

Appendix M  
**Western Burrowing Owl  
Conservation Strategy**



# Appendix M

## Western Burrowing Owl Conservation Strategy

### M.1 Introduction

This appendix is provided as a supplement to the summary of the western burrowing owl conservation strategy in Chapter 5. The conservation strategy presented below has been constructed to offset impacts to western burrowing owl discussed in Chapter 4. Additional items relevant to the western burrowing owl conservation strategy are:

- Condition 15 in Chapter 6,
- monitoring commitments in Chapter 7,
- Stay-Ahead requirements for the burrowing owl conservation strategy in Chapter 8, and
- the burrowing owl fee in Chapter 9.

### M.2 Background

Nesting burrowing owls in the greater San Francisco Bay area and the South Bay area in particular, are a dwindling resource. In the early 1990s there were an estimated 150–170 breeding pairs in the San Francisco Bay area (DeSante and Ruhlen 1995; DeSante et al. 1997). It was estimated that these numbers represented a 53% decline from the previous census period of 1986–1990 (DeSante et al. 1997) and more recent numbers indicate that, if anything, the downward trend is increasing. In those estimates it was assumed that 75% of the San Francisco Bay area burrowing owl population occurred in Santa Clara County and nearly all of those owls were congregated around the southern edge of the San Francisco Bay (DeSante et al. 1997). Surveys in the early 1990s revealed that about a third (43–47 pairs) of Santa Clara County breeding pairs occurred inside what is now the Santa Clara Valley Habitat Plan study area (City of San José 2000).

The Plan proposes to undertake a suite of measures aimed at reversing the declining trend of the burrowing owl population in Santa Clara County. The conservation goal of the Plan, as implemented by these measures, is to establish a burrowing owl population in the permit area (the permit area includes the study

area and the extended study area for burrowing owl conservation) that is first stable, then increasing over time, while accounting for normal fluctuations in population levels. The general approach will be to increase the numbers, distribution, and connectivity of burrowing owl colonies in the permit area so that the potential for conservation success is high. This will be accomplished by using a phased conservation approach, initially focusing efforts on areas within 5 miles of an established breeding site while gathering data to inform future conservation efforts. Later phases, triggered as more resources are available and hopefully in response to initial successes, will focus on lands further out to allow for growth in both numbers and range. Initial techniques will include utilizing data gathering and analysis to inform management decisions, testing proposed management techniques and analytical approaches with scientific studies, acquisition (both permanent and temporary) of existing and potential breeding and foraging areas, management of burrowing owl habitat and, as a last resort, population augmentation techniques. These measures will be applied in four burrowing owl conservation regions, as described below.

## M.2.1 Burrowing Owl Conservation Regions

Opportunities to conduct meaningful burrowing owl conservation inside the Habitat Plan study area are limited because the most effective conservation measures must take place in near proximity to the remaining burrowing owl occurrences. Since those occurrences are clustered around the southern part of the San Francisco Bay and northern San José, there is little unused land available and that which is not built on has high land values. As a result the conservation focus for burrowing owls was expanded to include the entire South Bay region, in addition to the Habitat Plan study area (see Chapter 1, **Figure 1-2**). This *expanded study area for burrowing owl conservation* was determined following examination of movement distances of burrowing owls in the South Bay area. Movement distances have been inferred from encounters with burrowing owls that were banded at other locations in the South Bay area. The longest recorded movement of a banded burrowing owl in the South Bay area is 7.5 miles (12 km) (Harman and Barclay 2007; City of San José 2000), from the San José International Airport to National Aeronautic and Space Administration Ames/Moffett Federal Airfield (Moffett Airfield). That distance is important because it indicates a reasonable measure of dispersal distance, either for natal dispersal (birth site to nesting site) or breeding dispersal (movement between nesting locations). Planning conservation within a documented movement distance is valid to support the goal to increase the burrowing owl population and expand the distribution of burrowing owls in the South Bay area, and to proactively protect habitat that may support this expansion. For that reason, and due to the fact that most burrowing owl nest occurrences inside of the study area are on the northern edge of the study area (Barclay 2008), it was determined that conservation efforts for the burrowing owl should not be restricted to within the Habitat Plan study area, as data indicates the owls that will be the initial focus of the conservation efforts are most likely to move to the north, outside of the study area. As described in Chapter 1, take in the expanded study area will only be

authorized for burrowing owl conservation actions and not for other covered activities.

The study area has been divided into four burrowing owl conservation regions to more easily prioritize conservation actions (**Figure 5-10**). These regions are described below in order of current conservation priority.

- North San José/Baylands
- Gilroy
- Morgan Hill
- South San José

Conservation actions that will be employed to achieve the biological goals and objectives for burrowing owl will vary throughout the permit area. Generally, temporary and permanent management agreements will be put in place in the northern part of the study area and in the expanded study area. At least initially, limited habitat acquisition (permanent protection) and management will occur along the southern edge of the study area and more limited conservation activities will occur in the two middle regions because of the current lack of nesting burrowing owl colonies in these areas. If conservation actions in the North San José/Baylands region prove successful, and the number of breeding burrowing owls increases substantially, it is reasonable to assume the nesting burrowing owl population will expand into suitable habitat in the South San José, Morgan Hill, and Gilroy regions. Management of foraging and overwintering habitat will also occur on lands in the Reserve System, especially those that are dominated by grassland land covers and are located below 200 feet in elevation.

## North San José/Baylands Region

The North San José/Baylands region includes the City of San José, north and west of I-280/680, and extends around the southern margin of the San Francisco Bay to the Dumbarton Bridge (**Figure 5-10**). The remaining burrowing owl nesting colonies in the South Bay area are in this region. This region also has the greatest potential for population expansion because of its proximity to the remaining colonies. It is reasonable to assume that properly managed burrowing owl habitat in this region would be colonized (or recolonized) sooner than similar habitat in any other region.

Sites of importance for nesting burrowing owls within this region include the San José International Airport, San José/Santa Clara Water Pollution Control Plant, Mission College, the Shoreline Park and amphitheater area (Shoreline Park), Moffett Airfield, Santa Clara Valley Transportation Authority (VTA) Cerone bus maintenance yard, Tesla Plant (Fremont), Warm Springs (Fremont), and the Don Edwards San Francisco Bay National Wildlife Refuge (Don Edwards). With the exception of the VTA Cerone bus yard, none of these sites are under the jurisdiction of the Habitat Plan Permittees. Based on documented movements of burrowing owls in the South Bay area (Harman and Barclay 2007; City of San

José 2000) it is reasonable to assume that burrowing owls from any of these locations could disperse to any one of the other locations. Conservation efforts in the North San José/Baylands region will be the highest priority of the Implementing Entity because of the existing colonies and it has the greatest potential for expansion of the population.

