

5.0 CONSERVATION PROGRAM

5.1 *Biological Goals and Objectives*

Section 10(a)(2)(A) of the Endangered Species Act requires that an HCP specify the measures that the permittee will take to minimize and mitigate to the maximum extent practicable the impacts of the taking of any federally listed animal species as a result of activities addressed by the plan. As part of the “Five Point” Policy adopted by the USFWS in 2000, HCPs must also establish biological goals and objectives (65 FR 35242) to ensure that the operating conservation program in the HCP is consistent with the conservation and recovery goals established for the species. These goals are developed based upon the species’ biology, threats to the species, the potential effects of the Covered Activities, and the scope of the HCP. The five-point policy also requires that monitoring be conducted to determine the effects of the HCP on the Covered Species, and the effectiveness of the HCP in minimizing and mitigating the adverse effects on the species; and to determine if compliance with the terms and conditions of the HCP are being met. This Chapter defines the MSHCP’s goals and objectives and identifies actions that will be taken to meet those goals and objectives. Chapter 6 describes the monitoring efforts that will be conducted, and describes performance and success criteria.

Biological goals and objectives are defined by the USFWS (65 FR 35242) as:

- Biological goals are “the broad guiding principles for the operating conservation program; they are the rationale behind the minimization and mitigation strategies”;
- Biological objectives are “the measurable targets for achieving the biological goals”.

The goals and objectives developed for each of the Covered Species are similar, as are the rationale for their importance as part of the conservation strategy. The Project’s primary biological goals are to preserve Covered Species and provide Covered Species habitat within the Permit Area by:

1. Increasing the ability of San Joaquin kit fox to disperse through the Permit Area and providing habitat within the region;
2. Preserving existing populations of the Tipton kangaroo rat within the Permit Area and, providing habitat for the Tipton kangaroo rat within the Permit Area;
3. Preserving existing populations of the Nelson’s antelope squirrel within the Permit Area and providing habitat for the Nelson’s antelope squirrel within the Permit Area
4. Preserving existing populations of the western burrowing owl within the Permit Area and, providing habitat for the western burrowing owl within the Permit Area
5. Providing habitat for the blunt-nosed leopard lizard within the Permit Area.

5.2 Species Specific Goals and Objectives

5.2.1 SAN JOAQUIN KIT FOX

Goals

The primary goals for the San Joaquin kit fox are to:

1. Minimize the impact of the Project on the ability of San Joaquin kit fox to disperse through the Permit Area and region; and
2. Provide habitat within the Permit Area.

Measurable Objectives

The measurable objectives to support meeting the above goals are:

1. Provide permeable perimeter security fencing around each of the seven Solar Sites that will allow the San Joaquin kit fox to move onto and through the solar development areas. A total of approximately 165,273 linear feet of permeable security fencing will be installed (also see Chapter 2, Section 2.3.1, Table 2-3 and Figure 2-3).
2. Provide Movement Corridors in strategic locations that abut four Solar Sites to facilitate the movement of San Joaquin kit foxes within and among the Solar Sites.
 - Four Movement Corridors, each 50 feet wide, will be placed along Solar Sites 2-S, 3-S, 4-S, and 7-S (designated as Movement Corridors 2-M, 3-M, 4-M, and 7-M; see Appendix B). These Movement Corridors total 33.8 acres (also see Chapter 2, Section 2.2, Table 2-1 and Figure 2-1). These Movement Corridors are currently in a disked state and provide little habitat value for foxes because of a lack of vegetation, a lack of prey availability, and a lack of escape cover. The lack of escape cover reduces the potential for foxes to avoid predation and successfully move across these lands.
 - The Movement Corridors will be enhanced to provide habitat for the San Joaquin kit fox by installing 44 artificial kit fox dens within the four Movement Corridors (10 per linear mile) as escape cover. One in ten dens will be of a natal den (or pupping den) design, while the remainder will be of the more simple escape den design. The artificial dens will be constructed following standardized configurations (Appendix D); i.e., simple artificial dens will be constructed with a main chamber and two associated entrance culverts that provide access to the surface. The natal artificial den will be constructed with a main chamber, secondary chambers, and several associated entrance culverts that provide access to the surface.
 - Habitat within the Movement Corridors will be enhanced by providing vegetation and topographic relief as described in Section 5.3, below, and in Appendix C.

3. Provide San Joaquin kit fox dispersal habitat near the Solar Sites and in the Permit Area, and enhance the dispersal habitat to facilitate kit fox movements.
 - Conservation Sites 1-C, 3-C, and 3-C2 are situated near and among six of the seven Solar Sites and will provide a total of 889.9 acres of dispersal habitat (1-C = 656.6 acres, 3-C = 80.4 acres, and 3-C2 = 152.9 acres) around the developed Solar Sites (also see Chapter 2, Section 2.2, Table 2-1, and Figure 2-2).
 - Additional dispersal habitat will be provided in strategic areas within the region, including near an existing San Joaquin kit fox movement corridor located along the California Aqueduct easement, and near the Wind Wolves Preserve near the Transverse Range, south of the Project. The Wind Wolves Preserve and surrounding lands are located within an east-west linkage corridor (see Appendix H) that is identified as essential to the recovery of the San Joaquin kit fox in the recovery plan for this species (USFWS 1998, 2010). The conservation lands along the California Aqueduct will enlarge that corridor by 356.8 acres (9-C = 180.6 acres and 10-C = 176.2 acres), and the conservation lands along the southern east-west linkage corridor along the Transverse Range will provide 647.7 acres of San Joaquin kit fox dispersal habitat (Site 17-C). Thus a total of 1,894.4 acres of dispersal habitat will be provided during the operational period of the solar project (also see Chapter 2, Section 2.2, Table 2-1; and Section 2.3 and Figure 2-2).
 - Enhancements to these lands will include installing 96 artificial kit fox dens (one per 20 acres within the 1,894.4 acres of Conservation Sites) that can be used by foxes. The dens will provide escape cover and reduce the potential for predation on dispersing San Joaquin kit foxes. One in ten dens will be of a natal den (or pupping den) design, while the remainder will be of the more simple escape den design. The artificial dens shall be constructed following standardized configurations (Appendix D); i.e., simple artificial dens will be constructed with a main chamber and two associated entrance culverts that provide access to the surface. The artificial natal den will be constructed with a main chamber, secondary chambers, and several associated entrance culverts that provide access to the surface.
 - Prior to the start of construction, conservation easements shall be recorded on the Solar Sites, and upon decommissioning of the Project, the Solar Sites will be managed in perpetuity for the benefit of Covered Species, resulting in a total of 5,692.6 acres of land that will be conserved in perpetuity and contribute to San Joaquin kit fox dispersal. The enhancement and management of these lands are presented in Sections 5.3 and 5.4, below, and in Appendix C.
4. Provide habitat to increase the likelihood of the San Joaquin kit fox breeding within the Permit Area.
 - A total of 1,894.4 acres of habitat that is or will become suitable to support breeding populations of the San Joaquin kit fox will be provided during the construction and operations and maintenance phases of the project. Two of the Conservation Sites totaling

