Final Restoration Plan for the Lower Mesa of the Bolsa Chica Ecological Reserve

Prepared for

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TABLE OF CONTENTS

TABLE OF CONTENTS (CONT.)

FIGURES

TABLES

TABLE OF CONTENTS (CONT.)

PHOTOGRAPHS

ATTACHMENTS

1.0 Introduction

The Restoration Plan for the Lower Mesa of the Bolsa Chica Ecological Reserve is a collaborative effort between the California Department of Fish and Game (CDFG), the Bolsa Chica Land Trust (BCLT), and Recon Environmental, Inc. (RECON). Because the restoration project is located in the coastal zone, the California Coastal Commission is also providing guidance in the development and approval of this plan.

The Lower Mesa contains disturbed non-native grassland, eucalyptus grove, and coastal sage scrub, which provide roosting and nesting habitat for special status raptors as well as habitat for southern tarplant (*Centromadia parryi* ssp. *australis*), a sensitive plant species. As coastal upland and wetland habitats are becoming increasingly rare, habitat restoration efforts are necessary for the recovery and conservation of these sensitive species. The ultimate goal of this project is to create a diversity of habitats that can continue to support these species as well as additional species of native plants and wildlife.

This plan utilizes community-based restoration methods to provide an opportunity for local community members to actively participate in the conservation of coastal resources. By engaging in community-based restoration projects, local volunteers will gain a vested interest in their local natural resources and become stewards of the environment.

2.0 Conservation Status

The Lower Mesa of the Bolsa Chica Mesa (Lower Mesa) is part of the Bolsa Chica Ecological Reserve in Huntington Beach, California. The Lower Mesa is located northeast of the Pacific Coast Highway, south of Warner Avenue, and west of the Hearthside Homes housing development (Figures 1–3).

2.1 Background

The land use planning effort for the Bolsa Chica Mesa began in 1982 when the California Coastal Commission (Commission) began considering the Bolsa Chica Local Coastal Program (LCP). The LCP would consist of a Land Use Plan (LUP) and implementation program. In 1984, the Commission approved the first proposed LUP. A revised LUP in 1985 proposed intensive development of the area including 575 acres of mixed use marina/commercial facilities and high-density urban development that were never completed.

FIGURE 1

Regional Location

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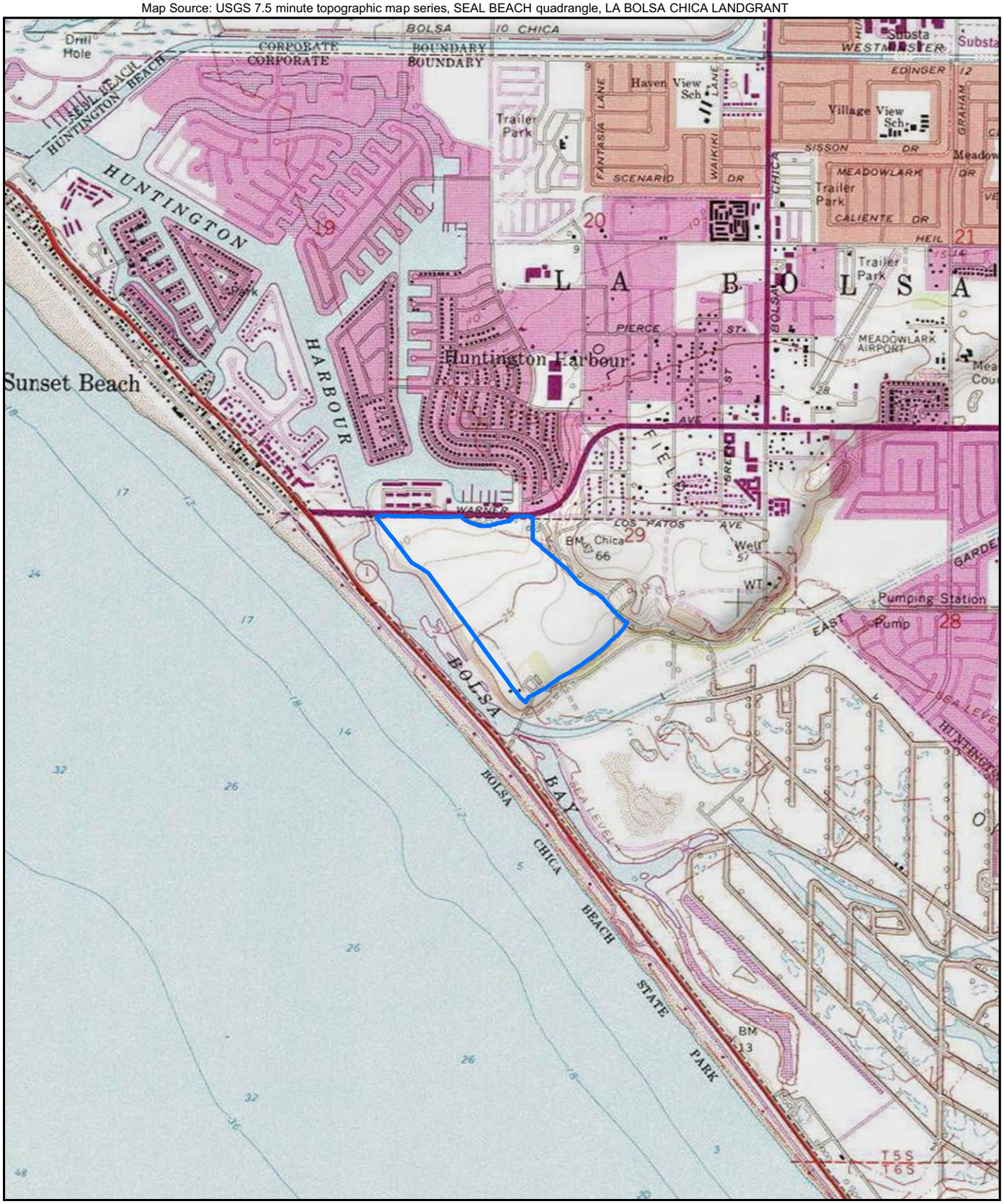
Map Source: USGS 7.5 minute topographic map series, SEAL BEACH quadrangle, LA BOLSA CHICA LANDGRANT



Restoration Area

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FIGURE 2

Project Location on USGS Map

Image source: Copyright 2010 Aerials Express, All Rights Reserved (flown Mar 2010)

Restoration Area

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FIGURE 3

Project Location on
Aerial Photograph

In 1995, the County of Orange submitted an amended proposal of the LCP to the Commission, with scaled-back plans for development of 2,400 homes on the mesa and 900 homes on the lowland. The development also included the elimination of Warner Pond and the fill of 120 acres of wetlands in the lowlands for residential development. When the Commission approved this plan in 1996, the decision became the subject of a lawsuit. It was determined that the Commission's decision conflicted with Sections 30233 and 30240 of the California Coastal Act. Section 30233 prohibits the fill of wetlands for residential purposes. Section 30240 protects environmentally sensitive habitat areas (ESHA) from significant disruption of habitat values (Commission 2010a). Warner Pond was determined to be an ESHA and, as such, could not be filled under Section 30240. As a result, the trial court set aside certification of the LCP and remanded it back to the Commission for reconsideration in 1997.

Subsequently, revisions were made to the LCP, including scaling back residential development of the mesa to 1,235 homes, eliminating residential development on the lowland, and preserving Warner Pond. These revisions were certified by the Commission in 1997. Due to these changes, the developer sold 880 acres of the lowland to the State of California. The lowland later became the subject of wetland restoration and was incorporated into the Bolsa Chica Ecological Reserve.

The Commission's 1997 certification of the LCP was set aside by a trial court in 1998 after it was determined that the Commission did not properly consider the entire LCP in the revisions. The County of Orange and the developer suggested changes to the LUP and made an informal submittal of the revised plan to the Commission in 2000. In 2000, the LUP was approved with modifications by the Commission. Modifications from the Commission included restricting residential development to the Upper Mesa and designating the Lower Mesa for conservation (Commission 2000). Following that action, the developer made plans to sell the Lower Mesa for conservation. Although the LUP was never approved, permits for the development of the Upper Mesa by Hearthside Homes were approved by the Commission and the Lower Mesa was purchased by the California State Lands Commission in 2005 (Commission 2010b).

