Management Act and NEPA* require that federal actions and land tenure adjustments that may impact or result in a loss of paleontological resources on public or split estate lands, be evaluated and necessary mitigation identified. Under NEPA, federal agencies are tasked with implementing specific guidelines for analyzing environmental effects. Under BLM's current guidelines, the PFYC system (BLM IM 2008-009) allows for a preliminary analysis of potential impacts. BLM IM 2009-011 outlines the requirements for scoping issues, assessing potential impacts, conducting paleontological field surveys, determining further mitigation requirements, field monitoring, and compliance monitoring and reporting.

Mitigation

The types of mitigation that have been adopted for approved projects are assumed to be the same as for mitigation that would apply in the future under the No Action Alternative. Mitigation for potential impacts typically involves implementation of a paleontological resources monitoring and mitigation program. Specific terminology for such monitoring plans vary by managing agency, but all usually contain the following elements:

- Qualification requirements for professional paleontologists and approved monitors
- Requirements for preconstruction surveys and salvage

- Construction phase monitoring of excavations, trenching, and other ground disturbances
- Procedures to follow in the event a significant resource is discovered
- Compliance monitoring and reporting procedures

Although preconstruction assessments of known paleontological resources, sites, or sensitive geologic units within the footprint of a project are typically completed as part of project-specific NEPA compliance, these surveys are also generally included in mitigation requirements if insufficient data is available to properly assess and minimize potential effects. If the environmental analysis of a project finds that geologic units underlying a project site have a low fossil-yield potential, or if project disturbances would be limited to surface disturbances in previously disturbed areas, lead agencies have typically found the potential impacts to be negligible or minor. In such cases, BLM can impose unanticipated-discovery stipulations (whereby construction activities would cease in the vicinity of a potential fossil find until a qualified paleontologist can assess and mitigate for the find), if deemed appropriate.

Coordination between the project developer and BLM would be required for all renewable energy projects before areas are developed. The use of management practices (e.g., training and education programs to reduce inadvertent destruction of paleontological sites) would also reduce the occurrences of human-related disturbances to nearby sites. The specifics of these management practices would be established in project-specific coordination between the project developer and BLM. BLM IM 2009-011 provides operationally sound guidance for assessing potential impacts on paleontological resources and determining mitigation measures. Mitigation measures developed as part of the Solar PEIS, currently applicable only to Solar Energy Zones and Variance Lands, would also adequately protect paleontological resources.

Mitigation of paleontological resource impacts can often provide significant public benefits. The science of paleontology is advanced by the discovery, study, and curation of new fossils. These fossils can be significant if they represent a new species, verify a known species in a new location, or include parts of similar specimens that had not previously been found preserved. In general, most fossil discoveries are the result of excavation, either purposeful in known or suspected fossil localities or as the result of excavations made during earthwork for civil improvements or mineral extraction. Such discoveries would not have been made without the construction activities that exposed them. Proper monitoring of excavation associated with continuing renewable energy development could result in fossil discoveries that would enhance our understanding of the fossil record or the past climate, geology, and geographic setting of the region for the benefit of current and future generations.

IV.10.3.1.2 Impacts of Ecological and Cultural Conservation and Recreation Designations

Under the No Action Alternative, existing land management plans within the LUPA Decision Area would continue to be implemented on BLM-managed lands. The existing conservation and recreation designations would protect paleontological resources by limiting development in higher value areas. However, because these designations would be less extensive than with the Preferred Alternative, paleontological resources would be more at risk.

IV.10.3.1.3 Impacts of Transmission Outside of DRECP Area

Under the No Action Alternative, additional transmission lines would be needed to deliver renewable energy to load centers (areas of high demand) outside the DRECP area. It is assumed that new transmission lines would use existing transmission corridors between the DRECP area and existing substations in the more heavily populated areas of the state. Transmission line development occurs within long linear corridors that traverse all types of land uses, including urban areas with high-density residential and commercial lands. The areas through which new transmission lines will likely be constructed include the San Diego, Los Angeles, North Palm Springs–Riverside, and Central Valley areas. The resources within these areas and corridors are described in Volume III, Section III.10.5.

Impact PR-1: Land disturbance could result in loss, damage, or destruction of significant paleontological resources.

Based on the underlying geology, maps of PFYCs would identify areas of low to high potential for the presence of fossils. During ground-disturbing activities (e.g., maintenance of unpaved access roads, transmission tower site preparation, and tower foundation construction) monitors would observe operations and check for evidence of paleontological resources that may be unearthed.

Impact PR-2: Construction and operations activities could increase the rate of erosion or alter drainage patterns removing significant paleontological resources from their context.

Ground disturbance on transmission lines is limited largely to tower sites, access roads, and construction yards. Contractors are required to address drainage and erosion as part of their stormwater pollution prevention plans. These plans would address any potential risk of increased erosion or change to drainage that could adversely affect paleontological resources.

Impact PR-3: Increased human access to significant paleontological resources could result in unauthorized collection or vandalism.

In existing transmission corridors, little or no additional access would be created beyond what already exists. Therefore, access would not increase.

IV.10.3.2 Preferred Alternative

The Preferred Alternative includes DFAs (388,000 acres) and transmission corridors which, together, could cause approximately 81,000 acres of ground disturbance and operations impacts on BLM-managed lands. The impact analysis for paleontological resources under the Preferred Alternative is provided in the following sections.

IV.10.3.2.1 Impacts of Renewable Energy and Transmission Development

This section provides the assessment of impacts from implementing the DRECP for the Preferred Alternative. This assessment addresses the impacts from renewable energy and transmission development and impacts of the conservation designations.

The following provides the assessment of impacts for renewable energy and transmission development for the Preferred Alternative. Impacts are presented for each paleontological resources impact statement (PR-1 through PR-3).

Impact PR-1: Land disturbance could result in loss, damage, or destruction of significant paleontological resources.

The nature and intensity of paleontological resource impacts from renewable energy and transmission development under the Preferred Alternative would be the same as described in Section IV.10.2, but the location and extent of impacts would differ somewhat among alternatives. Table R2.10-2 (in Appendix R2) presents the estimated paleontological resource impacts by ecoregion subarea, based on the general distribution of geologic formations and their PFYCs, within DFAs on BLM-managed lands, as well as estimates of permanent disturbance presented in Volume IV, Chapter IV.01. The estimated footprint impacts shown in Table R2.10-2 do not include disturbances from renewable energy transmission facilities outside of DFAs. However, the potential transmission corridors, while not located precisely, are expected to roughly underlie geologic units with a PFYC distribution similar to that within the conceptual energy corridors. The distribution of PFYCs within conceptual energy corridors is 6%, 79%, and 11% for LVL, MU, and HVH, respectively.

Impacts for the Preferred Alternative include the following:

- Across all BLM-managed lands, approximately 19% of the DFAs of the Preferred Alternative are underlain by geologic units with an HVH PFYC, 74% of the DFAs are underlain by geologic units with an MU PFYC, and approximately 5% of the DFAs are underlain by geologic units with an LVL PFYC. (The remaining 2% consists of water bodies.)
- The greatest degree of footprint impacts within DFAs would be within the Cadiz Valley and Chocolate Mountains ecoregion subarea, where 21,000 acres could experience ground disturbances, 28% of which (6,000 acres) could occur within areas with an HVH PFYC.
- This potential to impact geologic units in the Imperial Borrego Valley ecoregion subarea with an HVH PFYC is relatively low compared with potential impacts in other ecoregion subareas such as the Cadiz Valley and Chocolate Mountains and the West Mojave and Eastern Slopes ecoregion subareas (and as compared with the DRECP area generally).
- The Imperial Borrego Valley and West Mojave and Eastern Slopes ecoregion subareas both have the next greatest potential footprint impacts within DFAs, 16,000 acres and 8,000 acres, respectively. About 8% of the DFAs in the Imperial Borrego Valley subarea and 27% of the West Mojave and Eastern Slopes ecoregion subarea are underlain by geologic units with an HVH PFYC.