The conservation strategy within this region will be three-fold. First, the Implementing Entity will attempt to stabilize the existing colonies to the maximum extent practicable. This will be done by acquiring land or, in circumstances where outright acquisition is not feasible but the location has significant value in the short term (i.e., San José International Airport, Shoreline Park, and Moffett Airfield), attempt to secure temporary management agreements to maintain nesting and foraging areas. Although these agreements will be temporary, they are expected to last long enough (10 years or more) to support meaningful burrowing owl management activities. Overall, the approach is to acquire or manage key lands where opportunities exist. Where acquisition is not possible, for whatever reason(s), the Plan recognizes that there may still be substantial benefit in maintaining existing breeding and foraging areas in the short term, until permanent protection can be established within the Reserve System. Therefore, use of permanent conservation easements, temporary conservation easements, or temporary management agreements on key lands may be the preferable option.

Maintaining and increasing breeding pairs in a highly altered environment such as exists around the San Francisco Bay area will require active land management, so assuring long-term management is essential for the persistence of burrowing owls in the South Bay area. Lands acquired or protected as described above will be managed to protect and enhance the owl populations. However, for sites that cannot be acquired or when acquisition is not as desirable a strategy as establishment of temporary or permanent management agreements, other approaches will be utilized. For example, at many sites in this region, public lands are, or could be, managed to support burrowing owls. At some of these sites, however, no permanent management assurances currently exist. For these sites, the Implementing Entity can carry out this strategy by providing stable, long-term funding or staffing for effective and consistent management and monitoring. With enhanced management, sites that already support breeding pairs could be improved to support more pairs. Alternatively, there may be opportunities to obtain permanent management agreements, without acquisition of the underlying land.

The second component of the conservation strategy in this region will be to attempt to increase the burrowing owl population and number of colonies within the jurisdiction of Plan Applicants. This will be done by acquiring land or securing temporary and permanent management (preferably permanent for this phase) agreements on lands that will be enhanced to attract new burrowing owl pairs. Many sites in the region may not support burrowing owls consistently because vegetation or other factors (e.g., predators) render them unsuitable. With proper management, sites within the dispersal distance of breeding locations will be managed to attract new breeding pairs.

Public lands where enhanced management may be secured to meet the Implementing Entity's population goals in this region are:

- San José International Airport (including the VHF Omnidirectional Range [VOR] communications parcel adjacent to U.S. 101);
- San Jose/Santa Clara Water Pollution Control Plant, including buffer lands;
- Alviso;
- SCVWD levees not critical for flood protection (e.g., Pond A4);
- VTA Cerone bus maintenance yard; and
- Closed landfills within San José and other cities that primarily support annual grassland. If managed properly, these areas could provide foraging habitat for burrowing owls. In some cases, California ground squirrels have recolonized these sites, providing nesting opportunities for burrowing owls as well.

Some private land may also be suitable for management agreements to help meet Plan goals.

The final component of the strategy in this region is long term and will consist of attempting to extend the burrowing owl range beyond the existing localized area. It is intended that this range expansion will lead to an increase in the overall number of burrowing owls and colonies. The primary mechanism to accomplish this goal will be to acquire, either in fee title or through permanent conservation easements, or management agreements, areas outside of currently occupied nesting habitat to accommodate the population expansion. These areas will then be enhanced to provide suitable burrowing owl habitat. Suitable sites for habitat enhancement may include, but are not limited to the following.

- Moffett Airfield.
- Don Edwards.
- City of Sunnyvale San Francisco Bay front lands (Baylands).
- City of Palo Alto Baylands.
- City of Mountain View Shoreline Park.
- Golf courses (e.g., in Santa Clara along Tasman Road)—many golf courses in the South Bay Area provide foraging and, at times, nesting habitat for burrowing owls. This often occurs around the edges of a golf course, in areas outside of the fairways, where there is more natural vegetation (i.e., the “rough”).
- Various private lands in the City of Fremont—Warm Springs District.
- Various closed landfills.
- Various Baylands in the cities of Milpitas and Fremont.

Although burrowing owl conservation actions in the sites listed above could contribute to the burrowing owl conservation strategy, not all of the locations

listed above will be eligible to be counted toward the Habitat Plan's Reserve System acquisition commitments, since protection and management in perpetuity cannot be guaranteed for most of these sites. However, the conservation strategy for this species explicitly recognizes that there can be substantial interim benefit in protecting and managing these areas for the longest period possible, in order to provide time to allow the Reserve System to be assembled and for the expansion of the burrowing owl range within the Habitat Plan Reserve System.

## Gilroy Region

This region includes the valley floor in the southern tip of the study area surrounding the City of Gilroy (**Figure 5-10**) to the Pajaro River. This region has a moderate-high potential for nesting burrowing owls because of burrowing owl occurrences near the Pajaro River. The primary conservation actions in this region will be to attract burrowing owls into the region from neighboring San Benito County, where nesting burrowing owls have been documented in low numbers during surveys in 2008 and 2009 (Barclay 2008). This will occur through acquisition of or management agreements on potential burrowing owl nesting habitat (or occupied nesting habitat if a colony is discovered) and enhancement through improved management. Currently, most of the land along the San Benito County line is managed intensively for row crops, which is generally not suitable for nesting owls although the edges of fields and uncultivated areas can provide foraging habitat.

There have been no documented nesting burrowing owls within this region since the early 1990s. Lands in this region are within the expected dispersal distance of burrowing owls nesting in northern San Benito County (Barclay 2008), so with proper management the potential exists for burrowing owls to colonize reserve lands protected in this region. There may also be opportunities to implement or improve management on public lands in the Gilroy region to attract and maintain burrowing owls. These cost-effective measures may be appropriate at the South County Water Treatment Plant in Gilroy, or other sites.