The Lower Mesa was transferred to CDFG in 2007 and incorporated into the Bolsa Chica Ecological Reserve. In 2008, the CDFG and the BCLT signed a Memorandum of Understanding (MOU) for the *Lower Mesa Restoration Project at the Bolsa Chica Ecological Reserve* stating that both parties would develop and implement a habitat restoration program on the Lower Mesa. A Mitigated Negative Declaration was prepared by CDFG with the assistance of BCLT (2011) to address any adverse environmental impacts that would occur during the implementation of the restoration activities. CDFG then released the Mitigated Negative Declaration for public review in accordance with the CEQA process. This habitat restoration plan has been prepared by RECON to provide detailed methods for the implementation of the *Lower Mesa Restoration Project at the Bolsa Chica Ecological Reserv*e.

2.2 Sensitive Areas

The Lower Mesa contains four sensitive areas: the eucalyptus grove, remnant coastal sage scrub habitat, southern tarplant populations, and Warner Pond (Figure 4). Warner Pond and the eucalyptus grove have been designated as environmentally sensitive habitat areas (ESHA) by the California Coastal Commission. Section 30107.5 of the California Coastal Act defines an "environmentally sensitive area" as: "any area in which plant or animal life or their habitats are either rare or especially valuable because of their special nature or role in an ecosystem and which could be easily disturbed or degraded by human activities and developments" (Commission 2010).

The eucalyptus grove ESHA is located adjacent to Little Pocket Wetland, located along the southeastern boundary of the Lower Mesa (Photograph 1). The eucalyptus grove contains habitat for eleven known raptor species, including the CDFG fully protected white-tailed kite (*Elanus leucurus*). The raptors use the eucalyptus trees for roosting, nesting, and as elevated perch sites for foraging in the adjacent grassland (Bloom 2011).

The Warner Pond ESHA is located along the northern boundary of the Lower Mesa, adjacent to Warner Avenue (Photograph 2). Warner Pond is an approximately 1.7-acre wetland (Commission 2000). A wetland is defined by the California Coastal Act as "lands within the coastal zone which may be covered periodically or permanently with shallow water and include saltwater marshes, freshwater marshes, open or closed brackish water marshes, swamps, mudflats, and fens" (Commission 2010).

Remnant coastal sage scrub totaling 2.48 acres is located on the southeastern bluff adjacent to Little Pocket Wetland (Photograph 3). This community acts as a functional link between upland and wetland habitats for many species. For example, the pygmy blue butterfly feeds only on saltgrass (*Distichlis spicata*) in the wetlands as a caterpillar and on shrubs in the Asteraceae (sunflower) family found in the coastal sage scrub and grassland habitats. Upland predators such as coyotes also may hunt in both upland and wetland habitats. It is important to maintain this ecotone for the preservation of species that rely on both upland and wetland habitats for survival.

Historically southern tarplant has been found scattered throughout 110 acres in non-native grassland in the Lower Mesa (Photograph 4). Southern tarplant is a rare annual species that has a California Native Plant Society (CNPS) rare plant ranking of 1B.1, meaning that the species is seriously endangered in California (CNPS 2011). As a CNPS list 1B species, southern tarplant meets the definitions of Section 1901, Chapter 10 of the Native Plant Protection Act or Sections 2062 and 2067 of the California Endangered Species Act of the CDFG Code and is eligible for state listing. CNPS list 1B species are to be fully considered during preparation of environmental documents relating to the California Environmental Quality Act (CEQA) (CNPS 1998 and 2011).

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Restoration Area

Southern Tarplant Observations (1999-2001, 2004, 2011)

Remnant CSS

Sensitive Habitats

Eucalyptus Grove ESHA

Salt Marsh/Warner Pond ESHA

0 Feet 300

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FIGURE 4

Southern Tarplant and ESHA Locations

PHOTOGRAPH 1
Eucalyptus ESHA Area
Bolsa Chica
Photo: Connie Boardman

PHOTOGRAPH 2
Warner Pond ESHA Area
Bolsa Chica

PHOTOGRAPH 3
Remnant Coastal Sage
Scrub at Bolsa Chica

Between 1991 and 2000, plant surveys estimated the population of southern tarplant on the Bolsa Chica Mesa varied from zero to over 9,000 individuals.

3.0 Existing Conditions

3.1 Existing Vegetation

Four vegetation communities have been documented within the Lower Mesa: coastal sage scrub, non-native grassland, salt marsh, and eucaluptus grove. Coastal sage scrub borders the restoration area. To the west, the coastal sage scrub is part of ongoing restoration. Common species within the restored area include California buckwheat (*Eriogonum fasciculatum*), California sagebrush (*Artemisia californica*), bladderpod (*Cleome arborea* [=*Isomeris arborea*]), wild oat (*Avena* sp.), radish (*Raphanus sativus*), ripgut grass (*Bromus diandrus*), and spreading goldenbush (*Isocoma menziesii* var. *menziesii*). Intact coastal sage scrub is not present within the restoration area.

Coastal sage scrub is also located outside of the restoration area along the southern border. This area appears to be remnant coastal sage scrub dominated by California sagebrush, chaparral prickly-pear (*Opuntia oricola*), coastal cholla (*Cylindropuntia prolifera*), common encelia (*Encelia californica*), fourwing saltbush (*Atriplex canescens*), California buckwheat (*Eriogonum fasciculatum*), and California box-thorn (*Lycium californicum*). Total cover exceeds 75 percent with very few non-native species occurring within the interspaces between shrubs. The most prevalent non-native species are tocalote (*Centaurea melitensis*) and short-pod mustard (*Hirschfeldia incana*). California ground squirrels (*Spermophilus beecheyi*) were observed within the coastal sage scrub.

The majority of the restoration area consists of non-native grassland dominated by Italian ryegrass (*Lolium multiflorum*), ripgut grass (*Bromus diandrus*), wild oats (*Avena* sp.), and radish (*Raphanus sativus*) (Photograph 5). Additional species include southern tarplant, fascicled tarplant (*Deinandra fasciculata*), short-pod mustard (*Hirschfeldia incana*), coyote brush (*Baccharis pilularis*), curly dock (*Rumex crispus*), salt heliotrope (*Heliotropium curassavicum*), non-native barley (*Hordeum* sp.), and telegraph weed (*Heterotheca grandiflora*). Much of the soil has been disturbed by Botta's pocket gophers (*Thomomys bottae*) and California ground squirrels.

The eucalyptus grove is located within the southern corner of the restoration area. The eucalyptus grove has been designated as an ESHA. Dominant plant species include gum tree (*Eucalyptus* sp.), Canary Island date palm (*Phoenix canariensis*), century plant (*Agave americana*), and black mustard (*Brassica nigra*).

PHOTOGRAPH 4
Southern tarplant (*Centromadia parryi* ssp. *australis*)

PHOTOGRAPH 5
Non-native Grasses Currently Dominate the Restoration Area

Salt marsh occurs within the Warner Pond ESHA, adjacent to the northern boundary of the restoration area. Dominant species include alkali heath (*Frankenia salina*) and pickleweed (*Salicornia* sp.).

3.2 Soils and Topography

Soil properties at eight stations within the restoration area were analyzed by Wallace Laboratories in 2007. On average, the first foot of the soil was friable and slightly acid (pH 6.12) with dead roots and gopher pockets present. On average, the soil at depths greater than one foot were compacted and strongly alkaline (pH 8.45), with no rooting generally observed. Soil textures at the eight stations varied between sandy loam, clay loam, and loam (Wallace 2007).

Additionally, four soil types have been mapped within the restoration area: Beaches; Marina loamy sand, 0 to 9 percent; Marina loamy sand, 2 to 9 percent; and Myford sandy loam, 9 to 30 percent slope, eroded (Figure 5).