approximately 828.3 acres provide existing lands that are suitable to support breeding of San Joaquin kit fox (Sites 9-C = 180.6 acres and 17-C = 647.7 acres). Both of these Conservation Sites are located contiguous to lands that are known to support San Joaquin kit foxes. The remaining Conservation Sites, totaling 1,066.1 acres, are not currently suitable for breeding San Joaquin kit foxes. These lands will be enhanced to increase their value to the San Joaquin kit fox and foster breeding during the operations and maintenance phase of the Project. Enhancements to these lands will include installing 96 artificial kit fox dens (one per 20 acres within the 1,894.4 acres of Conservation Sites) that can be used by foxes. Vegetation will be restored by the cessation of disking and by planting naturalized vegetation to increase prey availability and provide cover. The enhancement and management of these lands are presented in Sections 5.3 and 5.4, below, and in Appendix C. Upon decommissioning of the Solar Sites, conservation acreage would be increased to 5,692.6 acres. This acreage will be conserved in perpetuity, and enhanced and managed for the San Joaquin kit fox.

Success Criteria

- Having established 165,273 linear feet of permeable fencing around conservation easements to protect the land in perpetuity.
- Having established Movement Corridors for the benefit of San Joaquin kit fox on 33.8 acres of land and 44 artificial dens within the Movements Corridors.
- Having established conservation easements for the benefit of San Joaquin kit fox on 1,894.4 acres of land, prior to construction activities and “phased” to coincide with construction (see Chapter 8, Section 8.2).
- Having established conservation easements for the benefit of San Joaquin kit fox on a total of 5,692.6 acres of land within the Maricopa Sun Solar Complex.

5.2.2 TIPTON KANGAROO RAT

Goals

The primary goals for the Tipton kangaroo rat are to:

1. Preserve existing populations of the Tipton kangaroo rat within the Permit Area; and
2. Provide habitat for the Tipton kangaroo rat within the Permit Area.

Measurable Objectives

The measurable objectives to support meeting the above goals are:

1. Preserve existing populations of the Tipton kangaroo rat within the Permit Area.

- The Tipton kangaroo rat is known to occur on a total of 837.2 acres of land within the Permit Area (1-C = 656.5 acres and 9-C = 180.6 acres, occupied Tipton kangaroo rat habitat). These lands will be placed into a conservation easement and managed in perpetuity for this species. Management of these lands is provided in Appendix C.

2. Provide habitat for Tipton kangaroo rats within the Permit Area.

- The Tipton kangaroo rat currently exists on 837.2 acres of land within the Permit Area. These lands will not be impacted by the project, and will be set aside and managed in perpetuity for this species. Additional lands totaling 233.3 acres of Permit Area lands (Site 3-C = 80.4 acres, Site 3-C2 = 152.9 acres) are within the range of the Tipton kangaroo rat and have the potential to be occupied by this species. Enhancements will occur on these lands to increase the lands' suitability to support the Tipton kangaroo rat within the Permit Area. Habitat will be restored by the cessation of disking and, if needed, planting naturalized vegetation. The enhancement and management of these lands are presented in Sections 5.3 and 5.4 below and in Appendix C.
- Prior to the start of construction, conservation easements shall be recorded on the Solar Sites, and upon decommissioning, all Solar Sites, totaling 3,798.2 acres, will be managed in perpetuity for the Tipton kangaroo rat. Thus, the Project will result in a total of 4,868.7 acres of habitat being placed into conservation easements and managed in perpetuity for this species.
- Portions of Conservation Site 1-C, all of Site 3-C, and all of Site 3-C2 are within a flood-prone area (Figure 10 in Appendix G). Topographic relief will be created on sites 1-C, 3-C, and 3-C2 to increase the potential for these sites to support Covered Species, including the Tipton kangaroo rat, during periods of flooding.
- Topographic relief will be created within the 187.6 acres of flood prone area of Site 1-C and on the 80.4 acres of Sites 3-C at a rate of 10 percent coverage. This will result in a total disturbance area of 26.8 acres. The topographic relief will consist of shallow depressions, approximately one foot deep, and areas that will be elevated approximately six inches above grade to provide refugia for small mammals during periods of flooding and create burrowing opportunities.

Topographic relief will be created on Conservation Site 3-C2. However, because a large portion of this site is exhibiting substantial vegetative recovery after the cessation of disking several years ago, judicious placement of relief will be necessary to avoid undue disturbance. Topographic relief placement will avoid small mammal burrows, burrowing owl burrows, and diversely vegetated areas. Areas that will be enhanced with topographic relief are large patches of bare ground and areas of vegetation that support very few species, which are weedy (e.g., large expanses of this site support only London rocket). A total of 15.3 acres of topographic relief will be installed within Site 3-C2.