Some of the DFAs for the Preferred Alternative are in areas known as vertebrate fossil-yielding geologic units. For example:

- In the Horned Toad Hills west of Mojave and east of Tehachapi and in the hills surrounding Tehachapi Valley (the West Mojave and Eastern Slope ecoregion subarea), portions of the DFAs are sited in areas underlain by known vertebrate fossil-bearing strata. These strata include the Horned Toad Formation and the Bopesta Formation, respectively.
- Certain DFAs in the Kingston and Funeral Mountains ecoregion subarea are in the Mountain Pass area near I-15 (Mescal Range), which is underlain by known fossil-bearing Paleozoic and Mesozoic sedimentary rocks (e.g., Sultan Limestone, Bird Spring Formation, and Aztec Sandstone).
- In the area immediately northeast of Barstow and northwest of Daggett (Mojave and Silurian Valley ecoregion subarea), a portion of the DFAs is underlain by vertebrate fossil-bearing strata of the Barstow Formation.

- On the Palo Verde Mesa (Cadiz Valley and Chocolate Mountains ecoregion subareas), DFAs associated with all five action alternatives are sited in areas underlain by known vertebrate fossil-bearing Pleistocene paleosols.

As indicated in Table R2.10-2 (in Appendix R2), many other areas may be underlain by fossil-yielding geologic units, but these provide examples specific to the Preferred Alternative.

This distribution of PFYCs within the DFAs indicates that in almost all circumstances—whether or not known paleontological resources are present—subsurface excavations associated with all technologies may impact geologic units that are potentially fossil-yielding. For example, although only 8% of the DFAs within the Imperial Borrego Valley ecoregion subarea are within areas mapped as having an HVH PFYC, the majority (82%) are within geologic units where the PFYC is MU. Furthermore, since geothermal would be emphasized in the region, drill pad foundations, production facility foundations, and especially the injection and production wells themselves may penetrate sensitive units at depth. These issues are project-specific considerations that would require remapping the paleontological potential at a finer level of detail using the best available information. Many of the areas mapped with an MU PFYC are likely to be assigned, at least partially, to a lower or a higher PFYC when examined at a finer scale.

The geographic pattern of development at the level of ecoregion subarea and scales (i.e., clustered or dispersed) matters little with respect to paleontological resources. What matters, instead, is whether and to what degree fossil-yielding geologic units are impacted, what the significance of those impacts are, and whether important or unique specimens and data can be collected and recovered. In addition, to the degree that solar energy development requires large-scale grading (i.e., if not sited in sufficiently flat areas), footprint impacts in areas emphasizing solar technology may be more widespread across the entire development footprint. Wind and geothermal development, while potentially requiring less widespread grading, would require deeper and wider foundations and may involve drilling and excavation techniques that make identification and recovery of impacted paleontological resources less likely.

Impact PR-2: Construction and operations activities could increase the rate of erosion or alter drainage patterns removing significant paleontological resources from their context.

The typical effects of erosion and soil loss are described in greater detail in Section IV.10.2, though the location and extent of impacts for the Preferred Alternative would differ somewhat from the No Action Alternative and Alternatives 1 through 4. The potential for this type of impact within the DRECP area would be proportional to the severity of the hydrologic impacts discussed in Chapter IV.5. The analysis presented

indicates that all renewable energy technologies could have adverse environmental impacts to the rate of erosion, soil loss, or drainage patterns; but solar energy development would have the greatest potential of all for adverse impacts. Therefore, indirect impacts to paleontological resources may be greater in areas emphasizing solar development, such as the West Mojave and Eastern Slopes and the Cadiz Valley and Chocolate Mountains ecoregion subareas, when compared to the Owens River Valley ecoregion subarea, which emphasizes geothermal.

Substantial adverse impacts can be avoided or sufficiently minimized by compliance with applicable laws, ordinances, regulations, and standards. These include implementing stormwater pollution prevention plan design criteria, monitoring water quality and wastewater management, and complying with Clean Water Act and related state and local agency regulations. To the extent these actions reduce impacts on hydrology, drainage, and erosion (see Chapters IV.4 and IV.5), they would also reduce impacts on paleontological resources.

Impact PR-3: Increased human access to significant paleontological resources could result in unauthorized collection or vandalism.

The nature and intensity of paleontological resource impacts from renewable energy and transmission development under the Preferred Alternative would be the same as described in Section IV.10.2, but the location and extent of impacts would differ among the alternatives. Typically, renewable energy transmission and development that is further removed from existing roads and transmission infrastructure would have a greater potential to increase unauthorized collection or vandalism. Potential transmission corridors conceptually identified under the Preferred Alternative tend to follow existing major roads, highways, and utility corridors, which means that public accessibility to currently inaccessible areas would not change greatly. Otherwise, the impacts described under the No Action Alternative (see Section IV.10.3.1, No Action Alternative) would be the same as the unauthorized collection or vandalism impacts presented in the Preferred Alternative.

Impacts of Variance Process Lands

Variance Process Lands are neither reserve lands nor DFAs; they are a subset of the variance lands identified in the Solar PEIS Record of Decision (ROD) and additional lands that, based on current information, have moderate to low ecological value and ambiguous value for renewable energy. If renewable energy development occurs on Variance Process Lands, a BLM LUPA would not be required so the environmental review process would be somewhat simpler than if the location were left undesignated. Variance Process Lands for each alternative are included and located as shown in Chapter IV.1, Table IV.1-2 and in Volume II, Figure II.3-1, for the Preferred Alternative. Development of renewable

generation projects on Variance Process Lands would affect paleontological resources in a similar manner as would development within DFAs.

Impact Reduction Strategies

Plan implementation would result in conservation of some desert lands as well as the development of renewable energy generation and transmission facilities on other lands. There are two ways in which the impacts of the renewable energy development covered by the Proposed LUPA would be lessened. First, the Proposed LUPA incorporates CMAs for each alternative. Second, the implementation of existing laws, orders, regulations, and standards would reduce the impacts of project development.

Conservation and Management Actions

The conservation strategy for the Preferred Alternative (presented in Volume II, Section II.3.2) defines specific actions that would reduce the impacts of this alternative. The conservation strategy includes the definition of the conservation designations and specific CMAs for the Preferred Alternative; CMAs are listed in Volume II, Section II.3.4.2. The Proposed LUPA includes one nonbiological CMA that would directly apply to paleontological resources; it includes the following requirements:

- **LUPA-PALEO-1:** If not previously available, prepare paleontological sensitivity maps consistent with the Potential Fossil Yield Classification, before NEPA analysis.
- **LUPA-PALEO-2:** Incorporate all guidance provided by the Paleontological Resources Protection Act.
- **LUPA-PALEO-3:** Ensure proper data recovery of significant paleontological resources where adverse impacts cannot be avoided or mitigated.
- **LUPA-PALEO-4:** Because of recent significant discoveries in areas within the Chuckwalla Valley where previous assessments had predicted low sensitivity, require paleontological surveys and construction monitors for ground-disturbing activities that require an EIS.

In addition, certain biological CMAs are proposed to avoid adverse impacts to paleontological resources. These include worker education; resource setback standards; standard practices for siting and design, hydrology and water resources, and soil resources; and certain landscape-level biological CMAs:

- **LUPA-BIO-13. *General Siting and Design.*** This CMA would implement designs that to the maximum extent feasible would confine disturbances, project vehicles, and equipment to the delineated project areas and prohibit, within project boundaries,

cross-country vehicle and equipment use outside of approved designated work areas. This CMA also restricts to the maximum extent feasible construction activity to the use of existing roads and utility corridors to minimize the number and length/size of new roads, laydown, and borrow areas. These standards would reduce the potential for adverse impacts to any paleontological resource at the surface due to incidental disturbances caused by vehicles and equipment. It would also minimize new areas of access and thus avoid or reduce the potential for unauthorized-collection activities to occur in new geographic areas.