Beaches consists of sandy, gravelly, or cobbly coastal shores that are washed and rewashed by tidal and wave action. These areas may be partly covered with water during high tides or stormy periods. They support little or no vegetation. Runoff is very slow, and the erosion hazard is high (USDA 1978). Beaches are mapped within the northern border of the restoration area east of Warner Pond. At one time this area may have been beaches, but appears to have been manipulated for urban development. Vegetation is present within this area. Non-native soil may be present (USDA 1978).

Marina consists of somewhat excessively drained soils on terraces near the coast. Slopes range from 0 to 9 percent and elevations range from 50 to 600 feet. Vegetation consists mainly of annual grasses and forbs and some areas of scattered low brush. Marina loamy sand, 0 to 2 percent slopes, is nearly level soil which generally occurs on terraces near the coast. If the soil is bare, runoff is slow and the erosion hazard is slight (USDA 1978). Marina loamy sand, 0 to 2 percent slope is by far the dominant soil type on-site.

Marina loamy sand, 2 to 9 percent slopes, is a gently sloping to moderately sloping soil that generally occurs on terraces near the coast. If the soil is bare, runoff is slow to medium and the erosion hazard is slight to moderate (USDA 1978). Marina loamy sand, 2 to 9 percent slope, is located south of Warner Pond and in the southeastern corner of the restoration area.

Myford consists of moderately well drained soils on marine terraces. These soils formed in sandy sediments. Slopes range from 0 to 30 percent. Elevations range from 50 to 1,500 feet. The vegetation generally is annual grasses and forbs and scattered low growing brush. Myford sandy loam, 9 to 30 percent slopes, eroded, is strongly sloping to

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Restoration Area

Soil Classification

- BEACHES
- MARINA LOAMY SAND, 0 TO 2 PERCENT SLOPES
- MARINA LOAMY SAND, 2 TO 9 PERCENT SLOPES
- MYFORD SANDY LOAM, 9 TO 30 PERCENT SLOPES, ERODED

0 Feet 300

FIGURE 5

Soils

RECON

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moderately steep soil and generally occurs on side slopes of terraces. The profile is similar to the one described as typical of the series, but is very shallow because of erosion. If the soil is bare, runoff is rapid and the erosion hazard is high. Myford sandy loam, 9 to 30 percent slopes, eroded, runs along eastern border of the site (USDA 1978). A small amount is located in the northeastern corner of the site between beaches and Marina loamy sand.

Elevation within the restoration area ranges from approximately 8 feet above mean sea level (AMS) along the northern boundary of the site to 35 feet AMS along the southeastern boundary of the site (see Figure 2). The slope gradually increases from the northwestern corner of the site to the south eastern corner.

3.3 Sensitive Plant Species

A resource search was conducted to gather historic occurrence information on sensitive plants that occur or once occurred within the Lower Mesa. Sensitive plant species occurrences within a 5-mile radius of the Lower Mesa were reviewed (Figure 6a), as well as the sensitive species list from the Initial Study for the Bolsa Chica Lower Mesa Restoration Project (BCLT 2011) and plant vouchers from Consortium of California Herbaria (CDFG 2011a, CCH 2011). One sensitive plant species, southern tarplant, is known to be present within the restoration area and is discussed further below. Additional sensitive plant species documented within 5 miles of the restoration area and their potential for occurrence are discussed in Attachment 1.

3.3.1 Lower Mesa—Known Occurences

Southern tarplant (*Centromadia parryi* ssp. *australis*)—a CNPS 1B.1 species. Southern tarplant is a member of the sunflower family (Asteraceae). It is a CNPS list 1B.1 species (rare, threatened, or endangered in California and elsewhere; seriously endangered in California) (CNPS 2011; CDFG 2011b). As a CNPS list 1B species, southern tarplant meets the definitions of Sec. 1901, Chapter 10 of the Native Plant Protection Act or Sections 2062 and 2067 of the California Endangered Species Act of the CDFG Code, and is eligible for state listing. CNPS list 1B species are to be fully considered during preparation of environmental documents relating to the California Environmental Quality Act (CEQA) (CNPS 1998 and 2011).

This annual herb occurs within the restoration area (LSA 2001; CCH 2011; BCLT 2011; CDFG 2011a). Population estimates within the restoration area ranged from 3,399 to 8,000 between 1999 and 2011 (Table 1) (LSA 2001; Navarro and Osborne (2011). Southern tarplant occurs in mesic grasslands, salt marshes, alkali meadows, ditches, vernal pools, and in coastal scrub less than 650 feet above mean sea level (AMS) in elevation (Roberts 2008; CNPS 2011). The species ranges from southern California to

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Restoration Area
2 mile Buffer
5 mile Buffer

CNDDB Point Observations

Within 2 Miles

- Coulter's Goldfields
- San Bernardino Aster
- Sanford's Arrowhead
- Santa Barbara Morning-glory
- Southern Coastal Salt Marsh
- Southern Dune Scrub
- Southern Foredunes
- Ventura Marsh Milk-vetch
- Coast Woolly-heads
- Estuary Seablite
- Salt Marsh Bird's-beak
- Southern Tarplant

Within 5 Miles

- Coulter's Saltbush
- Davidson's Saltscale
- Gambel's Water Cress
- Los Angeles Sunflower
- Salt Spring Checkerbloom

0 Miles 1

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FIGURE 6a

California Natural Diversity Database: Flora Species Occurrences

northwestern Baja California. This species can form sterile hybrids with fascicled tarplant (*Deinandra fasciculata*). Southern tarplant blooms typically June through October, but can range from May through November (JFP 2011; CNPS 2011). Potential pollinators that have been observed visiting the flowers of southern tarplant include various native bees, skipper butterflies and bee flies (Photographs 6–8).

TABLE 1
SOUTHERN TARPLANT POPULATIONS AT THE LOWER BENCH OF THE BOLSA CHICA MESA

Survey Date	Population Size (# of individuals)	Surveyor
1999	3,399	LSA Associates, Inc.
2000	8,000	LSA Associates, Inc.
2001	7,586	LSA Associates, Inc.
2004	5,951	LSA Associates, Inc.
2011	6,544	CDFG

In Orange County, many historical occurrences of southern tarplant are now extirpated, with population fragmentation being a serious problem. Southern tarplant continues to be threatened by urbanization, vehicles, development, foot traffic, grazing, habitat disturbance, and competition from non-native plants. It is known in California from Los Angeles, Orange, Santa Barbara, San Diego, and Ventura Counties (CNPS 2011).

Reiser (2001) reports that southern tarplant utilizes mesic areas in valley and foothill grasslands, alkaline locales, and peripheral salt marsh. Known populations of southern tarplant at Upper Newport Bay Ecological Reserve occur in mesic grasslands with an ocean influence where most of the surrounding vegetation consists of invasive non-native weeds. Possible associates include Pacific swampfire (*Salicornia pacifica*), alkali weed (*Cressa truxillensis*), and coastal goldenbush (*Isocoma menziesii*). Also at Upper Newport Bay Ecological Reserve, a number of scattered colonies are centered near a bike bridge, which crosses Delhi Channel; southern tarplant is also known to occur at Big Canyon; and an additional site has been observed across the bay along the shoulder of Back Bay Drive. Southern tarplant also occurs at Bonita Canyon on the Irvine Campus, near the Peters Canyon Channel by the intersection of Walnut Avenue and Harvard Avenue east of the Tustin Marin Helicopter Station, at the mouth of the Santa Ana River, near Kalmus in Costa Mesa, and along a graded slope at the Wintersburg Flood Control Channel near Bolsa Chica. Reiser (2001) states that southern tarplant should be given status as federally endangered since it is severely declining throughout its United States range. Coastal development and historical alterations to most coastal drainages in southern California appear to be the primary cause of the severe decline of this species (Reiser 2001).