## Morgan Hill Region

This region includes the valley floor between the northern boundary of the City of Gilroy and the southern boundary of the City of San José (**Figure 5-10**). The region extends west and east to the toe of the surrounding hills. While there seems to be an abundance of burrowing owl habitat in this part of the study area no burrowing owl nests have been observed in this region since 2002 (DeSante et al. 2007; Townsend and Lenihan 2007; Barclay 2008). Before 2002, reports of nesting owls in this region were sporadic. As a result, this region has only a moderate potential to provide expansion for the burrowing owl population from the South Bay area.

During the Plan permit term, the primary purpose of burrowing owl conservation in this region will be to provide connectivity between populations in the North San José/Baylands Region and the Gilroy Region. It is hoped that burrowing owls will eventually return to this area in significant numbers. Potential nesting habitat will be acquired or placed under management agreements in this region to attract burrowing owls. When a parcel is acquired for the Reserve System that has burrowing owl habitat present, the management plan for that parcel will specify management actions that enhance the burrowing owl habitat.

## South San José Region

The South San José region includes the remainder of the City of San José south and east of I-280/680 (**Figure 5-10**). This region extends to the southern urban edge of San José and into the eastern hills. It is unknown what population levels were in this region historically, and there are currently very limited conservation opportunities in this part of the study area due to the urban environment, poor connectivity to populations that could provide colonizers and the low numbers of nesting burrowing owls in the recent past (Barclay 2008; California Natural Diversity Database 2009). Typically the number of burrowing owls in this region ranges from 0–2 adult burrowing owls. During surveys conducted from 2008–2009, one nesting pair was observed (on vacant land next to Meadowfair Park).

Expected impacts to occupied nesting burrowing owl habitat will be low or absent from this region because few, if any, nesting owls remain.

The primary goal of burrowing owl conservation in the South San José Region is to provide stepping-stone connectivity between the North San José/Baylands region, and the Morgan Hill region. The functionality of any connectivity through this area is constrained because it is mostly a highly urbanized environment. Due to the limited amount of suitable habitat and the isolation of existing habitat patches the Implementing Entity will not only pursue land acquisition in this region to secure conservation but will also attempt to reach permanent or temporary management agreements with public or private landowners to retain suitable habitat for burrowing owls.

### M.2.2 Population Performance

As part of the process to determine a viable conservation plan for burrowing owls in the Plan, it was decided to utilize a count-based population viability analysis (PVA) to determine the probability of persistence of three burrowing owl nest colonies in the South Bay (**Appendix N**). This analysis was completed on the three largest remaining burrowing owl colonies in the South Bay area: Moffett Airfield, San José International Airport, and Shoreline Park using survey data of adult burrowing owls from the 11-year period, 1999–2009. These sites were chosen because they are the primary remaining population clusters and because

data was available for the period of time recommended for the analysis (i.e., at least 10 years). The intent of the analysis was to quantify population size, trend, growth rate, and variance in the three burrowing owl colonies and to evaluate the probability of persistence of these colonies (individually and combined) during that 11-year period. Using those data, a PVA was generated to estimate the risk of future extinction based on the behavior of the data during the 11-year period. It is assumed that changes in population performance at these three colonies are indicators of changes that could occur in the South Bay burrowing owl nesting population as a whole if it were under more of a managed condition. Therefore, the population performance at these three sites can be used as an index for population performance for burrowing owls in the Habitat Plan study area.

All three colonies showed declining population trends during the 11-year period from 1999–2009. The colonies at San José International Airport and Moffett Airfield showed very similar magnitudes and variance of decline, while Shoreline Park showed an even greater magnitude and variance of decline. The PVA model predicts similar probabilities of extirpation for the colonies at San José International Airport and Moffett Airfield, while Shoreline Park reflects an even higher probability.

The standard that was used to represent effective extirpation is the probability of reaching a quasi-extinction threshold of two adult owls. Quasi-extinction in this case is defined as the point at which the breeding colony becomes essentially non-functional (two adults). San José International Airport and Moffett Airfield showed similar probabilities of quasi-extinction, with an unacceptably high chance of extinction (95%) by Year 22. Shoreline Park showed a probability of reaching the quasi-extinction threshold of two adults, with an unacceptably high<sup>1</sup> chance of extinction (95%) by Year 10. This is likely due to the smaller size of this colony. The probability of quasi-extinction for the combined populations was set at six adults for all three colonies (representing two adults at each colony). The combined sites had an unacceptably high chance of extinction (95%) by Year 18. See **Appendix N** for more details on the methods and results of this analysis.

## Population Size

In order to develop a burrowing owl population size goal for the Habitat Plan, the annual population size of adult owls was artificially increased in a statistical model to determine the rate at which the numbers of adult burrowing owls at the three baseline colonies (San José International Airport, Moffett Airfield, and Shoreline Park) would need to increase and over what period of time to change the PVA probability of extinction trend from a negative growth rate to a positive growth rate. It was determined that if currently measured population characteristics held true (i.e., growth rate and variance were constant) changing the overall number of adult burrowing owls in this type of model did not change

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<sup>1</sup> The point at which probability of quasi-extinction reaches an “unacceptably high” level is described in the PVA (**Appendix N**).

the probability of persistence significantly (**Appendix N**). Instead, changing the growth rate from negative to positive required an incremental, annual, steady increase in the number of adult burrowing owls over a number of years. Therefore, for the purposes of this Plan, growth rate is a more correct predictor of persistence than an ultimate population size.

The most recent survey year that was considered in the PVA was 2009. During that year there were 51 adult burrowing owls observed at the three nest colonies under study. This analysis focuses on the number of adult burrowing owls rather than breeding pairs or juveniles (for a complete discussion of this see **Appendix N**). In order to change the population trend at the three colonies from negative to positive, within a 10-year time period there would have to be an increase of three adult owls per year combined at the three sites. Based on the data set used in the PVA, quasi-extinction at the three PVA colonies would occur in 18 years. By setting population growth goals that would change the growth rate from negative to positive by Year 15, the strategy aims to avoid a situation where the South Bay burrowing owl population gets too low to recover. A period of at least 10 years is also needed to allow time for collection of data at occupied nest sites in the permit area and integration of that data into the PVA model.

### M.3 Biological Goals and Objectives

The primary goal of the conservation strategy is to increase the size and sustainability of the breeding population and increase the distribution of breeding and wintering burrowing owls in the study area and the expanded burrowing owl conservation area. The PVA demonstrates that the overall number of adult burrowing owls in the South Bay area is less important than the trend in population numbers and the variability in the number of owls from year to year. An unsurprising conclusion is that a growing or stable population is more likely to persist than a widely fluctuating population.