- **LUPA-BIO-5: *Worker Education*.** This CMA would provide workers with information on the legal protection for protected resources and penalties for violation of federal and state laws intended to protect site-specific biological and nonbiological resources. This type of program would reduce the potential for adverse impacts to any paleontological resource by informing workers of the legislative protections for paleontological resources (i.e., Paleontological Resources Preservation Act) so they will be better informed that fossils are an environmental resource and should not be vandalized, stolen, disturbed, or destroyed.
- **LUPA-BIO-3: *Resource Setback Standards*.** This CMA would identify setbacks to avoid and buffer mapped riparian or wetland vegetation communities and the Federal Emergency Management Agency 100-year floodplain. Such setbacks would also be protective of paleontological resources, because the incised banks of washes and arroyos can occasionally expose fossils, or fossil-yielding geologic units. Avoiding development within these areas also avoids potential impacts to fossils, if present on the sides of incised banks.
- **LUPA-BIO-9: *Water and Wetland Dependent Species Resources*.** This CMA would require all Development activities to create a project-specific drainage, erosion, and sedimentation control plan that meets the approval of the appropriate DRECP Coordination Group. Among other things, the CMA includes measures to prevent excessive and unnatural soil deposition and erosion, design measures to maintain natural drainages and to reduce the amount of area covered by impervious surfaces, stabilization of disturbed areas, and regular inspections of permanent erosion control measures. These standards would reduce the potential for adverse impacts to paleontological resources because fossils (in addition to soils that contain them) can likewise be eroded and buried.
- **LUPA-SW-6 through LUPA-SW-11: *Standard practices for soil and water resources*.** These CMAs would implement standard industry construction practices to minimize water and air erosion of soils and would require construction and installation techniques that minimize new site disturbance, soil erosion and deposition, soil compaction, disturbance to topography, and removal of vegetation. Additionally,

desert pavement impacts will be minimized to the extent possible and in coordination with the BLM if in excess of 10% of the extent mapped within the activity area. These standards would also reduce the potential for adverse impacts to paleontological resources.

Laws and Regulations

Similar to the No Action Alternative, existing laws and regulations will reduce certain impacts of Plan implementation. Relevant regulations are presented in the Regulatory Setting in Volume III. The requirements of relevant laws and regulations are summarized for the No Action Alternative in Section IV.10.3.1.1. There are no other laws or regulations that would uniquely apply to this alternative.

IV.10.3.2.2 Impacts of the Ecological and Cultural Conservation and Recreation Designations

The Proposed LUPA would establish conservation designations on BLM-administered lands that would conserve ecological, cultural, and recreation resources. Changes to BLM land designations would include (1) the designation of new NLCS lands, (2) the designation of new ACECs and wildlife allocations and the expansion or reduction of existing ACECs, (3) the designation of new SRMAs and the expansion or reduction of existing SRMAs, (4) the creation of buffer corridors along NSHTs, and (5) the management of lands with wilderness characteristics to protect wilderness characteristics.

To the extent that conservation designation areas are newly established or expanded (i.e., beyond existing protected areas), the conservation designations would be considered a beneficial impact to paleontological resources, because renewable energy development would be prohibited in these areas. Efforts to preserve wildlife, habitat, and ecologic values would likewise serve to protect paleontological resources.

On BLM-administered lands under the Preferred Alternative, 4,966,000 acres of BLM LUPA conservation designations are proposed on BLM-administered lands in the DRECP area outside existing conservation areas, including 1,313,000 acres (26%) of existing or proposed ACEC, 3,337,000 acres (67%) of existing or proposed ACEC and National Conservation Lands, 298,000 acres (6%) of National Conservation Lands only, and 18,000 acres (less than 1%) of wildlife allocation. Additionally, existing conservation areas occur on BLM-administered lands that conserve biological resources. To the extent that such areas are newly established or expanded (i.e., beyond existing protected areas), such BLM land designations would be considered beneficial impacts for paleontological resources because renewable energy development would be precluded and efforts to preserve wildlife, habitat, and ecologic values would likewise serve to protect paleontological resources. The

distribution of PFYCs within proposed conservation designations outside existing conservation areas is 29%, 47%, and 24% for LVL, MU, and HVH, respectively. This distribution of PFYCs indicate that up to 71% of these proposed conservation designations would protect lands that is or may have paleontological resource value (i.e., lands with a PFYC of MU or HVH). Whether or not known paleontological resources are present—new or expanded conservation designations elements would serve to protect geologic units that are potentially fossil yielding.

Expansion or designation of new ACECs, SRMAs, and NSHT management corridors, to the extent that they allow an increase in public accessibility or new or expanded open OHV areas, could result in adverse impacts to paleontological resources at the ground surface (no subsurface impacts). Unit-specific SRMA Special Unit Management Plans are in Appendix L, and the CMAs specific to lands managed to protect wilderness characteristics are provided as part of the Volume II descriptions of the LUPA alternatives.

IV.10.3.2.3 Impacts of Transmission Outside of DRECP Area

The impacts of developing new transmission lines outside the DRECP area on paleontological resources would be the same under all alternatives. These impacts are as described for the No Action Alternative in Section IV.10.3.1.3, Impacts of Transmission Outside the DRECP Area.

IV.10.3.2.4 Comparison of the Preferred Alternative with No Action Alternative

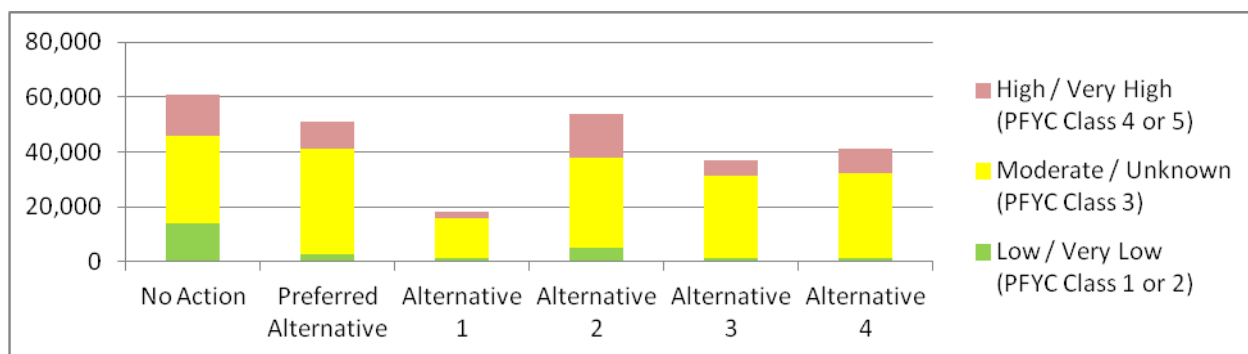
Chapter IV.27 presents a comparison of all action alternatives and the No Action Alternative across all disciplines. This section summarizes the comparison of the Preferred Alternative with the No Action Alternative.

The Preferred Alternative would concentrate renewable energy development into approximately 388,000 acres of DFAs on BLM-administered lands, as compared with the more than 2.8 million acres of BLM-administered lands considered open to renewable energy development under the No Action Alternative. Under the Preferred Alternative, the BLM and Proposed LUPA would designate approximately 5 million acres of Conservation Designations on BLM-administered lands involving the addition of 1,313,000 acres (26%) of existing or proposed ACEC, 3,337,000 acres (67%) of existing or proposed ACEC and National Conservation Lands, 298,000 acres (6%) of National Conservation Lands only, and 18,000 acres (less than 1%) of wildlife allocation. As shown in Exhibit IV.10-1, estimated footprint impacts under the No Action alternative on BLM-administered land would be about 25% greater than those under the Preferred Alternative. Furthermore, about three times the amount of geologic units with an HVH PFYC would be affected. Because the

Preferred Alternative also includes a greater amount of Conservation Designations, paleontological resources would be protected over a wider geographic area.