PHOTOGRAPH 6
Native Bee Visiting
Southern Tarplant

PHOTOGRAPH 7
Skipper Butterfly Nectaring
on Southern Tarplant

PHOTOGRAPH 8
Bee Fly Visiting
Southern Tarplant

3.4 Sensitive Wildlife Species

A resource search was conducted to gather historic occurrence information on sensitive wildlife that occur or once occurred within the Lower Mesa. Sensitive wildlife species occurrences within a 5-mile radius of the Lower Mesa were reviewed (Figure 6b; CDFG 2011a), as well as the sensitive species list in the Bolsa Chica Lower Mesa Restoration Project Initial Study/Mitigated Negative Declaration (BCLT 2011), Bolsa Chica Ecological Reserve East Annual Report (O'Reilly 2011),Belding's savannah sparrow surveys conducted by Zembal and Hoffman (2010) and Hoecker et al. (1998), California least tern surveys conducted by O'Reilly et al. (2011), western snowy plover surveys conducted by Knapp and Peterson (2011), light-footed clapper rail surveys conducted by Zembal et al. (2010, 2011), and raptor surveys conducted by Bloom et al. (2011). Twelve sensitive species have been documented within the restoration area and are discussed further below. Additional sensitive wildlife species documented within 5-miles of the restoration area and their potential for occurrence is discussed in Attachment 1.

3.4.1. Lower Mesa—Known Occurrences

3.4.1.1 Birds

As previously mentioned, one of the primary reasons that the Lower Mesa at Bolsa Chica was conserved was the presence of numerous species of raptors and other sensitive bird species. Photographs 9–12 show some of the sensitive bird species that have been observed on the Lower Mesa. Raptors and other sensitive bird species are described below.

American peregrine falcon (*Falco peregrinus anatum*)—a CDFG fully protected species and USFWS Bird of Conservation Concern. The American peregrine falcon was observed in coastal sage scrub and eucalyptus adjacent to the restoration area in spring 2011 (Bloom and England 2011) and has been reported within the Bolsa Chica Mesa by BCLT (BCLT 2011). Peregrine falcons commonly inhabit open coastal areas and mudflats near cliffs. This species also forages on a variety of birds including pigeons, ducks, grebes, coots, sandpipers, other raptors, and songbirds. They will also forage on small mammals, fish, and insects. Nesting sites are typically located on high cliffs, in trees, or on man-made structures. Nesting sites may be used for multiple years and are considered sensitive.

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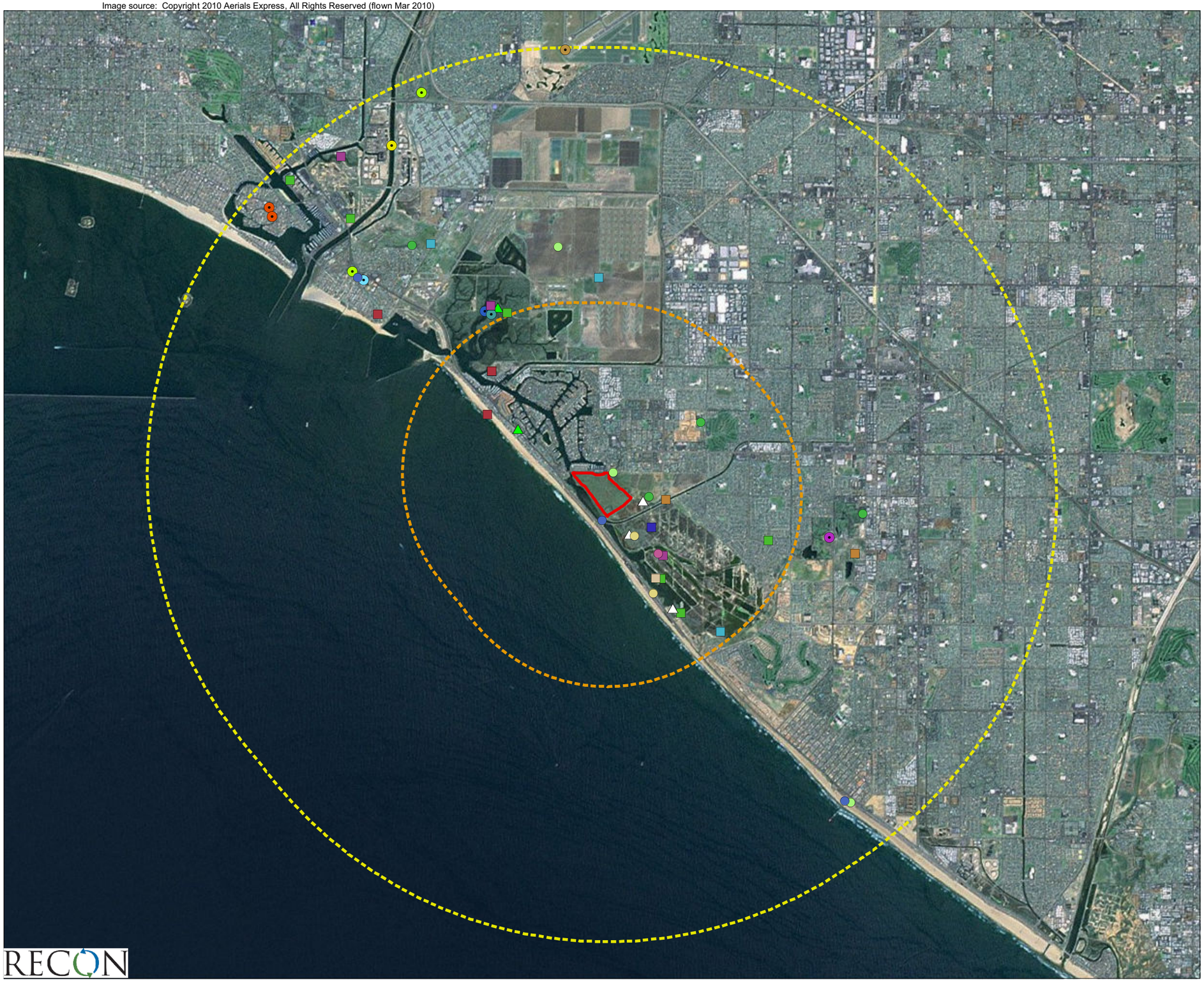

Restoration Area

2 mile Buffer

5 mile Buffer

CNDDB Point Observations

Within 2 Miles

- Belding's Savannah Sparrow
- California Least Tern
- Burrowing Owl
- Coastal California Gnatcatcher
- Light-footed Clapper Rail
- Western Snowy Plover
- Black Skimmer
- South Coast Marsh Vole
- Wandering (=saltmarsh) Skipper
- Dorothy's El Segundo Dune Weevil
- Mimic Tryonia (=California brackishwater snail)
- Monarch Butterfly
- Western Beach Tiger Beetle
- Western Tidal-flat Tiger Beetle

Within 5 Miles

- Southern California Saltmarsh Shrew
- Western Mastiff Bat
- Green Turtle
- Coast Horned Lizard
- Ferruginous Hawk
- Mud Nama
- Sandy Beach Tiger Beetle
- Senile Tiger Beetle

0 Miles 1

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FIGURE 6b

California Natural Diversity
Database: Fauna Species Occurrences

PHOTOGRAPH 9
Osprey (*Pandion haliaetus*)

PHOTOGRAPH 10
American Kestrel (*Falco sparverius*)

PHOTOGRAPH 11
Red-tailed Hawk (*Buteo jamaicensis*)

PHOTOGRAPH 12
Turkey Vulture (*Cathartes aura*)

White-tailed kite (*Elanus leucurus*)—a CDFG fully protected species. The white-tailed kite has been reported within the Bolsa Chica Mesa by BCLT (BCLT 2011) and is known to occur in coastal lowland areas throughout California. White-tailed kite populations in southern California have declined due to the loss of nesting and foraging habitat. The white-tailed kite forages over open areas and grasslands feeding primarily on small rodents and insects. Nesting occurs in riparian woodlands, oaks, or sycamore groves that border grassland or open fields (Unitt 2004). Nesting sites of white-tailed kites are considered sensitive.