Based on this conclusion, the Implementing Entity will establish a positive growth trend in the permit area by Year 15 of the permit term and maintain the overall positive growth trend thereafter; manage 5,300 acres of modeled occupied and potential nesting habitat in the permit area; and protect and manage 21,310 acres of modeled overwintering habitat (**Figure 5-10**). This will be accomplished by targeting protection and management of grassland or barren land (as described in Chapter 3 and shown in **Figure 3-10**) with less than 25% slope in tracts that meet minimum species spatial requirements. When considering the recovery of the burrowing owl in the Habitat Plan permit area, the ultimate regional goal is to have a burrowing owl population determined by the PVA to be stable. In practical terms, we define this goal as being met by achieving a positive growth rate by Year 15 of the Plan using annual data collected from active nesting colonies in the South Bay area for which adequate data is available and determined to be stable enough to not artificially skew the results. Year 15 was chosen to allow adequate time for the conservation actions

to have a measureable effect and to provide a buffer on the 10-year goal discussed above. In addition, if counts of adult burrowing owls begin in Year 1 of implementation, those data cannot reliably be used in a PVA until Year 10 of implementation. Setting the goal of achieving a positive growth rate by Year 15 allows for the inclusion of sites in the South Bay area be incorporated into a PVA analysis, and apply an adaptive management approach if it is discovered that positive results are not being reached at Year 10.

The most likely way to achieve the Year 15 positive growth rate will through an average increase in the number of adult burrowing owls at San José International Airport, Moffett Airfield, and Shoreline Park each year during the Year 15 time period. These three sites are the focus because there was enough data (recommended 10 years) at each site to perform a PVA. Continuing to track the number of adult burrowing owls at each of these locations will give the Implementing Entity the most accurate assessment of how the burrowing owl population is performing and whether the goals for the number of adult burrowing owls is being met each year. Additional data will be collected annually at VTA Cerone bus yard, the San Jose/Santa Clara Water Pollution Control Plant buffer lands, and any other nest sites found during Plan implementation, but that data will not be useful for assessment using a PVA until ten years of data is collected at the site.

In addition to monitoring population changes in adult owls, the Implementing Entity will enhance grassland or barren land (as described in Chapter 3 and shown in **Figure 3-10**) on which management agreements have been placed and on Reserve System lands that are flat or moderate slopes (<25%). In order to increase the chance that the sites will be used by owls, areas will be targeted within 5 miles of an established breeding site in the permit area (i.e., San José International Airport, Reid Hill View Airport, San Jose/Santa Clara Water Pollution Control Plant buffer lands). Acquisition, enhancement, and restoration conservation actions identified for grasslands (see Section 5.3.3 *Grassland Conservation and Management*), valley oak woodlands (see Section 5.3.5 *Oak and Conifer Woodland Conservation and Management*), and seasonal wetlands (see Section 5.3.7 *Wetland and Pond Conservation and Management*) are intended to benefit western burrowing owl through breeding and foraging habitat conservation and management.

An adaptive management approach for determining what types of conservation actions will be employed and where conservation funds will be spent is critical since management activities are likely to change often, due to rapidly changing circumstances, both negative and positive. Depending on a number of factors, the priorities for conservation monies may shift (see *Setting Conservation Priorities*, below). Priorities may also shift through the adaptive management process if additional colonies are discovered during the permit term.

In order to achieve Plan goals during the permit term the Implementing Entity will carry out the following generalized conservation actions.

1. Protect existing colonies through fee title acquisition, purchase of a conservation easement, or other management agreements (San José

International Airport, Moffett Airfield, Shoreline Park and others, known or unknown), managing the sites for long-term nest viability.

2. Protect foraging habitat, through fee title acquisition, purchase of conservation easements, or other management agreements (San José International Airport, Moffett Airfield, Shoreline Park and others, known or unknown), ensuring proper burrowing owl management on those sites.
3. Protect through fee title acquisition, purchase of a conservation easement, or other management agreements, currently unoccupied areas that have potential nesting habitat and are within the expected dispersal distance of nesting burrowing owls.
4. Protect through fee title acquisition, purchase of a conservation easement, or other management agreements, locations outside of the 7.5-mile dispersal distance in anticipation that these lands will be needed in the future for nesting, foraging, and connectivity between colonies as the burrowing owl population expands beyond its current distribution.
5. Carry out data collection, analysis and controlled experiments to ensure the most appropriate techniques will be used and are being used.
6. Manage habitat areas that may support burrowing owls.
7. If the conservation strategy is implemented as planned but the number of adult burrowing owls fails to meet the annual increase of at least three adult owls each year at the annual survey sites described in Section 7.3.3 Species *Level Actions* subheading *Western Burrowing Owl (Group 1)* the Implementing Entity will propose more active conservation methods to the Wildlife Agencies, such as population augmentation to provide a boost to local population numbers. Active methods utilized will be supported by data gained from pilot studies. Any changes to the conservation strategy (i.e., adaptive management) must be approved by the Wildlife Agencies prior to implementation.

The specific burrowing owl conservation plan is comprised of conservation actions that are grouped into three “tiers” of priority. Each tier is discussed in detail below but generally consists of:

- **Tier 1 conservation actions** are designed to stabilize the existing population by protecting and/or managing occupied burrowing owl nesting habitat. Tier 1 actions may indirectly increase the numbers of owls in extant colonies. Tier 1 conservation actions will take place initially in the North San José/Baylands Region where owls currently occur. Tier 1 conservation actions will occur immediately.
- **Tier 2 conservation actions** are designed to facilitate growth and expansion of existing colonies, the number of colonies, and the range of the species in the permit area by protecting and managing potential burrowing owl nesting habitat in all portions of the permit area. Tier 2 conservation actions will also take place immediately and initially in the North San José/Baylands Region where owls currently occur.

- **Tier 3 conservation actions** consist of more experimental and active methodologies such as population augmentation and owl relocation within the permit area to increase owl numbers and expand distribution. Tier 3 actions will be implemented in response to population performance at the three index sites (Shoreline Park, San José International Airport, and Moffett Airfield) but these actions could occur in any of the burrowing owl conservation regions. These actions will be coordinated with the Wildlife Agencies and will only be implemented upon their approval.