Topographic relief on all 42.1 acres will be created using scrapers, loaders, or other heavy equipment. All installations of relief will be monitored by the Project lead biologist to ensure that all sensitive biological resources are avoided.

No topographic relief will be created within Site 17-C or the lower portion of Site 9-C, which, having never been actively farmed or tilled, are both in a relatively natural state with native vegetation. The installation of topographic relief would cause unnecessary disturbance to existing habitat.

Success Criteria

- Having preserved 837.2 acres of currently occupied lands as conservation easements for the benefit of Tipton kangaroo rats prior to construction activities and “phased” to coincide with construction (see Chapter 8, Section 8.2).
- Having established conservation easements for the benefit of Tipton kangaroo rats on 233.3 acres of currently unoccupied lands, prior to construction activities and “phased” to coincide with construction (see Chapter 8, Section 8.2).
- Having established a total of 4,868.7 acres of conservation easements for the benefit of Tipton kangaroo rats within the Maricopa Sun Solar Complex.
- Having established 42.1 acres of topographic relief on flood prone lands within one year of establishing a conservation easement.

5.2.3 NELSON’S ANTELOPE SQUIRREL

Goals

The primary goals for the Nelson’s antelope squirrel are to:

1. Preserve existing populations of the Nelson’s antelope squirrel within the Permit Area; and
2. Provide habitat for the Nelson’s antelope squirrel within the Permit Area.

Measurable Objectives

The measurable objectives to support meeting the above goals are:

1. Preserve existing populations of the Nelson’s antelope squirrel within the Permit Area.
 - The Nelson’s antelope squirrel is known to occur within the Permit Area only on Conservation Site 9-C (180.6 acres), which contains saltbush scrub habitat. These lands will be placed into a conservation easement and managed in perpetuity for this species. The enhancement and management of these lands are summarized in Section 5.3 and 5.4 below and in Appendix C.

2. Provide habitat for Nelson’s antelope squirrel within the Permit Area.

- The Nelson’s antelope squirrel was observed adjacent to Conservation Sites 1-C (656.6 acres), and 10-C (176.2 acres), and may also be present on Site 17-C (647.7 acres), although the latter has not been confirmed. These lands, totaling 1,480.5 acres, will not be impacted by the project and will be set aside and managed in perpetuity for this species.
- Additional lands totaling 233.3 acres (Site 3-C = 80.4 acres and Site 3-C2 = 152.9 acres) are within the range of the Nelson’s antelope squirrel and have the potential to be occupied by this species. Enhancements will occur on these 233.3 acres of Permit Area lands to increase their suitability for the Nelson’s antelope squirrel in the Permit Area. Habitat will be restored through the cessation of disking and, if needed, planting naturalized vegetation. The enhancement and management of these lands are presented in Section 5.3 and 5.4 below, and in Appendix C.
- Prior to the start of construction, conservation easements shall be recorded on the Solar Sites, and upon decommissioning, all Solar Sites, totaling 3,798.2 acres, will be managed in perpetuity for this species. Thus the project will result in 5,692.6 acres of habitat being placed into conservation easements and managed in perpetuity for this species.

Success Criteria

- Having preserved 180.6 acres of known Nelson’s antelope squirrel habitat as a permanent conservation easement, prior to construction activities and “phased” to coincide with construction (see Chapter 8, Section 8.2).
- Having established conservation easements on 1,713.8 acres of currently unoccupied lands within the known range of Nelson’s antelope squirrel. These lands will be placed into conservation easements prior to construction activities and “phased” to coincide with construction (see Chapter 8, Section 8.2).
- Having established a total of 5,692.6 acres of conservation easements for the benefit of Nelson’s antelope squirrel within the Maricopa Sun Solar Complex.

5.2.4 WESTERN BURROWING OWL

Goals

The primary goals for the western burrowing owl are to:

1. Preserve existing populations of the western burrowing owl within the Permit Area; and
2. Provide and enhance habitat for the western burrowing owl within the Permit Area.

Measurable Objectives

The measurable objectives to support meeting the above goals are:

1. Preserve existing populations of the western burrowing owl within the Permit Area.
 - The western burrowing owl is known to occur within the Permit Area on Solar Sites 3-S, 6-S, and 7-S, and on Conservation Sites 3-C2 and 9-C. Western burrowing owls were also observed adjacent to Solar Sites 2-S, 5-S, and 15-S and Conservation Sites 1-C, 3-C, and 10-C. Site 17-C appears to contain suitable habitat for the western burrowing owl, but none have been observed on the site. Western burrowing owls occurring on the Solar Sites are foragers and transients and do not breed on those sites, as evidenced by a lack of owl burrows on those lands. Sign does exist that the western burrowing owl forages and burrows on Conservation Sites 3-C2 and 9-C. The 152.9-acre Conservation Site 3-C2 and the 180.6-acre Conservation Site 9-C will be placed into a conservation easement and managed in perpetuity for this species, resulting in a total of 333.5 acres of existing habitat preserved for the species. The enhancement and management of these lands are summarized in Sections 5.3 and 5.4, below, and in Appendix C.
2. Provide habitat for western burrowing owls within the Permit Area.
 - In addition to the 333.5 acres of preserved, occupied habitat, conservation lands totaling 1,560.9 acres (Site 1-C = 656.6 acres, Site 3-C = 80.4 acres, Site 10-C = 176.2 acres, and Site 17-C = 647.7 acres) have the potential to provide habitat for this species and will be preserved in perpetuity. Enhancements will occur on the 1,894.4 acres of Conservation Site lands for the western burrowing owl in the Permit Area. Habitat will be restored by the cessation of disking and, if needed, planting naturalized vegetation. The enhancement and management of these lands are presented in Sections 5.3 and 5.4, below, and in Appendix C.
 - Perching posts constructed from T-posts will be provided at a rate of one per 20 acres within Conservation Areas. A 2-foot-long section of T-post will be welded to the top of each T-post, at a right angle to the main post, to provide a suitable perching surface. Dens constructed for use by kit fox will serve the dual purpose of also providing denning opportunities for the western burrowing owl. The number and placement of artificial dens installed for kit fox will coincide with the placement of 25 percent of perching posts to encourage western burrowing owls to use artificial dens.
 - The 33.8 acres of Movement Corridors located along the borders of Solar Sites 2-S, 3-S, 4-S, and 7-S will be enhanced and managed for western burrowing owls. Habitat will be restored by the cessation of disking, and if needed, planting natural vegetation. The enhancement and management of these lands are presented in Sections 5.3 and 5.4, below, and in Appendix C.