Though the overarching analyses and conclusions under both alternatives with respect to paleontological resource impacts are the same, there would be less potential to impact paleontological resources under the Preferred Alternative.

Exhibit IV.10-1
Comparison of BLM LUPA Paleontological
Resource Impacts within DFAs by Alternative



IV.10.3.3 Alternative 1

The following sections provide the assessment of impacts for renewable energy and transmission development and impacts of the conservation designations for Alternative 1. Alternative 1 includes DFAs (81,000 acres) and transmission corridors where approximately 52,000 acres of ground disturbance-related impacts and operations impacts would occur.

IV.10.3.3.1 Impacts of Renewable Energy and Transmission

Impact PR-1: Land disturbance could result in loss, damage, or destruction of significant paleontological resources.

The nature and intensity of paleontological resource impacts on BLM lands under existing BLM land use plans in Alternative 1 would be the same as described in the analysis of typical impacts. Under the DRECP and Proposed LUPA, renewable energy development on BLM lands in DFAs would be streamlined (i.e., permitted faster and with fewer steps). However, the speed or timing of renewable energy development ultimately does not affect the magnitude of potential paleontological impacts.

Table R2.10-3 presents the estimated BLM LUPA paleontological resource impacts by ecoregion subarea. The estimated footprint impacts shown in Table R2.10-3 do not include the disturbance that could occur as a result of renewable energy transmission outside of the DFAs. However, the potential transmission corridors—while not located precisely—can roughly be expected to be underlain by geologic units with a PFYC distribution similar to that within the conceptual energy corridors. The distribution of PFYCs within conceptual energy corridors is 14%, 71%, and 15% for LVL, MU, and HVH, respectively. With respect to DFAs, the Imperial Borrego Valley ecoregion subarea would experience the greatest impacts, with an estimated 7,000 acres of potential land disturbance, 14% (1,000 acres) of which is within an HVH PFYC. The Cadiz Valley and Chocolate Mountains ecoregion subarea would experience the next highest level of footprint impact, with 4,000 acres of potential footprint impacts within DFAs, 17% of which (700 acres) is within an HVH PFYC. The mix of renewable energy technology on BLM-administered land under Alternative 1 would be focused more on solar and geothermal, with the types of impacts as described in the discussion of impacts typical to all alternatives (see Section IV.10.2.1).

Impact PR-2: Construction and operations activities could increase the rate of erosion or alter drainage patterns removing significant paleontological resources from their context.

The nature and intensity of paleontological resource impacts on BLM lands with existing BLM land use plans in Alternative 1 would be the same as described in the analysis of typical impacts (see Section IV.10.2.1). The mix of renewable energy technology on BLM-administered lands under Alternative 1 would be focused more on solar and geothermal, with the types of impacts being as described in the discussion of impacts typical to all alternatives (see Section IV.10.2.1).

Impact PR-3: Increased human access to significant paleontological resources could result in unauthorized collection or vandalism.

The nature and intensity of paleontological resource impacts on BLM lands of existing BLM land use plans in Alternative 1 would be the same as described in the analysis of impacts for the Preferred Alternative (see Section IV.10.3.2.1). The mix of renewable energy technology on BLM-administered land under Alternative 1 would be focused more on solar and geothermal, with the types of impacts as described in the discussion of impacts typical to all alternatives (see Section IV.10.2.1).

Impacts of Variance Process Lands

Variance Process Lands are neither reserve lands nor DFAs; they are a subset of the variance lands identified in the Solar PEIS ROD and additional lands that, based on current

information, have moderate to low ecological value and ambiguous value for renewable energy. If renewable energy development occurs on Variance Process Lands, a BLM LUPA would not be required so the environmental review process would be somewhat simpler than if the location were left undesignated. Variance Process Lands for each alternative are included and located as shown in Chapter IV.1, Table IV.1-2 and in Volume II, Figure II.4-1 for Alternative 1. Development of renewable generation projects on Variance Process Lands would affect paleontological resources in a manner similar to development within DFAs.

Impact Reduction Strategies

Plan implementation would result in conservation of some desert lands as well as the development of renewable energy generation and transmission facilities on other lands. There are two ways in which the impacts of the renewable energy development covered by the Plan would be lessened. First, the DRECP Proposed LUPA and EIS incorporates CMAs for each alternative, including specific biological conservation designations components and LUPA components. Second, the implementation of existing laws, orders, regulations, and standards would reduce the impacts of project development.

Conservation and Management Actions

The conservation strategy for Alternative 1 (presented in Volume II, Section II.3.1.1) defines specific actions that would reduce the impacts of this alternative. The conservation strategy includes definition of the conservation designations and specific CMAs for the Preferred Alternative.

The CMAs applicable to paleontological resources listed under the Preferred Alternative, which would likewise apply to this alternative, include (1) the paleontology CMAs (LUPA-PALEO-1 through LUPA-PALEO-2), (2) worker education (LUPA-BIO-5), (3) standard practices for siting and design (LUPA-BIO-13), (4) resource setback standards (LUPA-BIO-3), (5) standard practices for soil and water resources (LUPA-SW-6 through LUPA-SW-11), and (6) standard practices for *water and wetland dependent species resources* (LUPA-BIO-9).

Laws and Regulations

Similar to the No Action Alternative, existing laws and regulations will reduce certain impacts of DRECP Proposed LUPA implementation. Relevant regulations are presented in the Regulatory Setting in Volume III. The requirements of relevant laws and regulations are summarized for the No Action Alternative in Section IV.10.3.1.1.1. There are no other laws or regulations that would uniquely apply to this alternative.

IV.10.3.3.2 Impacts from Ecological and Cultural Conservation and Recreation Designations

On BLM-administered lands under Alternative 1, the BLM LUPA would designate approximately 4.8 million acres of Conservation Designations Lands. BLM LUPA land designations emphasize ACECs and wildlife allocations, with less identification of lands with national-level resource values (i.e., NLCS lands).

To the extent that conservation designations are newly established or expanded (i.e., beyond existing protected areas), such BLM land designations would be considered beneficial impacts to paleontological resources because renewable energy development would be precluded in these areas and because efforts to preserve wildlife, habitat, and ecologic values would likewise serve to protect paleontological resources. The distribution of PFYCs is 28%, 53%, and 18% for LVL, MU, and HVH, respectively. This distribution of PFYCs indicates that in almost all circumstances—whether or not known paleontological resources are present—new or expanded conservation designations elements would serve to protect geologic units that are potentially fossil-yielding.

Under Alternative 1, the following scientific values associated with paleontological and geologic resources would not be included within NCLS lands (but they would be included in the Preferred Alternative):

- The Pisgah Crater—the NASA Mars analog site and unique invertebrate assemblage associated with the lava tubes
- The paleontological values associated with Rainbow Basin and the Manix area
- The Carbonate Endemic Plant Research Natural Area ACEC, with its unusual geologic, soil, and plant association and habitat for threatened and endangered species

However, the paleontological resources within these areas would continue to be protected in accordance with current policy; and there would be no DFAs proposed in these areas. Therefore, no adverse impacts on these areas would occur even if they are not designated under the NLCS.

Expansion or designation of new ACECs, SRMAs, and NSHT management corridors, to the extent that they allow an increase in public accessibility or new or expanded open OHV areas, could result in adverse impacts to paleontological resources at the ground surface (no subsurface impacts). These would have the same effects as described under the No Action Alternative. Only the location and extent of SRMAs would change. Unit-specific SRMA Special Unit Management Plans are in Appendix L, and the CMAs specific to lands managed to protect wilderness characteristics are provided as part of the Volume II descriptions of the DRECP alternatives.