Funds collected for burrowing owl conservation actions related to occupied and potential nesting habitat come from the Habitat Plan land cover fee and the burrowing owl fee. It is anticipated that funds will be obtained from other sources, such as non-profits and State and Federal grants, to augment specific conservation actions, including research efforts. The land cover fees will support acquisition and management of land in the Reserve System which will assist with all three tiers of conservation. The burrowing owl fee will be used to complete conservation actions in all three tiers as well, but if the population trend is downward, use of the burrowing owl fee could shift as described below. The types of conservation actions that burrowing owl fee funds will be used for will depend on the conservation need at the time the accumulated funds are spent, and may include activities in all tiers. However, in the short-term<sup>2</sup>, funds collected from the burrowing owl fee will be used for two purposes: protection and management of occupied burrowing owl habitat (Tier 1), and data collection (e.g., annual surveys).

Through the course of the permit term these three tiers of conservation actions may occur in any of the four burrowing owl conservation regions. Initially, Tier 1 conservation actions will only occur in the North San José/Baylands region because occupied burrowing owl nesting habitat currently only occurs in this region. Should burrowing owls begin to nest consistently in other regions of the permit area, Tier 1 conservation actions may occur in those areas as well. Tier 2 conservation activities will occur throughout the permit area, in all four burrowing owl conservation regions because potential burrowing owl nesting habitat occurs in all four regions. Initially, Tier 3 conservation activities will only occur in the North San José/Baylands region since this is where existing nest colonies occur, and there is the greatest potential for effective implementation of these measures, should they become necessary. Tier 3 conservation actions may also occur in other regions later in the permit term if nesting burrowing owls establish there on their own.

### **M.3.1 Setting Conservation Priorities**

The Implementing Entity will determine how burrowing owl conservation funding will be allocated. Acquisition in fee title or conservation easement will always be the preferred strategy. However, given the unique circumstances for

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<sup>2</sup> Until at least two annual surveys (one to establish the baseline and one year to determine whether or not the population is increasing by three birds per year) have been completed.

the burrowing owl, the conservation strategy for the burrowing owl includes more flexibility than is provided for the conservation strategy for other covered species. The default assumption is that funds generated from the burrowing owl fee will be used to acquire and manage occupied and potential burrowing owl nesting habitat in the South Bay area through fee title, conservation easements, or management agreements. Other funding sources may also be used for this purpose, but monies from the burrowing owl fee will be earmarked for this purpose, as well as for other burrowing owl conservation actions. The selection criteria for how acquired or managed parcels will be chosen are discussed below (see Section M.4.3). Burrowing owl fees will be used wholly to acquire and manage occupied or potential nesting habitat, as long as the PVA population curve indicates a positive growth. During the first 10 years, this will be assumed to be occurring as long as there is sufficient annual increase of at least three adult owls per year cumulatively at the annual survey sites (e.g., Moffett Airfield, Shoreline, San José Airport, VTA Cerone bus yard, and San Jose/Santa Clara Water Pollution Control Plant buffer lands). During the first 10 years, burrowing owls will be surveyed inside the permit area to begin to build a dataset that can be used in a PVA for the South Bay population starting in Year 10. From that point forward the PVA will be based on all sites surveyed in the South Bay area, both inside and outside of the permit area, for which sufficient data exists. This will give the most accurate picture of population viability in the South Bay and will better inform whether the conservation strategy is working. Conservation action prioritization will be based on available funding and the numbers predicted by the PVA model necessary to achieve positive growth.

The first year of annual surveys will determine the baseline population of burrowing owls in the permit area. If during Plan implementation the cumulative annual growth rate is below the three-owl threshold at the annual survey sites, or after more colonies are added to the model, below whatever number of owls is predicted by the model to achieve positive growth, then 50% of the revenue generated from the burrowing owl fee will be shifted from Tier 1 and 2 conservation actions to Tier 3 conservation actions. The decision about funding allocation for Tier 1 and 2 conservation actions versus Tier 3 conservation actions will be made following the annual survey that begins during the second full year of Plan implementation. The numbers of adult burrowing owls annually at the three index sites will be compared to the number of adult burrowing owls observed at the three sites during the first full year of implementation. Following the assessment during year two, the change in the number of adult burrowing owls at the three sites will be documented annually and the trend recorded. If the goal of an increase of at least three adult burrowing owls is not being met, then the money collected from burrowing owl fee will be split 50/50, between Tier 1 and 2 vs. Tier 3 conservation actions.

## M.3.2 Burrowing Owl Conservation Priorities

### Tier 1 Conservation Actions

1. Protect and manage occupied burrowing owl nesting habitat (an active nest and foraging lands within 0.5 mile of the active nest).

In order to identify occupied nesting habitat, the Implementing Entity will coordinate annually with survey efforts conducted at known nesting sites in the permit area including surveys conducted at San José International Airport, Moffett Federal Airfield, Shoreline at Mountain View, VTA Cerone bus maintenance yard, and San Jose/Santa Clara Water Pollution Control Plant buffer lands. Additional locations will be surveyed in subsequent years as new colonies are formed or discovered over the permit term. The Implementing Entity will coordinate with survey staff at the first three locations to obtain data from ongoing annual survey efforts and will provide guidance on the survey information required to inform regional data collection. The Implementing Entity will be responsible for conducting surveys at the last two locations (and any new colonies that may be discovered during the permit term) and will use the same methodology across sites to ensure consistency. All surveys will be conducted consistent with California Burrowing Owl Consortium methodology (California Burrowing Owl Consortium 1993). Data collected from the annual survey sites will be used to track the number of adult burrowing owls and to assess reproductive status. Information will contribute to a rolling population viability analysis in the region. Collectively, the data will inform the adaptive management of this species and will help prioritize use of funds for burrowing owl conservation under the Plan. The first annual survey will occur during the first full year of Plan implementation and each year thereafter.

The protection of occupied and potential nesting habitat will be tracked in the same manner as other land cover types, discussed in Section 8.6.1, to ensure that impacts are occurring in rough step with habitat goals based on the necessary population increase to allow for recovery.