T-posts will be driven into the top of earthen berms at a rate of eight per mile along Movement Corridors. T-post design and installation will be as described above for Conservation Areas.

- Prior to the start of construction, conservation easements shall be recorded on the Solar Sites, and upon decommissioning, all Solar Sites, totaling 3,798.2 acres, will be managed in perpetuity as conservation lands for western burrowing owls. Thus, the project will result in 5,692.6 acres of habitat for the western burrowing owl, including 647.7 acres of potential habitat (Conservation Site 17-C), being placed into conservation easements and managed in perpetuity for this species.

Success Criteria

- Having preserved 333.5 acres of occupied western burrowing owl habitat as a permanent conservation easement. These lands will be placed into conservation easements prior to construction activities and “phased” to coincide with construction (see Chapter 8, Section 8.2).
- Having established conservation easements on 1,560.9 acres of land not currently occupied, but with the potential to provide foraging and burrowing habitat within the Permit Area. These lands will be placed into conservation easements prior to construction activities and “phased” to coincide with construction (see Chapter 8, Section 8.2).
- Having established one T-post perch per 20 acres of land within one year of conservation easements being established. The installation of these T-posts will be completed using a “phased” approach coinciding with placing the lands into a conservation easement (see Chapter 8, Section 8.2).
- Having established 33.8 acres of Movement Corridors as conservation easements with eight T-post perches per mile.
- Having established a total of 5,692.6 acres of conservation easements for the benefit of western burrowing owls within the Maricopa Sun Solar Complex.

5.2.5 BLUNT-NOSED LEOPARD LIZARD

Goals

The primary goals for the blunt-nosed leopard lizard are to:

1. Preserve existing populations of the blunt-nosed leopard lizard within the Permit Area; and
2. Provide habitat for the blunt-nosed leopard lizard within the Permit Area.

Measurable Objectives

The measurable objectives to support meeting the above goals are:

1. Preserve existing populations of the blunt-nosed leopard lizard within the Permit Area.

- The blunt-nosed leopard lizard is historically known to occur within the Permit Area only on Conservation Site 9-C (180.6 acres), which contains saltbush scrub habitat, and adjacent to Solar Sites 2-S and 3-S. Although the species was not detected on Conservation Site 9-C during project-related surveys, there are numerous records of the blunt-nosed leopard lizard occurring in contiguous habitat, and it is likely that they are present within the native saltbush scrub area of Site 9-C. Similarly, this species may be present on 647.7 acres of Site 17-C based on the presence of natural habitat, although the species presence has not been confirmed. Lands within the Permit Area with the potential to support existing populations of blunt-nosed leopard lizards, totaling 828.3 acres, will be placed into a conservation easement and managed in perpetuity for the species. The enhancement and management of these lands are summarized in Sections 5.3 and 5.4, below, and in Appendix C.

2. Provide habitat for blunt-nosed leopard lizards within the Permit Area.

- Based on the presence of natural habitat, the blunt-nosed leopard lizard is likely to occur on approximately 828.3 acres of land within the Permit Area. These lands will not be impacted by the project and will be conserved and managed in perpetuity for this species.
- Additional lands totaling 1,066.1 acres (Site 1-C = 656.6 acres, Site 3-C = 80.4 acres, Site 3-C2 = 152.9 acres, and Site 10-C = 176.2 acres) have the potential to be occupied by blunt-nosed leopard lizards once disking ceases and the lands are allowed to become revegetated. Enhancements will occur on the 1,066.1 acres of Permit Area lands. Habitat will be restored by the cessation of disking, and if needed, planting natural vegetation. The enhancement and management of these lands are presented in Sections 5.3 and 5.4, below, and in Appendix C.
- Prior to the start of construction, conservation easements shall be recorded on the Solar Sites, and upon decommissioning, all Solar Sites, totaling 3,798.2 acres, will be managed in perpetuity for this species. Thus, the project will result in 5,692.6 acres of land being placed into conservation easements and managed in perpetuity for this species.

Success Criteria

- Having preserved as permanent conservation easement approximately 828.3 acres of natural habitat currently able to support blunt-nosed leopard lizard populations. These lands will be placed into conservation easements prior to construction activities and “phased” to coincide with construction (see Chapter 8, Section 8.2).
- Having established conservation easements on approximately 1,066.1 acres of land currently unoccupied, but within the known range of blunt-nosed leopard lizards. These lands will be placed into conservation easements prior to construction activities and “phased” to coincide with construction (see Chapter 8, Section 8.2).
- Having established a total of 5,692.6 acres of conservation easements for the benefit of blunt-nosed leopard lizards within the Maricopa Sun Solar Complex.