Loggerhead shrike (*Lanius ludovicianus*)—a CDFG Species of Special Concern. The loggerhead shrike has been reported within the Bolsa Chica Mesa by BCLT (BCLT 2011) and is a year-round resident of southern California. In southern California, loggerhead shrikes inhabit grasslands, agricultural fields, chaparral, sage scrub, and desert scrub (Unitt 2004). The loggerhead shrike prefers open habitat with perches for hunting and fairly dense shrubs for nesting (Yosef 1996). Loggerhead shrikes feed on small reptiles, mammals, amphibians, and insects that they often impale on sticks or thorns before eating. Their breeding season is from March to August. Ideal nesting sites occur in dense-foliaged, thorny shrubs and small trees that offer cover and protection from predators (Unitt 2004). Nesting sites of loggerhead shrikes are considered sensitive.

Coastal California gnatcatcher (*Polioptila californica californica*)—a federally threatened species and CDFG Species of Special Concern. The coastal California gnatcatcher has been reported within the Bolsa Chica Mesa by BCLT (BCLT 2011) and observed north of the Wintersburg Channel just east of the restoration area. This species is a resident of the coastal slopes of southern California and typically occurs in sage scrub habitat, although chaparral, grassland, and riparian woodland habitats are used where they occur adjacent to sage scrub. Breeding occurs from February through August, and nests are constructed most often in California sagebrush. The coastal California gnatcatcher diet consists mainly of sessile small arthropods, such as leafhoppers, spiders, beetles, and true bugs (Atwood and Bontrager 2001).

Burrowing owl (*Athene cunicularia*)—a CDFG Species of Special Concern and USFWS Bird of Conservation Concern. CDFG is planning a burrowing owl survey to be conducted on the Bolsa Chica Mesa in Summer 2012 for updated status. The burrowing owl has been reported within the Bolsa Chica Mesa by BCLT (BCLT 2011). An adult and burrow were reported in the grasslands within the vicinity of the Bolsa Chica Ecological Reserve in 1993. Species occurrences are also reported from 1977 to 1983 within two miles of the restoration area (CDFG 2011a). Habitat for the burrowing owl includes dry, open, short-grass areas often associated with burrowing mammals. Burrowing owls are opportunistic feeders, consuming a diet that includes arthropods, small mammals, and birds, and occasionally amphibians and reptiles. Nesting occurs in burrows from March through August. Burrowing owls exhibit high site fidelity, reusing the

same burrow year after year (Haug et al. 1993). Burrowing and wintering sites of the burrowing owl are considered sensitive.

Cooper's hawk (*Accipiter cooperii*)—a species on the CDFG Watch List. The Cooper's hawk is adapted to both natural and urban environments and was observed hunting in the Lower Mesa in the spring of 2011 (Bloom and England 2011). This species was also reported within the Bolsa Chica Mesa by BCLT (BCLT 2011). This species traditionally breeds in oak and willow riparian woodlands but also uses eucalyptus and other planted trees. Cooper's hawk nests from March to June high in trees beneath the canopy (Unitt 2004). An active Cooper's hawk nest was reported in a eucalyptus tree in an area adjacent to the restoration area during a raptor survey in the spring of 2011 (Bloom and England 2011). This hawk forages primarily on medium-sized birds and tree-dwelling mammals in forests and brush. Cooper's hawks have wide binocular fields and are capable of inhabiting visually complex and closed habitats (Hall et al. 2010).

Merlin (*Falco columbarius*)—a species on the CDFG Watch List. The merlin has been reported within the Bolsa Chica Mesa by BCLT (BCLT 2011) and is known to winter in California from September to May. This species commonly occurs in coastal regions, grasslands, savannahs, woodlands, lakes, and wetlands. Its primary prey consists of small birds, small mammals, and insects. The merlin does not breed or nest in California (Gardali and Shuford 2008).

Northern harrier (*Circus cyaneus*)—a CDFG Species of Special Concern. The northern harrier has been reported within the Bolsa Chica Mesa by BCLT (BCLT 2011). In California, the northern harrier is a common winter migrant, with some resident breeding populations in the summer. Orange County occurs within the breeding range of the northern harrier, however, breeding populations have declined in California due to loss of wetlands and native grasslands. This species forages in a variety of habitats including marshes, meadows, lakes, rivers, streams, grasslands, sage scrub, pastures, desert sinks, and some croplands. Its diet consists of small- and medium-sized rodents, birds, reptiles, and frogs (Gardali and Shuford 2008).The northern harrier most commonly nests on the ground at the edge of marshes but will also nest on grasslands, in fields, or in areas of sparse shrubs (Bildstein et al. 1996). Nesting sites for this species are considered sensitive.

Olive-sided flycatcher (*Contopus cooperi*)—a CDFG Species of Special Concern and USFWS Bird of Conservation Concern. The olive-sided flycatcher has been reported within the Bolsa Chica Mesa by BCLT (BCLT 2011) and is a known summer resident in California. It occurs within the edges and openings of relatively dense forests or within semi-open forests. Its breeding season occurs from May to August and is known to nest in eucalyptus, oaks, willows, and alders. Its diet is almost entirely insects (Gardali and Shuford 2008).

Osprey (*Pandion haliaetus*)—a CDFG Watch List species. The osprey is an uncommon winter visitor to coastal southern California and has been reported within the Bolsa Chica Mesa by BCLT (BCLT 2011). The osprey was also observed in coastal sage scrub and Eucalyptus adjacent to the restoration area in spring 2011. The osprey requires clear, open water for foraging including rivers, lakes, reservoirs, bays, and estuaries to feed on fish There is a multi-year active nest of osprey at Upper Newport Bay Ecological Reserve with annual banding of young. Ospreys have successfully nested at Upper Newport Bay Ecological Reserve since a nesting platform was erected in 2006. Over the following five years a total of 17 chicks have successfully fledged. A nesting platform was erected at the San Joaquin Marsh, and in 2010 a female from the 2008 Newport clutch successfully fledged one chick.

Sharp-shinned hawk (*Accipiter striatus*)—a CDFG Watch List species. The sharp-shinned hawk is a common winter visitor to southern California and has been reported within the Bolsa Chica Mesa by BCLT (BCLT 2011). This species consumes avian prey such as songbirds, waterfowl, and quail. During winter, this species populates lower elevations using brush, shrubs, and trees that provide cover and large concentrations of small birds. The sharp-shinned hawk does not breed in southern California (Grindrod n.d.).

Other Species Covered Under the Migratory Bird Treaty Act of 1918. The following species have also been observed nesting within or adjacent to the restoration area: American kestrel (*Falco sparverius*), great horned owl (*Bubo virginianus*), and common raven (*Corvus corax*).The following species were also observed within or adjacent to the restoration area: red-tailed hawk (*Buteo jamaicensis*), turkey vulture (*Cathartes* aura), and barn owl (*Tyto alba*) (Bloom and England 2011). These species are not considered sensitive but are protected under the Migratory Bird Treaty Act of 1918.

3.4.1.2 Reptiles

Silvery legless lizard (*Anniella pulchra pulchra*)—a CDFG Species of Special Concern. The silvery legless lizard has been reported within the Bolsa Chica Ecological Reserve by BCLT (BCLT 2011). This species has been documented along the bluffs of the southeastern boundary of the restoration area. This species lives mostly underground by burrowing in loose sandy soils. Moisture is essential for this species to be present. It can often be found under objects on the soil surface such as rocks, boards, driftwood, logs, and leaf litter. Larval insects, beetles, termites, and spiders serve as prey (Nafis 2011).

4.0 Restoration Goals

The goals of this restoration project are:

- Increase the overall native plant diversity within the Lower Mesa by restoring native grassland, coastal sage scrub, seasonal pond, alkali marsh-upland transition, and mule fat scrub on the Lower Mesa in areas currently dominated by non-native grass and herbaceous plant species.

- Increase the population of southern tarplant by decreasing competition from weed species and creating seasonal pond habitat that will support southern tarplant.