2. Increase survival rates at existing nest colonies through one or more management actions including, but not limited to:
  - a. protection of nests by controlling access and maintaining fencing,
  - b. predator control,
  - c. habitat management to increase prey availability,
  - d. cessation of inappropriate rodent control (e.g., application of rodenticides, hunting, or trapping) on-site and/or implementation of activities that would enhance burrowing mammals.
3. Where feasible, fund management activities on the three index sites (San José International Airport, Moffett Airfield and Shoreline) to benefit burrowing owls.

## Tier 2 Conservation Actions

Tier 2 conservation actions will be initiated during the first year of implementation. These actions will require several years to complete and will be initiated upon Plan implementation.

1. During the first 3 years of implementation, survey all undeveloped parcels within 7.5-miles of documented nest colonies in the North San José/Baylands Region and complete an opportunities and constraints assessment of each, relative to the potential of the parcel to function as a burrowing owl reserve in the future. Assign parcels a high, medium, or low priority for burrowing owl conservation.
  - a. High: parcel with documented nesting burrowing owls in the previous 3 years and grassland or barren land cover, which can be managed (vegetation height) to be favorable to burrowing owls and is currently occupied by ground squirrels or has other suitable nesting burrows. Existing landowners willing to enter into management agreements and current land uses that are compatible with burrowing owl habitat requirements would be ranked higher than those that do not meet these criteria.
  - b. Medium: parcel with no history of burrowing owl occupancy but with grassland or barren land cover, which can be managed (vegetation height) to be favorable to burrowing owls and is currently occupied by ground squirrels or has other suitable nesting burrows.
  - c. Low: parcel with grassland or barren land cover type that can be managed (vegetation height) to be favorable to burrowing owl but lacks ground squirrels or other suitable nesting burrows.
2. The Implementing Entity will also coordinate with other South Bay local governments, special districts, and non-profit organizations every 3 years to assess status of the burrowing owl population in the study area and the expanded study area for burrowing owl conservation. These survey efforts are aimed at identifying occupied and potential burrowing owl habitat in the four burrowing owl conservation regions. The focus of this larger survey effort is to document population expansion into new areas. This 3-year survey will help determine whether the range of nesting burrowing owls in the study area and expanded study area for burrowing owl conservation is stable and, possibly, expanding. Analysis of the survey results will encompass the areas surveyed annually, areas with historical or recent occurrences of nesting burrowing owls, and areas with highly suitable habitat that has not been occupied in the past.
3. Protect and/or manage potential or occupied burrowing owl nesting habitat as described above.
4. Conduct two meetings annually of burrowing owl survey partners. The first meeting will be in January, prior to the burrowing owl nesting season to coordinate with surveyors and ensure that all appropriate locations are surveyed. The second meeting would be in September, following the

burrowing owl nesting season, to gather data from surveyors and discuss potential changes in survey protocols.

## **Tier 3 Conservation Actions**

1. With Wildlife Agency approval, implement a program to increase reproductive success of burrowing owls in the South Bay area. General success criteria for the program will be defined in close coordination with the Wildlife Agencies and set prior to its implementation, during the surveys described in Tier 2, and based on the success or failure of the program, interim checkpoints will be established to determine if/when the program should cease.
2. Study the feasibility of population augmentation activities including the following.
  - a. Initiate a pilot reintroduction program and study the success of the effort and the feasibility of replicating the effort elsewhere. Potential locations for a pilot study include, but are not limited to:
    - 1) San José International Airport VOR site (radio tower),
    - 2) fenced portion of San Jose/Santa Clara Water Pollution Control Plan buffer lands,
    - 3) fenced portion of Don Edwards,
    - 4) existing burrowing owl mitigation area in the City of Santa Clara at the end of Great America Parkway, and
    - 5) Parts of Shoreline Park designated burrowing owl habitat under an approved Burrowing Owl Management Plan.
  - b. Initiate a pilot study to determine other methods to increase reproduction of local burrowing owls. These methods may include but are not limited to:
    - 1) protect nest sites to reduce predation on eggs and young,
    - 2) supplemental feeding of nesting females and young,
    - 3) forced re-nesting or double-clutching of owls in captivity, and
    - 4) foster nestlings to maximize brood size.

If studies have not been completed to justify the use of one or more of these techniques, then funds shifted to Tier 3 will be used first to plan and complete those studies.

## **M.4 Habitat Management and Enhancement**

### **M.4.1 Occupied and Potential Nesting Habitat**

The Plan assumes that 5,300 acres of occupied and potential nesting habitat will be managed for the conservation strategy. This land may be acquired in fee title or conservation easement, or it may be managed under temporary or permanent management agreements. At a minimum, 600 acres of the 5,300 acres must be protected under a conservation easement as part of the Reserve System, and this 600 acres must be occupied nesting habitat.

#### **Assumptions for Calculating Amount of Conservation Needed**

1. In order for the South Bay burrowing owl population to be stable or increasing, an additional three owls (1.5 breeding pair) will need to be recruited into the population each year.
2. A breeding location (nest) requires a minimum of 140 acres of foraging habitat surrounding the nest site. If an additional 1.5 breeding pairs are recruited into the local population each year an additional 210 acres ( $1.5 \times 140 = 210$ ) would need to be managed each year to support that expansion.
3. Many of the areas where conservation opportunities exist are already owned and managed by Permittees. It is assumed that some conservation actions will occur on those lands to benefit burrowing owls outside of the Plan requirements. As such, the acres of new lands that will be acquired or put under management agreements was reduced by 15%.
4. Owls from multiple nest sites use the same foraging habitat (i.e., breeding territories overlap). The total estimate of land that needs to be acquired and/or managed for burrowing owl population growth has been reduced by 20% to account for this overlap in foraging habitat.
5. Utilizing survey data from 2009 the number of adult burrowing owls for Shoreline Park (6), Moffett Airfield (26), and San José International Airport (19) was 51 adult burrowing owls. An additional 19 burrowing owls were observed during surveys in 2008 in other parts of the Habitat Plan study area. This total of 70 adult burrowing owls in the South Bay area is a good estimate of the baseline number of adult burrowing owl in the South Bay area. Of those 70 owls, 38 (or 54%) were inside of the Habitat Plan study area.
6. It is assumed that even though 54% of the burrowing owl population currently resides inside the Habitat Plan study area, the Habitat Plan conservation strategy will address the habitat needs of 70% of the population going forward. This additional commitment is an acknowledgement of habitat lost in the north San José area in the past and demonstrates a

commitment to recovering the species in the South Bay area during the permit term.