IV.10.3.3.3 Impacts of Transmission Outside of DRECP Area

The impacts of transmission outside the DRECP area on paleontological resources would be the same under all alternatives. These impacts are as described for the No Action Alternative in Section IV.10.3.1.5.1.

IV.10.3.3.4 Comparison of Alternative 1 with Preferred Alternative

Chapter IV.27 presents a comparison of all action alternatives and the No Action Alternative across all disciplines. This section summarizes the comparison of Alternative 1 with the Preferred Alternative.

As the same renewable energy generation goals would be met under both Alternative 1 and the Preferred Alternative, and only the geographic location of the development would change, the potential for impacts would increase or decrease only in terms of the geologic units affected (and their associated PFYCs). In addition, certain DFAs under Alternative 1 are in areas or geologic units already known to be fossil-producing but to a notably lesser degree than those under the Preferred Alternative.

As shown in Exhibit IV.10-1, estimated footprint impacts under Alternative 1 would be about two-thirds of those under the Preferred Alternative. In addition, Alternative 1 would include slightly less area underlain by geologic units with an HVH PFYC (in both absolute and relative terms). On the other hand, BLM LUPA Conservation Designation lands under Alternative 1 would place less emphasis on NLCS lands and a greater emphasis on ACECs and wildlife allocations than would the Preferred Alternative. This may result in slightly fewer beneficial impacts compared with the Preferred Alternative since areas of national-level resource values would receive the strongest protection. However, this distinction results in a relatively minor difference in terms of paleontological resource impacts, since ACECs and wildlife allocations are also protective of paleontological resources.

Though the overarching analyses and conclusions under both alternatives with respect to paleontological resource impacts are the same, there would be slightly less potential to impact paleontological resources on LUPA lands under the Preferred Alternative.

The paleontological potential of specific geographic areas under Alternative 1—compared with the Preferred Alternative—would differ only to the extent the paleontological potential of the geologic units underlying developable areas differ. Specific geographic areas of interest to managing agencies include:

- The Silurian Valley (Mojave and Silurian Valley ecoregion subarea).
- The Pahrump Valley area (Kingston and Funeral Mountains ecoregion subarea).

- The area north of Tehachapi (West Mojave and Eastern Slopes ecoregion subarea).
- The area east of Twentynine Palms (Providence and Bullion Mountains ecoregion subarea).
- Owens Lake (Owens River Valley ecoregion subarea).
- Searles Lake between Fort Irwin and China Lake (Panamint Death Valley ecoregion subarea).
- The area along U.S. Route 395 (US 395) north of Edwards Air Force Base (West Mojave and Eastern Slopes ecoregion subarea).

Differences in the distribution of PFYCs are shown across each geographic ecoregion in Appendix R2.10. These differences are generally minor, as shown by comparing Table R2.10-2, Preferred Alternative, with Table R2.10-3, Alternative 1.

More localized differences between Alternative 1 and the Preferred Alternative in the geographic areas listed above may exist, but the type and nature of impacts to paleontological resources would be the same. This is because fossil-yielding geologic units could be encountered under either alternative, and because any ground disturbance—even if confined to areas mapped as having an LVL PFYC—could result in significant impacts on fossils or fossil-bearing formations (e.g., in the subsurface). For example, the DFAs of Alternative 1 would not intersect several known fossil-bearing geologic units that would be impacted under the Preferred Alternative including: (1) the Horned Toad Formation and the Bopesta Formation (West Mojave and Eastern Slope ecoregion subarea); (2) vertebrate fossil-bearing strata of the Barstow Formation (Mojave and Silurian Valley ecoregion subarea); and (3) known fossil-bearing Paleozoic and Mesozoic sedimentary rocks such as the Sultan Limestone, Bird Spring Formation, and Aztec Sandstone (Kingston and Funeral Mountains ecoregion subarea). However, under both alternatives, the impact conclusion and impact reduction strategies are the same.

While the underlying potential to impact fossil-yielding geologic units may differ between Alternative 1 and the Preferred Alternative in specific geographic regions, the severity of the impact would be the same.

IV.10.3.4 Alternative 2

The impact analysis for paleontological resources under Alternative 2 is provided in the following sections.

IV.10.3.4.1 Impacts of Renewable Energy and Transmission Development

This section provides the assessment of impacts from implementing the DRECP for Alternative 2. This assessment addresses the impacts renewable energy and transmission development and impacts of the conservation designations.

The following sections provide the assessment of impacts measures for renewable energy and transmission development for Alternative 2. Alternative 2 includes DFAs (718,000 acres) and transmission corridors where approximately 88,000 acres of ground disturbance-related impacts and operations impacts would occur.

Impact PR-1: Land disturbance could result in loss, damage, or destruction of significant paleontological resources.

The nature and intensity of paleontological resource impacts on BLM lands under existing BLM land use plans in Alternative 2 would be the same as described in the analysis of typical impacts. Under the DRECP LUPA, renewable energy development on BLM lands in DFAs would be streamlined (i.e., permitted faster and with fewer steps). However, the speed or timing of renewable energy development ultimately does not affect the magnitude of potential paleontological impacts.

Table R2.10-4 presents the estimated BLM LUPA paleontological resource impacts by ecoregion subarea. The estimated footprint impacts shown in Table R2.10-4 do not include the disturbance that could occur as a result of renewable energy transmission outside of the DFAs. However, the potential transmission corridors—while not located precisely—can roughly be expected to be underlain by geologic units with a PFYC distribution similar to that within the conceptual energy corridors. The distribution of PFYCs within conceptual energy corridors is 9%, 64%, and 27% for LVL, MU, and HVH, respectively. With respect to DFAs, the Imperial Borrego Valley ecoregion subarea would experience the greatest impacts, with an estimated 16,000 acres of potential land disturbance, 36% (6,000 acres) of which is within an HVH PFYC. The DFAs in Alternative 2 include a large new area near (but not within) the Algodones Sand Dunes, which has high paleontological sensitivity. This accounts for the relative increase in the amount of land underlain by HVH PFYCs compared with all other action alternatives. The Cadiz Valley and Chocolate Mountains ecoregion subarea would experience the next highest level of footprint impact, with 14,000 acres of potential footprint impacts within DFAs, 26% of which (4,000 acres) are within an HVH PFYC.

The expanded wind opportunities and the large fraction of the DFAs within federal land mean that potential impacts are comparable to the No Action Alternative and potentially greater than the Preferred Alternative.

Impact PR-2: Construction and operations activities could increase the rate of erosion or alter drainage patterns removing significant paleontological resources from their context.

The nature and intensity of paleontological resource impacts on BLM lands under existing BLM land use plans in Alternative 2 would be the same as described in the description of typical impacts (see Section IV.10. 2.1). The mix of renewable energy technology on BLM-administered land under Alternative 2 would be focused more on expanded wind energy opportunities, with the types of impacts being as described in the discussion of impacts typical to all alternatives (see Section IV.10.2.1).

Impact PR-3: Increased human access to significant paleontological resources could result in unauthorized collection or vandalism.

The nature and intensity of paleontological resource impacts on BLM lands in Alternative 2 would be the same as described in the analysis of typical impacts (see Section IV.10.2.1). The mix of renewable energy technology under Alternative 2 would be focused more on expanded wind energy opportunities, with the types of impacts being as described in the discussion of impacts typical to all alternatives (see Section IV.10.2.1).