5.3 Enhancing Vegetation within the Permit Area

Enhancements will be made within the Permit Area to assist in achieving the species specific biological goals and objectives for the Covered Species (Section 5.2). Covered Species occur in a variety of grassland and scrubland habitats. In the southern San Joaquin Valley, the San Joaquin kit fox is commonly associated with Valley Sink Scrub, Valley Saltbush Scrub, Upper Sonoran Subshrub Scrub, and Annual Grassland, both grazed and not grazed. The Tipton kangaroo rat inhabits remnants of their historic range that have one or more species of sparsely scattered woody shrubs, and a ground cover of mostly introduced and native annual grasses and forbs. They occur in terrace grasslands devoid of woody shrubs, with sparse to moderate shrub cover being associated with high density populations. Blunt-nosed leopard lizards inhabit open, sparsely vegetated areas of low relief on the San Joaquin Valley floor. They are most commonly found in the non-native grassland and Valley Sink Scrub communities but are also found in Saltbush Scrub communities with sparse to moderate shrub cover. It has been speculated that 15 to 30 percent bare ground was optimal for leopard lizard habitat and greater than 50 percent was unsuitable (Chesemore 1980). Nelson's antelope squirrel occupies dry flat or gently rolling terrain consisting of sparse grassy or shrubby habitat, including annual grassland and alkali desert scrub. Nelson's antelope squirrel rarely digs its own burrow, relying instead on the burrows of other small mammals. The western burrowing owl is a grassland specialist distributed throughout western North America, primarily in open areas with short vegetation and bare ground in desert, grassland, and shrub-steppe environments (USFWS 2003a). Western burrowing owl nesting habitat consists of open areas with mammal burrows. They use a wide variety of arid and semi-arid environments, with well-drained, level to gently sloping areas characterized by sparse vegetation and bare ground (Haug et al. 1993, Dechant et al. 1999).

In general, all of the Covered Species tend to avoid areas of dense shrubs. Preliminary research indicates that populations of the San Joaquin kangaroo rat (i.e., Tipton kangaroo rat), Nelson's antelope squirrel, and blunt-nosed leopard lizard are affected negatively by thick herbaceous cover (Germano et al. 2001, 2012). Although the Covered Species can occur in a variety of habitats and within a variety of conditions within those habitats, grassland and scrub habitats with less than 20 percent shrub cover, less than 50 percent grass and forb cover, and a relatively low level of residual dry matter (RDM) of 500 to 1,500 lbs per acre is a reasonable target to achieve (Germano et al. 2012). Under the Project MSHCP, the initial planting of vegetation and adaptive management will focus on establishing and managing for these conditions (see Section 5.3).

Vegetative recovery and habitat restoration will be achieved by the cessation of disking. No additional vegetation enhancement will be undertaken unless suitable habitat conditions do not naturally develop. The areas within the Solar Development Footprints will be managed to facilitate the operations and maintenance of the solar facilities and will not be managed in a manner that will enhance the sites for Covered Species. However, upon decommissioning, the areas within the Solar Development Footprints will be enhanced as defined for the Conservation Sites. Movement Corridors and Conservation Sites will be enhanced and managed for the benefit of Covered Species as described below.

Vegetation enhancements will foster the growth and establishment of native vegetation to aide in the recovery of previously disked lands should those lands not recover as rapidly as predicted. Habitat enhancements will be conducted in support of the species specific goals and objectives outlined in Section 5.2, above, and do not have unique goals and objectives. Parameters for the management of the Conservation Areas are provided in Appendix C.

Because disking is currently performed biannually on the Movement Corridors and many of the Conservation Sites, normal ecological function is prohibited. Research has shown that, following complete loss of vegetation (e.g., resulting from fire) in habitat such as exists in the vicinity of the Project, plant and wildlife species begin to recover within two to three years, and can return to pre-disturbance levels within five to seven years (e.g., Germano et al. 2012). Cessation of disking, along with appropriate management of the conservation easements, will allow revegetation, and will provide additional available cover and opportunities for breeding, and increase foraging opportunities for Covered Species. In the event that habitat recovery does not proceed as rapidly as predicted (e.g., due to drought conditions), vegetative enhancement will be performed as outlined below.

5.3.1 ENHANCEMENTS AND IMPROVEMENTS TO THE MOVEMENT CORRIDORS

Movement Corridors will be maintained on four of the Solar Sites (Sites 2-S, 3-S, 4-S, and 7-S) to facilitate regional wildlife movements and provide linear strips of habitat for covered species on those sites. The intent is to provide suitable habitat to reduce the effects of habitat fragmentation on local populations. The 50-foot-wide corridors will be placed along the perimeters of the Solar Sites such that they maintain connectivity between the sites and nearby native habitats.

Movement Corridors will be established along the north perimeter of Site 2-S, the north, east and south perimeters of Site 3-S, the south perimeter of Site 4-S, and the north perimeter of Site 7-S (Figure 2-1 in Chapter 2). Project-related ground disturbance will not occur within any of the Movement Corridors; however, conservation measures will require substantial ground disturbance during the creation of berms, installation of dens and perches, and the implementation of other conservation measures. For the most part, these areas are disked. Therefore, no vegetation will be disturbed during conservation activities.

Enhancement of vegetative communities within the Movement Corridors (Sites 2-M, 3-M, 4-M and 7-M) will be done through active and passive strategies. There is sufficient evidence (e.g., Germano et al. 2012) to suggest that, when disking is discontinued, the Movement Corridors will naturally revegetate with a variety of native species, including alkali seepweed (*Sueada* sp.), saltbush (*Atriplex* sp.), cheeseweed (*Isocoma acradenia*), and a variety of native and non-native annuals. However, seeding may be required to establish native vegetation along some Movement Corridors if they have not revegetated on their own within three growing seasons. Given that remnant patches of representative plant species of Valley Saltbush Scrub and Alkali Sink habitat are present on some of the Solar Sites and in the surrounding vicinity, a seed palette for revegetation efforts will include native annual and perennial species that are known to occur in these habitat types. The seed palette for restoration efforts will include a minimum of five species selected from Table 5-1, with at least one being a shrub species. Other species may be

substituted with the recommendation of a restoration botanist and with the approval of the USFWS.