- Enhance raptor foraging habitat by restoring native grassland and raptor roosting and nesting habitat by planting additional trees in the eucalyptus ESHA.

- Provide opportunities for community involvement by using volunteers to implement community-based restoration practices.

- Provide educational opportunities for volunteers, students, and community members by using an on-site nursery as a "living laboratory" for environmental education.

The primary goal of this plan is to create a diversity of habitats that support a variety of species and to enhance the overall habitat function of the Lower Mesa. Restoration activities will result in enhanced habitat for the sensitive plant and wildlife species present at the Lower Mesa and surrounding areas, including southern tarplant, sensitive raptor species, silvery legless lizard, and potentially coastal California gnatcatcher.

The creation of seasonal pond and native grassland habitat, coupled with the reduction of weed species, is expected to increase the amount of suitable habitat for southern tarplant in the restoration area. Roberts (2007) recommends the reduction or removal of non-native grasses and the creation of perennial or alkali annual grasslands to manage for southern tarplant within the restoration area. In addition, coastal sage scrub, consisting of sparse (open) shrub cover and a native grassland understory, may allow for southern tarplant establishment within the interspaces of shrubs (Roberts 2007).

Raptor foraging habitat will be enhanced through the restoration of native grasslands. As stated by Bentley et al. (2005), raptor habitat restoration best management practices (BMPs) include: (1) the restoration of native species in areas where natural vegetation has been altered, (2) the creation of shrub thickets for foraging habitat, (3) control of weed species, and (4) manage, restore, and enhance raptor habitat. Habitat restoration activities for this plan will utilize these BMPs by restoring and enhancing existing raptor roosting, nesting, and foraging areas. Raptor foraging areas will be restored by converting the existing non-native grassland to native grassland composed of native

bunchgrasses and a variety of other native grassland species. Native grassland is attractive to raptor prey such as small mammals, songbirds, and reptiles because it provides protective cover, quality nesting habitat, and food (Salk 2006). The open coastal sage scrub and mule fat scrub restoration will provide additional foraging and nesting habitat for migratory songbirds, small mammals, and reptiles, while providing interspaces between shrubs to allow raptors the ability to visually detect prey. The existing eucalyptus grove ESHA will be enhanced through the addition of trees such as western sycamore (*Platanus racemosa*) and southern California black walnut (*Juglans californica*) in order to provide roosting and nesting sites to supplement the dying eucalyptus trees. In addition, nest platforms can be installed within the EHSA to provide potential nesting habitat.

Silvery legless lizard habitat will also be enhanced through the removal of weed species and the creation of seasonal pond habitat. Silvery legless lizards require loose, moist sandy and loamy soils for burrowing. Soil moisture is essential for the silvery legless lizard to conserve energy at high temperatures and for shedding to occur. Weed species degrade silvery legless lizard habitat by decreasing soil moisture and altering the conformation of soil substrate (Contra Costa County 2006). By controlling weeds and replacing weeds with native plant species, soil moisture at the Lower Mesa is expected to increase.

In addition, coastal California gnatcatchers have been historically observed southeast of the Lower Mesa within a five-mile radius of the site (CDFG 2011a). Coastal California gnatcatchers are restricted to coastal sage scrub habitat for foraging and nesting (Unitt 2004). By increasing the acreage of suitable coastal sage scrub habitat, the Lower Mesa may be able to support coastal California gnatcatchers.

5.0 Restoration Project Phasing

This restoration plan will be implemented over 10 years consisting of 10 Phases. Proposed Phases for the restoration project are shown in Figure 7. One nursery and three seed harvesting and composting facilities will be installed in Phase 1. The remaining areas will be restored starting sequentially in Phases 2 through 10.

Starting in Year 1 of each Phase, an Initial 5-year Maintenance and Monitoring Program with defined success criteria will be implemented and will end contingent upon the achievement of the success criteria. The Initial 5-year Maintenance and Monitoring Program annual schedule for each of the ten Phases is shown in Table 2. The success criteria are described in Section 11.4. After the success criteria have been met, a Long-Term Maintenance and Monitoring Program (LTMMP) will begin which is intended to be implemented during Years 6 through 10 of this restoration plan and in perpetuity thereafter. Table 3 details the Maintenance and Monitoring Program. At the completion

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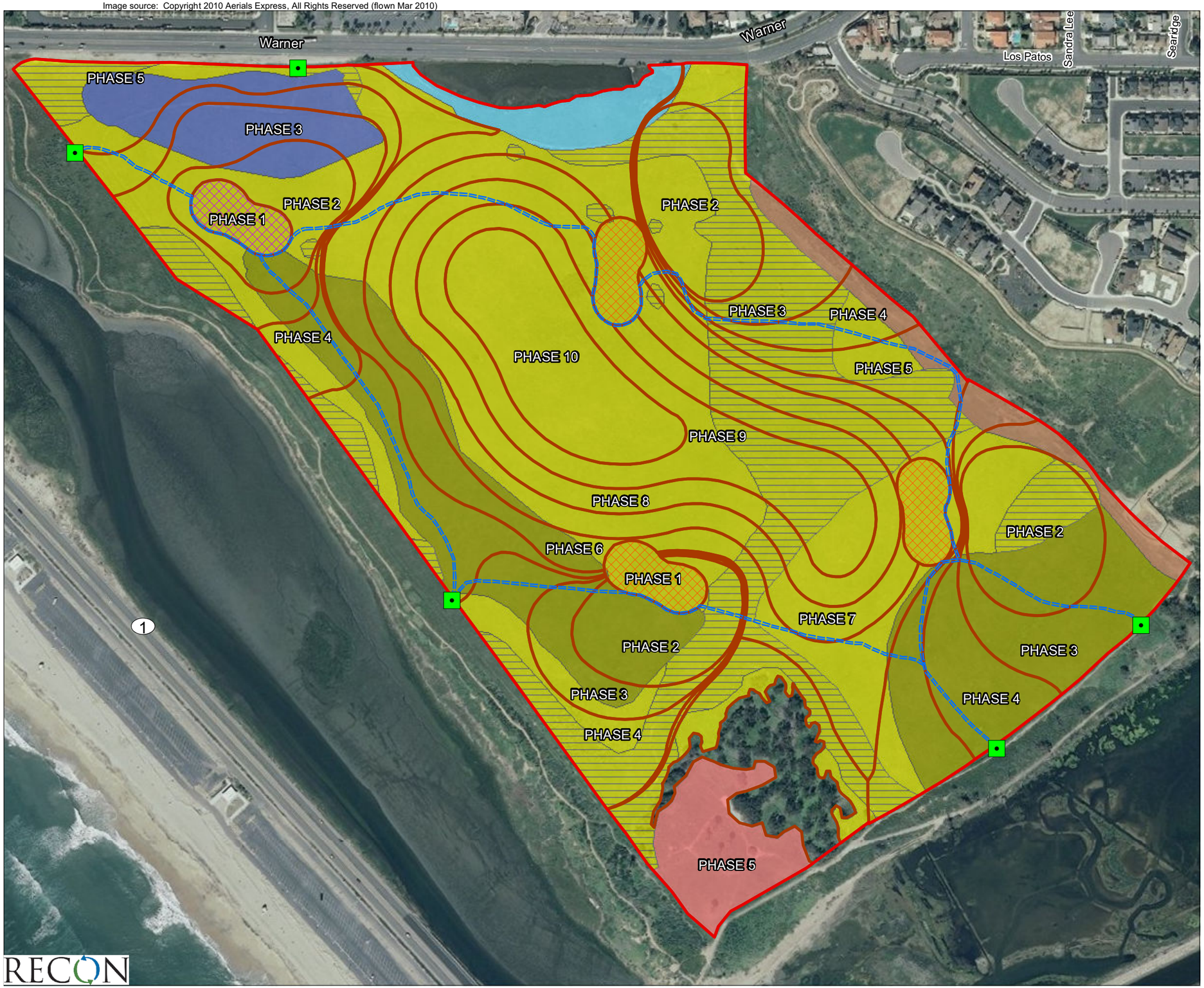

Restoration Area
Gates
Trails
Phase Area Boundary
Composting & Grassland Seed Harvesting Facility
Nursery

Proposed Habitat

Alkali Marsh-Upland Transition
Coastal Sage Scrub
Mule Fat Scrub
Native Grassland
Southern Tarplant Enhancement/Native Grassland
Raptor Roosting & Nesting
Seasonal Pond

0 Feet 300

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FIGURE 7

Project Phasing, Nursery Location, and Habitat Types to be Restored

of this plan (2022), not all restoration sites will have completed the Initial 5-year Maintenance and Monitoring Program. Therefore, those Phases will need to meet the respective interim performance standards discussed in Section 11.4.1.