7. If three burrowing owls (1.5 breeding pair) are recruited to the population each year, a total of 220 (70 baseline+150 new) would be attained over the 50-year permit term. Based on a commitment to support 70% of the habitat needed for a successful South Bay burrowing owl population, 154 (70% of 220) adult burrowing owls would be supported by lands managed by the Implementing Entity by the end of the permit term. Therefore adding 116 owls (154 total – 38 baseline) would be the responsibility of the Implementing Entity. Those additional 116 adult burrowing owls (58 breeding pair) would require 140 acres of foraging habitat per pair, for a total of 8,120 acres.
8. The 8,120 acre requirement would be reduced by 15% (see number 3 above) to give credit for additional conservation actions and by 20% (see number 4 above) to account for overlapping foraging habitat between breeding pairs  $(8,120 - (8,120 * 15\%) - (8,120 * 20\%) = 5,278$  acres which is rounded to a 5,300-acre commitment in the Habitat Plan).

## Nesting Habitat Acquisition and Management

Based on these assumptions, the Implementing Entity will manage a minimum of 5,300 acres for the western burrowing owl nesting habitat (occupied and potential) by Year 45. Of this acreage, a minimum of 600 acres of occupied nesting habitat must be protected in fee title or conservation easement. For the remaining 4,700 acres, land acquisition (fee title or easement) or management agreements may be used. The Implementing Entity will prioritize land acquisition over management agreements. All 5,300 acres of western burrowing owl nesting habitat will be acquired or under a permanent management agreement by Year 45.

Management agreements may be used in place of land acquisition on up to 4,700 acres, if the specified regional targets cannot be met through land acquisition. During the permit term, temporary management agreements may be put into place rather than permanent management agreements. Temporary management agreements (e.g., 10–20 year agreements as opposed to agreements in perpetuity) may be used to protect nesting habitat on areas not immediately planned for development as long as the amount of land permanently protected in fee title or conservation easement is consistent with the Stay-Ahead provision (Chapter 8, Section 8.6.1 *Stay-Ahead Provision*, subheading *Rough Proportionality and Stay-Ahead for the Burrowing Owl Conservation Strategy*). By Year 45 of the permit term, all management agreements must be permanent.

The management agreements must be legally binding documents to which the Wildlife Agencies are parties. Their establishment will follow a process similar to land acquisition described in Chapter 8, Section 8.6 *Land Acquisition*. The management agreements will be consistent with the land acquisition process; however, the Implementing Entity would work with the land owner to establish

the management agreement rather than acquiring the land in fee title or with a conservation easement. The duration and management requirements will be agreed upon by all parties and specified in the management agreement document. For the permanent management agreements, management must be assured in perpetuity. For temporary management agreements, management must be assured for the duration of the agreement. As parties to the management agreements, the Wildlife Agencies will have review and approval authority.

The opportunities for burrowing owl conservation are discussed for each burrowing owl conservation region in Section M.2.1 (above) and summarized in Chapter 5. Since the North San José/Baylands region is the most important for burrowing owl conservation and has the most immediate conservation opportunities, 70% (3,700 acres) of the total land management should occur in that region. These management agreements would occur inside the permit area, including the expanded study area. In addition, 15% (800 acres) of the total land managed would occur in the Gilroy region. The remaining 15% should remain flexible and could occur in any of the regions, but we recommend that 5% (270 acres) occur in the South San José region and 10% (530 acres) occur in the Morgan Hill region.

## M.4.2 Overwintering Habitat

There are 132,770 acres of burrowing owl overwintering only modeled habitat within the study area. A total of 28,517 acres (21%) of overwintering modeled habitat are located in Type 1, 2, or 3 open space with 12,584 acres (9%) of that habitat permanently protected as Type 1 open space. The Plan proposes to acquire a minimum of 17,000 acres of modeled overwintering habitat for the Reserve System. In addition, 4,310 acres of overwintering modeled habitat for western burrowing owl will be added to the Reserve System from existing open space. Incorporation of County Park lands into the Reserve System (**Table 5-5** and **Figure 5-4**) will benefit the species by providing opportunities for habitat enhancement and long-term monitoring. All of these acquisitions and additions will increase the proportion of protected overwintering modeled habitat in the study area to 26% in Type 1 open space and 34% in Type 1, 2, or 3 open space (**Table 5-17**).

Modeled overwintering habitat for western burrowing owl will be permanently preserved, managed, and enhanced throughout the Reserve System in all major watersheds in the permit area. Overwintering habitat will be protected in low elevation grassland valleys in the Diablo Range that currently support California ground squirrels, have supported California ground squirrels since 1997, or are adjacent to lands with existing California ground squirrel colonies (LAND-G8). Low elevation valleys within the Reserve System that are located on the valley floor or in the Diablo Range will be managed to benefit nesting and overwintering burrowing owls. Some locations on the southern edges of the City of San José could support burrowing owls in the future. In addition, several acres will be acquired in the southern part of the permit area in the Pescadero watershed that could be converted to annual grassland and managed for western

burrowing owls. Nearly all land acquisition in areas dominated by annual grassland has the potential to benefit overwintering owls. Most of that land acquisition will occur along Coyote Ridge, west of Chesbro Reservoir, west and east of Calero Reservoir, and between Henry W. Coe State Park and the San Benito County line. This land acquisition has been primarily targeted for other covered species but will have incidental conservation benefit for western burrowing owls, especially during the winter months.

### **M.4.3 Reserve System Lands Selection Criteria**

Land that is acquired through fee title purchase or easement to meet biological goals and objectives for burrowing owl nesting and overwintering habitat in the Habitat Plan permit area will be selected using the reserve design principles in Chapter 5. All lands or easements will be acquired from willing sellers using the process defined in Chapter 8.

#### **Location Criteria**

When identifying and acquiring the 600 acres for permanent protection and enrollment into the Reserve System, the Implementing Entity will use the following guidelines.

1. The Implementing Entity will preferentially select a parcel that is inside of the Habitat Plan study area over a parcel that is inside of the expanded study area for burrowing owl conservation.
2. The Implementing Entity will preferentially select parcels that are closer (i.e., within 0.5 mile) to documented nest locations over those that are farther away.
3. Parcels that do not meet criteria 2 (above) may be considered on a case-by-case basis to allow the Implementing Entity to take advantage of unusual opportunities or circumstances<sup>3</sup>.