Table 5-1
Seed Palette for Restoration Efforts
Maricopa Sun Solar Complex, Kern County, California

Forb and Grass Species	Shrub Species
<i>Common spikeweed (Hemizonia pungens)</i>	Seepweed (<i>Sueada moquinii</i>)
<i>Alkali goldfields (Lasthenia chrysantha)</i>	Valley saltbush (<i>Atriplex polycarpa</i>)
<i>Alkali barley (Hordeum depressum)</i>	Spiny saltbush (<i>Atriplex spinifera</i>)
<i>Peppergrass (Lepidum sp.)</i>	Cheeseweed (<i>Isocoma acedenia</i>)
<i>Small fescue (Vulpia microstachys)</i>	Iodine bush (<i>Allenrolfea occidentalis</i>)

The native seed will be applied to areas within the Movement Corridors via hand-broadcast. Seed may be mixed with equal parts clean and damp sand to aid in broadcasting. With this method, the seed mix is applied in a two-step application. Step one consists of broadcasting one-half of the seed mix across the planting area in one direction (e.g., north to south). Step two consists of broadcasting the remaining seed over the same area while moving in a perpendicular direction to step one. Broadcast seeding will occur only during low to no wind conditions. Subsequent to dispersal, seeds will be worked into the soil with rakes. Supplemental water application, if any, will be applied as determined appropriate by a qualified biologist, subject to review and approval by the USFWS, and will be based upon weather patterns and soil moisture levels. Target dates for grass and forb planting in the Central Valley are generally in the winter when soils are moist and seeds are poised to undergo spring germination.

In addition to vegetation enhancements, raised earthen berms will be created within Movement Corridors. The berms will be linear to facilitate construction by mechanical means, but they will not necessarily be continuous; gaps will be provided at strategic locations to allow flood waters to pass without causing undue damage to the berms. The berms will be constructed to widths of no less than 15 feet, and heights of approximately six feet above grade to allow for settling and erosion over time, which will ultimately result in berms of an anticipated height of three to four feet. All berms will be created using topsoil from the project site. A ditch no greater than three feet deep and 10 feet wide with sides graded such that no entrapment of wildlife will occur; i.e., a slope of no greater than 27 degrees will be excavated along one side of the berm. This ditch is intended to collect and direct water flow and will additionally provide habitat for burrowing mammals along the bank. A maintained dirt road will be constructed alongside the ditch.

5.3.2 ENHANCEMENTS AND IMPROVEMENTS TO THE CONSERVATION SITES

The Conservation Sites (Sites 1-C, 3-C, 3-C2, 9-C, 10-C and 17-C) totaling 1,894.4 acres will be enhanced and managed in perpetuity for Covered Species. Conservation Sites 1-C, 3-C, 9-C (upper portion only), and 10-C have been repeatedly disked for weed control and are devoid of vegetation. Site 3-C2, which is 152.9 acres, has been disked in the past, but it has not been disked in a number of years and is beginning to become revegetated and to provide habitat. Seeding of vegetation on Site 3-C2 will likely not be conducted because that site is currently recovering with native vegetation. The southern 83.25 acres of Site 9-C is vegetated with

Saltbush Scrub habitat, but portions of that site show signs of past disturbance from heavy equipment. Project-related ground disturbance leading to vegetation removal will not occur within any of the Conservation Sites; however there will need to be substantial ground disturbance within these areas during the creation of topographic relief, the installation of dens and perches, and the implementation of other conservation measures. All of these sites will undergo enhancements to varying degrees as described below.

Conservation Site 17-C is in a relatively native state, having never been actively farmed or tilled. It contains native Valley Saltbush Scrub (*Atriplex spinifera* and *A. polycarpa*), Chenopod Scrub, and goldenbush (*Isocoma acradenia*) habitat communities within a matrix of non-native annual grassland (Chapter 3; Quad Knopf 2009). Seeding or other vegetation enhancements will not be conducted on this site, unless unforeseen circumstances (such as a fire) make enhancement necessary. If seeding is needed, seeds will be collected from on site, and applied using a seed drill or hand-broadcast.

The establishment of vegetative communities within the disked portions of the remaining four Conservation Sites (Site 1-C, Site 3-C, the northern 97.35 acres of Site 9-C, and Site 10-C) will be accomplished through both active and passive strategies. There is sufficient evidence to suggest that the Conservation Sites will naturally revegetate (e.g., Germano et al. 2012), following cessation of disking with a variety of native species, including alkali seepweed (*Suaeda* sp.), saltbush (*Atriplex* sp.), cheeseweed, and various native and non-native annuals. However, seeding may be required to establish native vegetation within some portions of the sites, if they have not revegetated on their own within three growing seasons. Given that remnant patches of representative plant species of Valley Saltbush Scrub and Alkali Sink habitat are present in the vicinity surrounding the Conservation Sites, a seed palette for re-vegetation efforts will include native annual and perennial species that are known to occur in these habitat types. The seed palette for restoration efforts will include a minimum of five species selected from Table 5-1, with at least one being a shrub species. Other species may be substituted with the recommendation of a restoration botanist and with the approval of the USFWS.

The native seed will be applied to the Conservation Sites using a seed drill. In some areas, hand-broadcast seeding may be needed (such as in areas where topographic relief has been created). The methods for hand-broadcast seeding are described in Section 5.3.1. Target dates for grass and forb planting in the Central Valley are generally in the winter when soils are moist and seeds are poised to undergo spring germination. Seeding rates will be determined based upon the species used and the recommended seeding rates from seed suppliers. Generally, this is in the range of 5 to 15 pounds per acre.

5.3.3 ENHANCEMENTS AND IMPROVEMENTS TO THE SOLAR SITES

The Solar Sites will not be managed for the benefit of Covered Species until after the Project is decommissioned. While the solar facilities are operational, vegetation will be managed to facilitate the solar operations. Nonetheless, Covered Species may invade the developed Solar Sites. Vegetation height will be managed on the Solar Development Footprints because vegetation that grows up around or above the solar panel structures will interfere with their functioning. Therefore, a maximum vegetation height of approximately two feet will be

maintained within the Solar Development Footprints on the Solar Sites. Grazing will be used as the primary means of vegetation control on the Solar Sites. However, mowing or other mechanical means of vegetation control will also be used if needed. The physical removal of individual large plants using mechanical implements may sometimes become necessary. The removal of tamarisk or other problematic species using chemical means is likely to be required at times.