Impacts of Variance Process Lands

Variance Process Lands are neither reserve lands nor DFAs; they are a subset of the variance lands identified in the Solar PEIS ROD and additional lands that, based on current information, have moderate to low ecological value and ambiguous value for renewable energy. If renewable energy development occurs on Variance Process Lands, a BLM LUPA would not be required so the environmental review process would be somewhat simpler than if the location were left undesignated. Variance Process Lands for each alternative are included and located as shown in Chapter IV.1, Table IV.1-2 and in Volume II, Figure II.5-1 for Alternative 2. Development of renewable generation projects on Variance Process Lands would affect paleontological resources in a similar manner as would development within DFAs.

Impact Reduction Strategies and Mitigation

Plan implementation would result in conservation of some desert lands as well as the development of renewable energy generation and transmission facilities on other lands. There are two ways in which the impacts of the renewable energy development covered by the Plan would be lessened. First, the Plan incorporates CMAs for each alternative, including specific biological conservation designations components and LUPA components. Second, the implementation of existing laws, orders, regulations, and standards would reduce the impacts of project development.

Conservation and Management Actions

The conservation strategy for Alternative 2 (presented in Volume II, Section II.3.1.1) defines specific actions that would reduce the impacts of this alternative. The conservation strategy includes definition of the conservation designations and specific CMAs for the Preferred Alternative. While the CMAs were developed for BLM lands only, this analysis assumes that all CMAs would be applied also to nonfederal lands.

The CMAs applicable to paleontological resources listed under the Preferred Alternative—which includes (1) the paleontology CMAs (LUPA-PALEO-1 through LUPA-PALEO-2), (2) worker education (LUPA-BIO-5), (3) standard practices for siting and design (LUPA-BIO-13), (4) resource setback standards (LUPA-BIO-3), (5) standard practices for soil and water resources (LUPA-SW-6 through LUPA-SW-11), and (6) standard practices for *water and wetland dependent species resources* (LUPA-BIO-9)—would likewise apply to this alternative.

Laws and Regulations

Similar to the No Action Alternative, existing laws and regulations will reduce certain impacts of Plan implementation. Relevant regulations are presented in the Regulatory Setting in Volume III. The requirements of relevant laws and regulations are summarized for the No Action Alternative in Section IV.10.3.1.1.1. There are no other laws or regulations that would uniquely apply to this alternative.

IV.10.3.4.2 Impacts of Ecological and Cultural Conservation and Recreation Designations

The impacts of the conservation designations collectively refer to the designation and management of existing conservation areas (i.e., Legislatively and Legally Protected Areas and Military Expansion Mitigation Lands), BLM LUPA Conservation Designations, and reserves established within Conservation Planning Areas. On BLM-administered lands under Alternative 2, the BLM LUPA would designate approximately 5.2 million acres of BLM LUPA Conservation Designations. BLM land designations under LUPA emphasize designation of NLCS lands and include more identification of lands with national-level resource values than under the Preferred Alternative.

To the extent that Conservation Designations are newly established or expanded (i.e., beyond existing protected areas), such BLM land designations would be considered a beneficial impact on paleontological resources because renewable energy development would be precluded in these areas and because efforts to preserve wildlife, habitat, and ecologic values would likewise serve to protect paleontological resources. The distribution of PFYCs within Conservation Designations is 28%, 53%, and 18% for LVL, MU, and HVH, respectively. This distribution of PFYCs indicate that in almost all circumstances—whether or not known

paleontological resources are present—new or expanded conservation designations elements would serve to protect geologic units that are potentially fossil-yielding.

Under Alternative 2, the following scientific values associated with paleontological and geologic resources would be added or increased within NLCS lands (but would not be included under the Preferred Alternative):

- Paleontological values associated with the Coyote Mountains would be added in Alternative 2. The Coyote Mountains are a nationally significant fossil site where a 50-million-year record of geologic history is exposed, particularly the fossil-bearing Imperial Formation. This small mountain range has been famous for paleontological collecting and research since the nineteenth century. Fossils are predominantly marine invertebrates such as coral, mollusks, and gastropods; however vertebrate species are also represented by shark teeth and portions of a whale. The visibility of these resources, coupled with dramatic geology and spectacular scenic landforms, have made this area famous for paleontologists, students, photographers, and other visitors.
- Areas of paleontological values included in National Conservation Lands would increase in Rainbow Basin and slightly increase in the Manix area.

However, the paleontological resources within these areas would continue to be protected in accordance with current policy, and there would be no DFAs proposed in these areas.

Expansion or designation of new ACECs, SRMAs, and NSHT management corridors, to the extent that they allow an increase in public accessibility and new expanded open OHV areas, could result in adverse impacts to paleontological resources at the ground surface (no subsurface impacts). These would have the same effects as described under the No Action Alternative. Only the location and extent of SRMAs would change. Unit-specific SRMA Special Unit Management Plans are in Appendix L, and the CMAs specific to lands managed to protect wilderness characteristics are provided as part of the Volume II descriptions of the DRECP alternatives.

IV.10.3.4.3 Impacts Outside of DRECP Area

IV.10.3.4.5.1 Impacts of Transmission Outside of DRECP Area

The impacts of Outside of DRECP area transmission on paleontological resources would be the same under all alternatives. These impacts are as described for the No Action Alternative in Section IV.10.3.1.5.1.

IV.10.3.4.5.2 Impacts of BLM LUPA Decisions Outside of DRECP Area

Under the proposed BLM LUPA, the only changes outside the area would be the designation of NLCS lands, ACECs, and NSHT management corridors, and Visual Resource Management Classes and new land allocations to replace multiple use classes on CDCA lands. The nature and intensity of impacts on paleontological resources would be the same as those described in Section IV.10.3.1.5.2, though generally the impacts are limited to beneficial impacts associated with designation of NLCS lands, ACECs, and NSHT management corridors.

IV.10.3.4.4 Comparison of Alternative 2 with Preferred Alternative

Chapter IV.27 presents a comparison of all action alternatives and the No Action Alternative across all disciplines. This section summarizes the comparison of Alternative 2 with the Preferred Alternative.

As shown in Exhibit IV.10-1, estimated footprint impacts under Alternative 2 would be almost twice those under the Preferred Alternative. In addition, Alternative 2 would have well more than twice the amount of DFAs underlain by geologic units with an HVH PFYC. On the other hand, BLM LUPA Conservation Designation lands under Alternative 2 would place a greater emphasis on NLCS lands and a lesser emphasis on ACECs and wildlife allocations than would the Preferred Alternative. This may result in slightly greater beneficial impacts compared with the Preferred Alternative since areas of national-level resource values would receive the strongest protection. However, this distinction results in a relatively minor difference in paleontological resource impacts, since ACECs and wildlife allocations are also protective of paleontological resources.

Though the overarching analyses and conclusions under both alternatives with respect to paleontological resource impacts are the same, there would be a greater potential to impact paleontological resources under Alternative 2 because the geographic placement of DFAs is less favorable from a paleontological resources perspective.

IV.10.3.5 Alternative 3

The impact analysis for paleontological resources under Alternative 3 is provided in the following sections.

IV.10.3.5.1 Impacts of Renewable Energy and Transmission Development

This section provides the assessment of impacts of implementing the DRECP for Alternative 3. This assessment addresses the impacts from renewable energy and transmission development and impacts of the conservation designations. On BLM lands under LUPA, Alternative 3 includes DFAs (211,000 acres) and transmission corridors

where approximately 69,000 acres of ground disturbance impacts and operations impacts would occur.

Impact PR-1: Land disturbance could result in loss, damage, or destruction of significant paleontological resources.

The nature and intensity of paleontological resource impacts on BLM lands in Alternative 3 would be the same as described in the analysis of typical impacts. Under the LUPA, renewable energy development on BLM lands in DFAs would be streamlined (i.e., permitted faster and with fewer steps). However, the speed or timing of renewable energy development ultimately does not affect the magnitude of potential paleontological impacts.