#### **Habitat Criteria**

The 600 acres of occupied nesting habitat acquired for the Reserve System must have the following:

1. Documented nesting burrowing owls on the parcel in at least one of the previous 3 years. Parcels that are currently occupied should be selected first, followed by parcels that have been occupied in the previous 3 years.

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<sup>3</sup> It is not the intent of the burrowing owl conservation strategy to permanently protect or permanently manage lands in urban areas that are anticipated to be developed (e.g., the North First Street area of San José).

2. Be surrounded by at least 140 acres of foraging habitat within 0.5 mile of a nest site (including the parcel where nesting was documented). If there is no potential for foraging habitat to be protected through future acquisition, conservation easement, or management agreement, the nest site should not be acquired unless long-term viability of the site can be in some other way demonstrated.
3. Currently supports ground squirrels or is located adjacent to another parcel with ground squirrels.
4. Currently support grassland, barren, or other land cover types that can be managed or modified to enhance the site to increase the habitat quality for burrowing owls.

## Parcel Criteria

All parcels considered for inclusion in the Reserve System and managed as burrowing owl habitat will meet the following criteria.

1. Parcel size is not a limiting factor on burrowing owl occupancy, however larger parcels will be favored over smaller parcels to maximize the benefits of conservation funding that will be generated under the Habitat Plan. Larger parcels will support more burrowing owls over the long term and provide both nest sites and foraging habitat. Further, larger parcels allow for more options for important management practices (e.g., grazing with sheep is more practicable on a larger parcel than on a smaller one).
2. Adjacent land uses should not constrain necessary management (e.g., seasonal mowing, winter disking, grazing, or other methods of vegetation removal). Fencing around the parcel must be feasible to control human and animal access. Control of non-native predators (e.g., feral cats, foxes) must also be feasible on the site.
3. Ground squirrel management will not occur on the parcel (see above), so adjacent land uses should be such that ground squirrel control will not be needed (e.g., levees, dams, ranchlands where ground squirrels are not desired).

## M.5 Management Techniques and Tools

The general principles for grassland management will be followed in all grassland or barren areas (Section 5.3.3, *Grassland Conservation and Management*). Management techniques may include any or all of those outlined in Section 5.3.3 *Grassland Conservation and Management*; however, those that will be most beneficial to burrowing owls are grazing and mowing.

Enhancement of sites supporting nesting or overwintering will include maintaining a maximum Effective Height of 5-inches (Green and Anthony 1989).

There are two time periods when this is important, before February 1<sup>st</sup>, so the grasses at the site will be short when owls are selecting nest sites, and following the growing season (dependent on rainfall), so grasses will remain short until the next growing season. Burrowing owl management areas will be assessed monthly to determine if additional mowing treatments are needed to meet the maximum Effective Height of 5-inches requirement. Further, all nesting and overwintering locations that are managed will have restrictions on California ground squirrel control (GRASS-5). On sites where owls are not currently nesting but where attracting owls is consistent with management goals and where California ground squirrels are not present, artificial burrows will be installed to make breeding and wintering sites available immediately for burrowing owls (GRASS-9) (Barclay 2008). Artificial burrows will be used as a temporary measure to encourage use by burrowing owls while long-term measures such as ground squirrel population enhancement are developed and implemented.

Grazing can be used to reduce the biomass or effective height of nonnative invasive species and to maintain structural heterogeneity within the natural community. Grazing is beneficial to burrowing owls because it keeps the vegetation short. Short vegetation is necessary for a site to serve as functional nesting habitat for burrowing owls. Most of the grazing in the permit area will be by livestock (GRASS-6). In some urban areas grazing with goats or sheep may be a better approach.

In some instances, mowing is a reasonable alternative to grazing, and mowing in selected areas is often an option when grazing is infeasible (e.g., urban sites) (GRASS-8). Mowing can also be safer and easier to implement on small isolated parcels, which suits burrowing owls better than any other covered species. In either case the goal of vegetation management will be to reduce the overall height and Effective Height of vegetation on burrowing owl habitat to optimal conditions for the species (GRASS-8). Deep ripping will not be performed in the Reserve System or management areas for the burrowing owl because it often destroys burrows and increases soil erosion. Using light disking outside of the nesting season may be used in select cases. The use of light disking will be evaluated on a case-by-case basis and will be used only when other forms of vegetation removal are not practical. Disking does not result in re-contouring of the landscape and will not affect site hydrology.

The Implementing Entity will allow and encourage colonization by California ground squirrels in managed grasslands and barren lands, excluding engineered levees and dams. This expansion of colonies will be monitored and only allowed in areas where conflicts with covered activities will be minimized (GRASS-5). To facilitate this expansion of California ground squirrel colonies the Implementing Entity will cease using rodenticides on managed lands except when needed to protect the integrity of structures such as levees and dams (reservoirs or stock ponds) or to prevent nuisance (as defined in the Fish and Game Code Sections 4150 and 4152) populations on adjacent private lands (GRASS-5). This may include relocating ground squirrels from areas where they are less desirable (dams, levees, golf courses, etc.) into areas where they are needed and their presence is compatible with surrounding land uses.

## M.6 Threats and Uncertainties

Burrowing owls have been reluctant to disperse very far from their natal burrows within Santa Clara County (J. Barclay pers. comm.). A conservation strategy that depends on individual owls dispersing from known breeding sites (e.g., San José International Airport) to newly protected sites is uncertain. Further, the success of the burrowing owl population at San José International Airport is not guaranteed over the long term. Should the breeding population at San José International Airport be reduced significantly in the future there will be far fewer burrowing owls to recolonize these newly protected areas.

The second most vigorous burrowing owl breeding population in the study area is at the San Jose/Santa Clara Water Pollution Control Plant buffer lands. Management of this area has varied in the recent past and there is no long-term guarantee that the burrowing owl population will persist at this site. Planned development of portions of this site would result in the loss of burrowing owl habitat.

Though habitat is managed for burrowing owls at several locations there are still uncertainties with these management programs. Changes in current management practices that benefit burrowing owls at Moffett Airfield, Shoreline Park, VTA's Cerone bus yard, and Mission College continue to be uncertain and planned future development at any of these sites would be a threat to burrowing owls and their habitat.

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