5.4 Management of Permit Area

Management of the Conservation Sites will be conducted following Appendix C. Management will be instituted in a phased approach; as conservation easements are placed on the lands, management of those parcels will begin. After the solar project has been decommissioned and once all Success Criteria (Section 5.2) have been met, the conservation easements will need to be maintained in perpetuity. Routine maintenance on the conservation lands will involve the following:

- Vegetation density management to maintain suitable conditions for Covered Species;
- Noxious weed control to maintain habitat integrity; and
- Maintenance of fencing on an ongoing basis.

Specific management activities that will be performed on Movement Corridors, Conservation Sites, and Solar Sites are described below.

5.4.1 MANAGEMENT OF CONSERVATION SITES

Vegetation management will be implemented on the Conservation Sites to maintain habitat in a condition that provides value for the Covered Species. Vegetation within the sites will be maintained at a height and density that is suitable for cover, breeding, and foraging by Covered Species. Vegetation density will be maintained such that it does not serve as a fire hazard.

Adaptive management will be used to manage for conditions suitable for the Covered Species. Although the Covered Species can occur in a variety of habitats and within a variety of conditions within those habitats, grassland and scrub habitats with less than 20 percent shrub cover, less than 50 percent grass and forb cover, and a relatively low level of residual dry matter (RDM) of 500 to 1,500 lbs per acre appears to be a reasonable target to achieve (Germano et al. 2012).

Suitable landscape cover will be maintained on the Conservation Sites by various techniques such as mowing, managed grazing of sheep, and scraping. Low intensity sheep grazing has historically occurred in the project region, and is considered one the most effective and lowest impact methods for vegetation management available. Managed grazing will be the preferable method of vegetation control and will be used when possible. Sheep are preferred to cattle primarily because cattle would be more likely to compromise the structural integrity of roads, berms, artificial dens and perches, and project fencing.

The Conservation Sites would be leased as grazing land for sheep at an appropriate stocking rate, determined through consultation with rangeland specialists and subject to review and approval by the USFWS (see Germano et al. 2012 for an example of grazing as a small vertebrate habitat management tool). The most suitable stocking rate(s) will ultimately be determined through adaptive management. For appropriate vegetation control, sheep are often placed on grazing lands in October of each year, and their numbers are gradually increased as forage quality and quantity improve. The majority of sheep will likely be removed by the end of May when forage availability becomes significantly reduced, but in wet years this period may be extended. Alternatively, higher stocking levels for shorter time periods can achieve similar results.

The spread of noxious weeds on the Conservation Sites will be controlled so that habitat integrity for Covered Species is not jeopardized. Noxious species threaten the diversity and abundance of native species through competition for resources, predation, parasitism, interbreeding with native populations, transmitting diseases, or causing physical or chemical changes to the invaded habitat. The most aggressive exotic plants are unacceptable in natural areas because they can exclude native plants, degrade, alter, or displace natural plant communities, promote faunal change, reduce biological diversity, disrupt ecosystem processes, alter fire frequencies, and threaten the persistence of sensitive plant and wildlife species. Aggressive non-native plants and noxious weeds often have little or no habitat value for native wildlife species, and can even alter the physical substrate (e.g., soil moisture), further rendering the habitat unsuitable for some species.

Management of the Conservation Sites will be accomplished following the Long-term Habitat Management Plan (LTHMP) (Appendix C).

5.4.2 MANAGEMENT OF MOVEMENT CORRIDORS

Vegetation management will be implemented on the Movement Corridors to maintain habitat in a condition that provides value for the Covered Species. Vegetation within the corridors will be maintained at a height and density that is suitable for cover, breeding, and foraging by Covered Species. Vegetation density will be maintained such that it does not serve as a fire hazard or interfere with Project operations.

Adaptive management will be used to manage for conditions suitable for the Covered Species. Although the Covered Species can occur in a variety of habitats and within a variety of conditions within those habitats, grassland and scrub habitats with less than 20 percent shrub cover, less than 50 percent grass and forb cover, and a relatively low level of residual dry matter (RDM) of 500 to 1,500 lbs per acre appears to create desirable habitat and is a reasonable target to achieve (Germano et al. 2012).

Suitable landscape cover will be maintained on the Movement Corridors by various techniques, such as mowing, managed grazing using sheep, and scraping. Low intensity sheep grazing has historically occurred in the Project region, and is one of the most effective and lowest impact methods for vegetation management available. Managed grazing will be the preferable method of vegetation control and will be used when possible. Sheep are preferred to cattle primarily

because cattle would be more likely to compromise the structural integrity of roads, berms, artificial dens, perches, and project fencing.

Once the Movement Corridors have been improved, encroachment of construction activities and vegetation removal will be restricted by erecting security fencing along the boundaries of the Movement Corridors that adjoin Solar Development Footprints. Such fencing will be constructed using kit fox-friendly materials that are permeable to avoid introducing permanent barriers for movement of species (also see Chapter 2, Section 2.3.5).

Noxious weed control will follow management practices outline above in Section 5.4.1.

5.4.3 MANAGEMENT OF SOLAR SITES

During the operations and maintenance phase of the Solar Sites, the areas within the Solar Development Footprints will be managed in a manner that facilitates solar operations; no specific habitat enhancements or management actions will be implemented to benefit Covered Species. Nonetheless, it is anticipated that Covered Species may invade the Solar Sites, especially during the O&M phase after construction activities have ended. To ensure the protection of Covered Species, if they become present, avoidance and minimization measures will be implemented, including trapping and relocation of species if necessary (see Appendices E and F).