Table R2.10-5 presents the estimated BLM LUPA paleontological resource impacts by ecoregion subarea. The estimated footprint impacts shown in Table R2.10-5 do not include the disturbance that could occur as a result of renewable energy transmission outside of the DFAs. However, the potential transmission corridors—while not located precisely—can roughly be expected to be underlain by geologic units with a PFYC distribution similar to that within the conceptual energy corridors. The distribution of PFYCs within conceptual energy corridors is 6%, 85%, and 9% for LVL, MU, and HVH, respectively. With respect to DFAs, the Imperial Borrego Valley ecoregion subarea would experience the greatest impacts, with an estimated 17,000 acres of potential land disturbance, 13% (2,000 acres) of which is within an HVH PFYC. The Cadiz Valley and Chocolate Mountains ecoregion subarea would experience the next highest level of footprint impact, with 8,000 acres of potential footprint impacts within DFAs, 31% of which (3,000 acres) is within an HVH PFYC. Although the Imperial Borrego Valley ecoregion subarea has a greater extent of estimated footprint impacts in this alternative, the Cadiz Valley and Chocolate Mountains ecoregion subarea would have the greatest impact to HVH PFYCs.

The mix of renewable energy technology on BLM-administered land under Alternative 3 would be focused more on solar and geothermal, with the types of impacts as described in the discussion of impacts typical to all alternatives (see Section IV.10.2.1).

Impact PR-2: Construction and operations activities could increase the rate of erosion or alter drainage patterns removing significant paleontological resources from their context.

The nature and intensity of paleontological resource impacts on BLM lands of existing BLM land use plans in Alternative 3 would be the same as described in the analysis of typical impacts (see Section IV.10.2.1). The mix of renewable energy technology on BLM-administered land under Alternative 3 would be focused more on solar and

geothermal, where the types of impacts would be similar to those typical to all alternatives (see Section IV.10.2.1).

Impact PR-3: Increased human access to significant paleontological resources could result in unauthorized collection or vandalism.

The nature and intensity of paleontological resource impacts on BLM lands under existing BLM land use plans in Alternative 3 would be the same as described in the analysis of typical impacts (see Section IV.10.2.1). The mix of renewable energy technology on BLM-administered land under Alternative 3 would be focused more on solar and geothermal, with the types of impacts being similar to those described a typical to all alternatives (see Section IV.10.2.1).

Impacts of Variance Process Lands

Variance Process Lands are neither reserve lands nor DFAs; they are a subset of the variance lands identified in the Solar PEIS ROD and additional lands that, based on current information, have moderate to low ecological value and ambiguous value for renewable energy. If renewable energy development occurs on Variance Process Lands, a BLM LUPA would not be required so the environmental review process would be somewhat simpler than if the location were left undesignated. Variance Process Lands for each alternative are included and located as shown in Chapter IV.1, Table IV.1-2 and in Volume II, Figure II.6-1 for Alternative 3. Development of renewable generation projects on Variance Process Lands would affect paleontological resources in a similar manner as would development within DFAs.

Impact Reduction Strategies

Plan implementation would result in conservation of some desert lands as well as the development of renewable energy generation and transmission facilities on other lands. There are two ways in which the impacts of the renewable energy development covered by the Plan would be lessened. First, the Plan incorporates CMAs for each alternative, including specific biological conservation designations components and LUPA components. Second, the implementation of existing laws, orders, regulations, and standards would reduce the impacts of project development.

Conservation and Management Actions

The conservation strategy for Alternative 1 (presented in Volume II, Section II.3.1.1) defines specific actions that would reduce the impacts of this alternative. The conservation strategy includes definition of the conservation designations and specific CMAs for the Preferred Alternative.

The CMAs applicable to paleontological resources listed under the Preferred Alternative, and which would apply to this alternative, include: (1) the paleontology CMAs (LUPA-PALEO-1 through LUPA-PALEO-2); (2) worker education (LUPA-BIO-5); (3) standard practices for siting and design (LUPA-BIO-13); (4) resource setback standards (LUPA-BIO-3); (5) standard practices for soil and water resources (LUPA-SW-6 through LUPA-SW-11); and (6) standard practices for *water and wetland dependent species resources* (LUPA-BIO-9).

Laws and Regulations

Similar to the No Action Alternative, existing laws and regulations will reduce certain impacts of DRECP implementation. Relevant regulations are presented in the Regulatory Setting in Volume III. The requirements of relevant laws and regulations are summarized for the No Action Alternative in Section IV.10.3.1.1.1. There are no other laws or regulations that would uniquely apply to this alternative.

The conservation strategy for Alternative 3 (presented in Volume II, Section II.6.4.2) defines specific actions that would reduce the impacts of this alternative. The conservation strategy includes the definition of the conservation designations and specific CMAs for Alternative 3.

IV.10.3.5.2 Impacts of Ecological and Cultural Conservation and Recreation Designations

Under Alternative 3, the BLM LUPA would designate approximately 5 million acres of BLM LUPA conservation designations. BLM LUPA Conservation Designation lands seek to include both ACECs and NLCS lands, with somewhat greater emphasis on NLCS lands.

Of the conservation designations under Alternative 3, 61% would be NLCS lands, 36% would be ACECs, and 2% would be wildlife allocations. The conservation designations under Alternative 3 emphasizes the protection of Aeolian transport, riparian, and linkage areas in the Cadiz Valley and Chocolate Mountains ecoregion subarea, the US 395 corridor, Fremont Valley, and Ridgecrest, in addition to elements included in alternative-specific conservation designations for the Preferred Alternative.

To the extent that Conservation Designations are newly established or expanded (i.e., beyond existing protected areas), such BLM land designations would be considered a beneficial impact on paleontological resources because renewable energy development would be precluded in these areas and because efforts to preserve wildlife, habitat, and ecologic values would likewise serve to protect paleontological resources.

Under Alternative 3, the following scientific values associated with paleontological and geologic resources would be added or increased within NLCS lands (but would not be included under the Preferred Alternative):

- Research opportunities and other scientific values in the Fish Lake, Deep Springs, and Eureka valleys, and at the Trona Pinnacles, would not be included.
- National Conservation Lands would not include the paleontological values of Rainbow Basin or the Manix area.

However, the paleontological resources within these areas would continue to be protected in accordance with current policy, and there would be no DFAs proposed in these areas.

Expansion or designation of new ACECs, SRMAs, and NSHT management corridors, to the extent that they allow an increase in public accessibility or new expanded open OHV areas, could adversely impact paleontological resources at the ground surface (no subsurface impacts). These would have the same effects as described under the No Action Alternative. Only the location and extent of SRMAs would change. Unit-specific SRMA Special Unit Management Plans are provided in Appendix L and the CMAs specific to lands managed to protect wilderness characteristics are provided as part of the Volume II descriptions of the alternatives.

IV.10.3.5.3 Impacts of Transmission Outside of DRECP Area

The impacts of transmission on paleontological resources would be the same under all alternatives. These impacts are as described for the No Action Alternative in Section IV.10.3.1.3.

IV.10.3.5.4 Comparison of Alternative 3 with Preferred Alternative

Chapter IV.27 presents a comparison of all action alternatives and the No Action Alternative across all disciplines. This section summarizes the comparison of Alternative 3 with the Preferred Alternative.

As shown in Exhibit IV.10-1, estimated footprint impacts under Alternative 3 would be approximately 10,000 acres fewer than under the Preferred Alternative. Additionally, Alternative 3 would include less area underlain by geologic units with an HVH PFYC (in both absolute and relative terms). BLM LUPA Conservation Designation lands under Alternative 3 would roughly achieve the same result as the Preferred Alternative and thus have roughly equivalent impacts and benefits with respect to paleontological resources. Although the overarching analyses and conclusions under both alternatives with respect to

paleontological resource impacts are the same, there would be slightly less potential to impact paleontological resources on LUPA lands under Alternative 3.