TABLE 2
ANNUAL PHASE SCHEDULE:
INITIAL 5-YEAR MAINTENANCE AND MONITORING PROGRAM

Phase	Year 1	Year 2	Year 3	Year 4	Year 5*
1	2012–2013	2013–2014	2014–2015	2015–2016	2016–2017
2	2013–2014	2014–2015	2015–2016	2016–2017	2017–2018
3	2014–2015	2015–2016	2016–2017	2017–2018	2018–2019
4	2015–2016	2016–2017	2017–2018	2018–2019	2019–2020
5	2016–2017	2017–2018	2018–2019	2019–2020	2020–2021
6	2017–2018	2018–2019	2019–2020	2020–2021	2021–2022**
7	2018–2019	2019–2020	2020–2021	2021–2022**	2022–2023
8	2019–2020	2020–2021	2021–2022**	2022–2023	2023–2024
9	2020–2021	2021–2022**	2022–2023	2023–2024	2024–2025
10	2021–2022**	2022–2023	2023–2024	2024–2025	2025–2026

*Initial 5-year Maintenance and Monitoring Program completion date
**10-year restoration plan completion date

6.0 Avoidance and Minimization of Impacts to Sensitive Resources

6.1 Southern Tarplant

The Lower Mesa contains one of the largest southern tarplant populations known in California. Threats to southern tarplant include urbanization, vehicles, development, foot traffic, grazing, habitat disturbance, and competition from non-native plants (CNPS 2011). Southern tarplant has significantly declined over the last half-century and is mostly extirpated from Santa Barbara, Ventura, and Los Angeles Counties, and is rare in San Diego County. The majority of the remaining populations are in Orange County (Roberts 2008). Figure 4 shows all known occurrences of southern tarplant at the restoration area observed between 1999 and 2011. Measures to avoid and minimize impacts to southern tarplant will be employed and include:

TABLE 3
MAINTENANCE AND MONITORING SCHEDULE

	Initial 5-year Maintenance and Monitoring Program					Long-term Maintenance and Monitoring Program*				
Task	Year 1 (Implemen-tation)	Year 2 (Implemen-tation)	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Maintenance										
Weed control (Dethatch)	Summer/ fall	Summer/ fall–if needed	Summer/ fall–if needed	Summer/ fall–if needed	Summer/ fall–if needed	--	--	--	--	--
Weed control (by hand and/or herbicide)	Winter/ spring	Winter/ spring	Winter/ spring	Winter/ spring–quarterly	Winter/ Spring–quarterly	As needed†	As needed†	As needed†	As needed†	As needed†
Native seed collection	Fall/ spring	Fall/ spring	Fall/ spring	Fall/ spring	Fall/ spring	--	--	--	--	--
Plant production	Year-round	Year-round	Year-round	Year-round	Year-round	--	--	--	--	--
Plant installation	Fall/Winter	Fall/Winter	Fall/Winter	--	--	--	--	--	--	--
Supplemental irrigation	As needed	As needed	As needed	--	--	--	--	--	--	--
Shrub thinning & removal	--	--	As needed‡	As needed‡	As needed‡	As needed‡	As needed‡	As needed‡	As needed‡	As needed‡
Supplemental planting	--	--	--	As needed, in winter	As needed, in winter	As needed, in winter	As needed, in winter	As needed, in winter	As needed, in winter	As needed, in winter
Site checks	Weekly	Weekly	Weekly	Biweekly[1]	Biweekly	Monthly	Monthly	Monthly	Monthly	Monthly
Trash removal	Monthly if needed	Quarterly if needed	Quarterly if needed	Quarterly if needed	Quarterly if needed	As needed	As needed	As needed	As needed	As needed

TABLE 3
MAINTENANCE AND MONITORING SCHEDULE (CONT.)

	Initial 5-year Maintenance and Monitoring Program					Long-term Maintenance and Monitoring Program*				
Task	Year 1 (Implemen-tation)	Year 2 (Implemen-tation)	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Monitoring										
Qualitative vegetation monitoring	--	Weekly/ monthly	Quarterly	Quarterly	Quarterly	Spring	Spring	Spring	Spring	Spring
Wildlife observation list	--	Quarterly	Quarterly	Quarterly	Quarterly	--	--	--	--	Annually
Photopoint monitoring	--	Spring and late summer	Spring and late summer	Spring and late summer	Spring and late summer	--	--	Spring and late summer	--	Spring and late summer
Quantitative habitat vegetation monitoring	--	Spring	Spring	Spring	Spring	Spring	--	Spring	--	Spring
Quantitative southern tarplant monitoring	Summer	Summer	Summer	Summer	Summer	--	--	Summer	--	Summer

*Long-term maintenance activities extend beyond 10 years and will be implemented in perpetuity.
†The following criteria will trigger weed control measures: (1) 20% or more cover from non-native weed species, (2) presence of perennial species with a rating of moderate or high on the Cal-IPC Invasive Plant Inventory Database, or (3) presence of annual or perennial species with a red alert designation on the Cal-IPC Invasive Plant Inventory Database.
‡The following criteria will trigger shrub thinning and control measures: (1) 40% or more shrub cover in coastal sage scrub and mule fat scrub habitats or (2) invasion of shrubs into native grassland and/or seasonal ponds.
[1]Biweekly is equivalent to every other week.

Restoring all known areas with current or historic locations of southern tarplant with seasonal ponds, native grassland, or alkali marsh–upland transition habitat.

- Restoring coastal sage scrub only in areas without current or historic locations of southern tarplant.
- Restoring 'open' coastal sage scrub with a native grassland understory located in the interspaces between shrubs to allow southern tarplant to persist if a seed bank is present.
- Siting trails, the temporary on-site nursery, and three seed harvesting and composting facilities in areas where current or historic locations of southern tarplant are absent.
- Having the Restoration Biologist survey and flag areas where southern tarplant is located prior to maintenance activities each year.
- Propagating 200 southern tarplant individuals for planting and directly seeding southern tarplant into the seasonal pond area.
- Collecting and storing southern tarplant seed prior to mowing.
- Conducting annual surveys for southern tarplant for the duration of this 10-year restoration plan starting in Year 1 of each Phase.
- Placing processed compost only in areas proposed for coastal sage scrub restoration where southern tarplant has not been documented.

A description of how these practices will be carried out is described below:

All areas known to contain southern tarplant populations currently or historically are contained within southern tarplant enhancement areas, suitable seasonal pond habitat, or suitable upland habitat within the alkali marsh-upland transition. Only volunteers that have received training to identify southern tarplant in all of its growth stages will be allowed in the southern tarplant enhancement areas under the supervision of BCLT staff for weed eradication and planting activities (see Sections 9.1 and 9.5). Weed eradication efforts in these areas will be conducted using hand removal techniques that minimize soil disturbance. Native plant reintroduction will be done by hand-seeding these areas to reduce soil disturbance. Native plant associates of southern tarplant that are not overly competitive will be used for the native grassland and seasonal pond restoration areas.

Coastal sage scrub will only be restored in areas where southern tarplant has not been documented. The restored coastal sage scrub will be 'open' with a native grassland understory. The interspaces between coastal sage scrub may allow southern tarplant to persist if a seed bank is present. If the restored coastal sage scrub becomes dense or if southern tarplant colonizes previously unoccupied locations within the coastal sage scrub, the shrubs will be managed for southern tarplant.