After decommissioning of the solar project, Solar Site lands will be managed to maintain suitable vegetative cover density for Covered Species as described in the above sections. Low intensity sheep grazing combined with vegetation mowing and scraping will be used to control vegetation density. Sheep grazing will be the preferred method of vegetation management due to its low impact and cost effectiveness. Sheep are preferred over cattle as they tend to have a lower impact on the structural integrity of fences, roadways, berms, and artificial and natural dens and perches. As with Movement Corridors and Conservation Sites, decommissioned Solar Sites will be managed to achieve grassland and scrub habitats with less than 20% shrub cover, less than 50% grass and forb cover, and a relatively low level of RDM of 500 to 1,500 lbs per acre (Germano et al. 2012).

Noxious weed control will follow management practices outline above in Section 5.4.1.

5.5 Actions to Minimize Ground Disturbance

The following activities will occur within the 3,798.2 acres of Solar Development Footprint disturbance area.

Solar Sites will be cleared of vegetation, soil will be compacted, and topography will be altered in areas proposed for solar field installation. Habitat occupied by Covered Species and other sensitive species will be avoided by ground disturbance activities, and exclusion fencing will be erected to protect those areas.. Occupied habitat will be designated as ESAs and will be protected by exclusion fencing consisting of staking ESA perimeters, creating rope borders, and attaching survey flagging to clearly demarcate ESA boundaries. Equipment storage and parking areas will also be confined to designated areas.

Minimal site grading is anticipated throughout the Solar Development Footprint, and will be dependent upon site-specific topography. Tools used for clearing may consist of chainsaws, wood chippers, stump grinders and other grubbing equipment, agricultural disks and ring-rollers, and other tools and equipment. Soil will not be exported from or imported to any site. A qualified biological monitor will be on site during vegetation removal and grading activities when those activities take place within 200 feet of Covered Species or vegetated, natural habitat.

No construction-related ground disturbances will occur within the Conservation Sites. However, ground disturbance within some of these sites are anticipated to occur during enhancement activities, as previously described. Encroachment by construction activities will be restricted from Conservation Sites by installing temporary construction avoidance fencing along interfaces of construction areas/conservation lands that identify the conservation lands as environmentally sensitive areas. These boundaries will include, at a minimum, the east perimeter of Site 2-S, the north and west perimeters of Site 3-S, and the south and east perimeters of Site 3-C2. Conservation Site 1-C is separated from Solar Site 5-S by South Lake Road, and will therefore not require exclusion fencing. No potential encroachment of Project-related activities within Conservation Sites 9-C, 10-C or 17-C are anticipated because they are so far removed from the Solar Sites.

5.6 Benefits to Covered Species from Project Related Conservation Actions

Through the realization of the biological goals and objectives of the Conservation Program, as described in this MSHCP, impacts to Covered Species resulting from the Project will be mitigated and offset. This Conservation Program comprises two primary benefits toward fulfilling the species-specific biological goals and objectives.

First, the Project will result in the permanent protection of lands and the development of new habitat to encourage the colonization of Covered Species and other plant and wildlife species within the Permit Area. In general, most of the compensatory lands (Conservation Sites) constitute better habitat than the Solar Sites, because of the presence of vegetation communities favorable to support Covered Species. Eventually, lands within the Permit Area will no longer be disked, allowing them to return to a native state and to support more plant and wildlife species in general. These conserved lands all lie within the native range of the Covered Species and will constitute a significant addition to native protected lands. Second, all of the lands being included in the conservation easements will be fenced and managed in perpetuity for the benefit of Covered Species, therefore being protected from habitat destruction and future development.

Three categories of lands will be established as conservation easements to be protected in perpetuity. Movement Corridors and Conservation Sites will provide lands during the development and operation of the Project to encourage the growth of new habitat; and to provide safe dispersal lands between habitat fragments. At a later time, once the Project has been decommissioned, all of the Solar Site lands will be transitioned into the conservation easement for the benefit of Covered Species and will greatly increase the total acreage of conservation lands.

The Solar Sites do not currently provide a habitat corridor or conduit corridor between the western Kern County core population of San Joaquin kit fox and an isolated population to the east of the Projects. Conservation of the Permit Area lands will provide new dispersal habitat where none currently exists (Appendix H). Integrated Movement Corridors will be provided along the edges of the Solar Development Footprints, and escape dens will be provided along these corridors to reduce the potential for mortalities due to competition and predation by coyotes. These corridors will enhance the potential for survival of San Joaquin kit foxes as they disperse throughout their range. Additionally, the Conservation Program includes measures that will enhance the potential for San Joaquin kit foxes to reside on the conservation lands, which is preferable to simply improving connectivity. The conservation lands will be fenced with a perimeter fence that will be raised above ground level, allowing San Joaquin kit foxes to move on and off the lands, while preventing unauthorized grazing activity and vehicle traffic from disturbing sensitive San Joaquin kit fox habitat. Artificial escape dens installed on the conservation lands will provide refuges to escape predation, reduce stress, and in which to rear pups.

Conservation actions include the cessation of disking, which will allow western burrowing owls to become established within the conserved lands. T-post perches installed throughout the conservation lands will provide elevated vantage points from which western burrowing owls can hunt, and provide escape from predation. Artificial burrows installed throughout the conservation lands will provide valuable refugia and nesting habitat. Additionally, increased activity by San Joaquin kit fox and other ground burrowing species will provide additional burrows for western burrowing owls to use. As the conservation lands will be fenced, these burrows will be protected from destruction due to unauthorized grazing and vehicular activity.

The blunt-nosed leopard lizard, Tipton kangaroo rat, and Nelson's antelope squirrel favor habitats that are open, with low levels of ground cover. Currently, disking nearly eliminates all vegetation from the Project lands, making the Permit Area generally undesirable for these species. Cessation of disking upon establishing the conservation easements will result in revegetation of the lands and will provide valuable habitat in core range distribution areas for each of these species. Specific vegetation management practices, such as low impact grazing and noxious weed control will ensure long-term habitat suitability. Exclusion of unauthorized grazing and vehicular traffic through the use of perimeter fencing will further protect habitat, ensure long term suitability, and ensure that established small mammal burrow systems are not damaged through cave-in.