IV.10.3.6 Alternative 4

The following sections provide the assessment of impacts of renewable energy and transmission development for Alternative 4. Alternative 4 includes DFAs (258,000 acres) and transmission corridors where approximately 50,000 acres of ground disturbance impacts and operations impacts would occur.

IV.10.3.6.1 Impacts of Renewable Energy and Transmission Development

This section provides the assessment of impacts of implementing the LUPA for Alternative 4.

Impact PR-1: Land disturbance could result in loss, damage, or destruction of significant paleontological resources.

The nature and intensity of paleontological resource impacts on BLM lands under existing BLM land use plans in Alternative 4 would be the same as described in the analysis of typical impacts. Under the LUPA, renewable energy development on BLM lands in DFAs would be streamlined (i.e., permitted faster and with fewer steps). However, the speed or timing of renewable energy development ultimately does not affect the magnitude of potential paleontological impacts.

Table R2.10-6 presents the estimated BLM LUPA paleontological resource impacts by ecoregion subarea. The estimated footprint impacts shown in Table R2.10-6 do not include the disturbance that could occur as a result of renewable energy transmission outside of the DFAs. However, the potential transmission corridors—while not located precisely—can roughly be expected to be underlain by geologic units with a PFYC distribution similar to that within the conceptual energy corridors. The distribution of PFYCs within conceptual energy corridors is 5%, 80%, and 15% for LVL, MU, and HVH, respectively. With respect to DFAs, the Cadiz Valley and Chocolate Mountains ecoregion subarea would experience the greatest impacts, with an estimated 30,000 acres of potential land disturbance, 25% (8,000 acres) of which is within an HVH PFYC. The Imperial Borrego Valley ecoregion subarea would experience the next highest level of footprint impact, with 6,000 acres of potential footprint impacts within DFAs, 13% of which (700 acres) is within an HVH PFYC. The mix of renewable energy technology on BLM-administered land under Alternative 4 would be focused more on solar and geothermal, with the types of impacts as described in the discussion of impacts typical to all alternatives (see Section IV.10.2).

Impact PR-2: Construction and operations activities could increase the rate of erosion or alter drainage patterns removing significant paleontological resources from their context.

The nature and intensity of paleontological resource impacts on BLM lands under existing BLM land use plans in Alternative 4 would be the same as described in the analysis of typical impacts (see Section IV.10.2) The mix of renewable energy technology on BLM-administered land under Alternative 4 would be focused more on solar and geothermal.

Impact PR-3: Increased human access to significant paleontological resources could result in unauthorized collection or vandalism.

The nature and intensity of paleontological resource impacts on BLM lands in Alternative 4 would be the same as described in the analysis of typical impacts (see Section IV.10.3.2). The mix of renewable energy technology on BLM-administered land under Alternative 4 would be focused more on solar and geothermal, with the types of impacts being as described in the discussion of impacts typical to all alternatives (see Section IV.10.2.1).

Impacts of Variance Process Lands

Variance Process Lands are neither reserve lands nor DFAs; they are a subset of the variance lands identified in the Solar PEIS ROD and additional lands that, based on current information, have moderate to low ecological value and ambiguous value for renewable energy. If renewable energy development occurs on Variance Process Lands, a BLM LUPA would not be required so the environmental review process would be somewhat simpler than if the location were left undesignated. Variance Process Lands for each alternative are included and located as shown in Chapter IV.1, Table IV.1-2, and in Volume II, Figure II.7-1 for Alternative 4. Development of renewable generation projects on Variance Process Lands would affect paleontological resources in a similar manner as would development within DFAs.

Impact Reduction Strategies

Plan implementation would result in conservation of some desert lands as well as the development of renewable energy generation and transmission facilities on other lands. There are two ways in which the impacts of the renewable energy development would be lessened. First, the Plan incorporates CMAs for each alternative, including specific biological conservation designations components and LUPA components. Second, the implementation of existing laws, orders, regulations, and standards would reduce the impacts of project development.

Conservation and Management Actions

The conservation strategy for Alternative 4 (presented in Volume II, Section II.3.1.1) defines specific actions that would reduce the impacts of this alternative. The conservation strategy includes definition of the conservation designations and specific CMAs for the Preferred Alternative.

The CMAs applicable to paleontological resources listed under the Preferred Alternative, which would apply to this alternative, include: (1) the paleontology CMAs (LUPA-PALEO-1 through LUPA-PALEO-2), (2) worker education (LUPA-BIO-5), (3) standard practices for siting and design (LUPA-BIO-13), (4) resource setback standards (LUPA-BIO-3), 5) standard practices for soil and water resources (LUPA-SW-6 through LUPA-SW-11), and (6) standard practices for *water and wetland dependent species resources* (LUPA-BIO-9).

Laws and Regulations

Similar to the No Action Alternative, existing laws and regulations will reduce certain impacts of Plan implementation. Relevant regulations are presented in the Regulatory Setting in Volume III. The requirements of relevant laws and regulations are summarized for the No Action Alternative in Section IV.10.3.1.1.1. There are no other laws or regulations that would uniquely apply to this alternative.

IV.10.3.6.2 Impacts of Ecological and Cultural Conservation and Recreation Designations

The BLM LUPA would establish Conservation Designations on BLM-administered lands under each alternative that would conserve biological resources, including NLCS lands, ACECs, and wildlife allocations. On BLM-administered lands under Alternative 4, the BLM LUPA would designate approximately 4,431,000 acres of BLM LUPA Conservation Designations.

To the extent that Conservation Designations are newly established or expanded (i.e., beyond existing protected areas), such BLM land designations would be considered a beneficial impact on paleontological resources because renewable energy development would be precluded in these areas and because efforts to preserve wildlife, habitat, and ecologic values would likewise serve to protect paleontological resources. The distribution of PFYCs is 28%, 53%, and 18% for LVL, MU, and HVH, respectively. This distribution of PFYCs indicates that in almost all circumstances—whether or not known paleontological resources are present—new or expanded conservation designations elements would serve to protect geologic units that are potentially fossil-yielding.

Scientific values of National Conservation Lands in Alternative 4 would include the paleontological values of Rainbow Basin, and not those of the Manix area, as compared

with Preferred Alternative. However, the paleontological resources within these areas would continue to be protected in accordance with current policy, and there would be no DFAs proposed in these areas.

Expansion or designation of new ACECs, SRMAs, and NSHT management corridors, to the extent that they allow an increase in public accessibility or new expanded open OHV areas, could adversely impact paleontological resources at the ground surface (no subsurface impacts). These would have the same effects as described under the No Action Alternative. Only the location and extent of SRMAs would change. Unit-specific SRMA Special Unit Management Plans are in Appendix L, and the CMAs specific to lands managed to protect wilderness characteristics are provided as part of the Volume II descriptions of the DRECP alternatives.

IV.10.3.6.3 Impacts of Transmission Outside of DRECP Area

The impacts of transmission on paleontological resources would be the same under all alternatives. These impacts are as described for the No Action Alternative in Section IV.10.3.1.5.1.

IV.10.3.6.4 Comparison of Alternative 4 with Preferred Alternative

Chapter IV.27 presents a comparison of all action alternatives and the No Action Alternative across all disciplines. This section summarizes the comparison of Alternative 4 with the Preferred Alternative.

IV.10.3.6.5 Alternative 4 Compared with Preferred Alternative

As shown in Exhibit IV.10-1, estimated footprint impacts under Alternative 4 would be about 12,000 acres greater than under the Preferred Alternative. In addition, Alternative 4 would include a slightly greater area underlain by geologic units with an HVH PFYC (in both absolute and relative terms). Though the overarching analyses and conclusions under both alternatives with respect to paleontological resource impacts are the same, there would be a somewhat greater potential to impact paleontological resources on LUPA lands under the Preferred Alternative.