All trails, the nursery, and the three seed harvesting and composting facilities have been sited to avoid all current and historic locations of southern tarplant. If areas of the trails become colonized by southern tarplant, the Restoration Biologist will flag the locations and an alternative trail will be used. Similarly, if southern tarplant is observed at the nursery location, the area colonized will be delineated with flagging and work activities will avoid the location. Three seed harvesting and composting facilities are proposed. If southern tarplant colonizes any of the Facilities, the individuals will be flagged and avoided. Heavy foot traffic and vehicles will not be allowed in the areas occupied currently or historically by southern tarplant to minimize disturbance.

Prior to maintenance activities during each Phase, the Restoration Biologist will survey and flag areas where southern tarplant is located. It is preferred that flagging occurs soon after southern tarplant has germinated and is identifiable in its vegetative form. Areas occupied by southern tarplant may be overlooked if flagging only occurs when it is in flower.

Southern tarplant seed will be collected and stored at a local nursery prior to mowing. The seed will later be directly seeded into the seasonal pond, alkali marsh–upland transition, and native grassland areas. In addition, at least 200 individuals of southern tarplant will be grown on-site and planted in the seasonal pond area. By directly seeding and planting southern tarplant in the restoration area, the total population is expected to increase in area.

Annual surveys for southern tarplant will be conducted for the duration of this 10-year restoration plan starting in Year 1 of each Phase. The surveys will occur prior to maintenance, so that occupied areas can be flagged by the Restoration Biologist and avoided. A seed bank for southern tarplant likely persists in some areas currently covered with non-native thatch. It is expected that the seed bank will be expressed in areas where southern tarplant has not been documented as weed maintenance activities reduce competition from non-native plant species within the restoration area. Adaptive management strategies will be implemented as new locations of southern tarplant are documented.

6.2 Sensitive Raptors

The Lower Mesa provides habitat for many sensitive species of raptors. Avoidance of impacts to burrowing owls is discussed separately in Section 6.2.1 due to their unique nesting requirements. Avoidance and minimization of impacts to raptor species will be employed in a variety of ways using BMPs, and include:

- Enhancing roosting and nesting habitat within the eucalyptus ESHA by planting additional trees to supplement the dying eucalyptus trees.
- Leaving all existing eucalyptus trees within the eucalyptus ESHA in place.
- Restricting the use of mowers or other mechanized equipment within 250 feet of the eucalyptus ESHA during breeding season (January to August).
- Temporarily halting activities and notifying the appropriate agency if nests or burrows are observed.
- Phasing restoration areas so that raptor foraging habitat is always available.
- Restoring native grassland and open coastal sage scrub for foraging habitat.

The eucalyptus grove ESHA is important nesting and roosting habitat for raptors. Many of the eucalyptus trees are dying. In order to supplement the dying eucalyptus trees, trees native to California will be planted within the eucalyptus ESHA, as well as an understory of native grasses and shrubs. All existing eucalyptus tree will be maintained. As the planted trees mature, raptor roosting and nesting habitat will increase. The native grassland understory will serve to restrict non-native plant species cover within the ESHA and create habitat for prey species.

The nesting season varies between species, occurring from January to August in the bird species present at the Lower Mesa. Within 250 feet of the ESHA, the use of mowers or other mechanized equipment will be restricted to outside of the breeding season. Should the nests or burrows of any raptor species be observed within areas of active restoration, activities will be halted temporarily and the appropriate agency will be notified.

The non-native grassland currently within the restoration area serves as an important foraging habitat for raptors. Therefore, restoration activities will be phased over ten years so that foraging habitat is always present outside of active restoration sites. Ultimately, native grassland and open coastal sage scrub restoration activities will enhance the foraging habitat as described in Section 4.0.

6.2.1 Burrowing Owl

Wintering burrowing owls were documented on the Bolsa Chica Mesa between 2001 and 2003. Anecdotal observations have occurred since. The CDFG is planning on a burrowing owl survey to take place on the Bolsa Chica Mesa in Summer 2012 for updated status. Burrowing owl habitat includes annual and perennial grasslands as well as scrublands characterized by low-growing vegetation. Burrowing owls also often use burrows in these areas made by fossorial animals such as ground squirrels, which are prevalent within the restoration area. The Migratory Bird Treaty Act and CDFG Code prohibit the take, possession, or destruction of burrowing owls, their eggs, or nests (California Burrowing Owl Consortium 1993). Site-specific avoidance and mitigation measures will be developed in consultation with CDFG following the updated 2012 surveys in accordance with the protocol established in the Staff Report on Burrowing Owl Mitigation (CDFG 2012). Measures to avoid and minimize impacts to burrowing owl may include take avoidance (pre-construction) surveys, site surveillance, and the use of buffers, screens, or other measures to minimize impacts during project activities.

6.3 Silvery Legless Lizard

The silvery legless lizard is a CDFG species of special concern and considered sensitive by the U.S. Forest Service (CDFG 2011c). Silvery legless lizards require loose soil for burrowing such as the loamy sand and sandy loams found in the Lower Mesa. Silvery legless lizards have been identified near the bluffs on the southern edge of the Lower Mesa. Measures to avoid and minimize impacts to silvery legless lizard will be employed and include:

- Minimizing compaction and disturbance of soil throughout the Lower Mesa.
- Using weed removal techniques that minimize or eliminate soil disturbance.
- Restricting grading and excavation activities to the proposed seasonal pond creation area, roads, nursery, and seed harvesting and composting facilities.
- Having a biological monitor present during grading activities.
- Actively moving silvery legless lizard discovered during restoration activities to a nearby on-site location where work is not taking place.

Compaction and disturbance of soil will be minimized throughout the Lower Mesa so that soils will retain the potential to support the silvery legless lizard. Weed removal techniques have been designed to minimize soil disturbance (see Section 9.1).Grading activities will be limited to the creation of seasonal ponds, creation of roads, and preparation of the on-site nursery and seed harvesting and composting facilities. A

biological monitor will be present when grading is performed. Any legless lizards that are found during restoration activities will be moved out of harm's way. If legless lizards are discovered during restoration activities, they will be immediately moved to a nearby on-site location with vegetation cover and loose soil and will not be placed in containers and later moved. The latter may cause legless lizards to suffer physical damage and potential mortality from heat even if the individual is kept in a shaded location. Legless lizards will only be handled to relocate individuals to safe locations. Prolonged handling of legless lizards may stress the animal and would be considered harassment.

6.4 Cultural Resources

Archaeological resources are known to occur on the Lower Mesa, including remnants of the Bolsa Chica Gun Club and prehistoric remains. In addition, the Bolsa Chica Mesa is known for its historic use by Native Americans. Native American burial sites are known to be located within 100 yards of the restoration area. Measures to avoid and minimize impacts to archaeological resources will be employed, and include:

- Using hand removal techniques that do not disturb the soil and/or a glyphosate-based foliar spray rather to treat weeds minimizing soil disturbance in areas known to contain archaeological resources.
- Seeding native plants by hand rather than installing container plants to minimize soil disturbance in areas known to contain archaeological resources.
- Excluding heavy equipment, vehicle use, grading, and excavation activities in areas known to contain archaeological resources.
- Having an archaeological monitor present during all grading and excavation activities.
- Limiting excavation and grading to a depth of no more than 24 inches.

In areas known to contain archaeological resources, weed species will be controlled using cutting techniques and/or a glyphosate-based foliar spray since hand pulling techniques have the potential to disturb archaeological resources. Native plant reintroduction will be done by hand seeding these areas to avoid soil disturbance.

No heavy equipment, vehicle use, grading, or excavation activities will be permitted in areas known to contain archaeological resources. An archaeological monitor must be present during all grading and excavation activities at the restoration area. As excavation and grading will be limited to a depth of no more than 24 inches in areas where cultural resources have not been observed and an archaeological monitor will be

present, it is expected that the risk of unearthing buried cultural resources will be minimal.

If the archaeological monitor finds that the excavation and grading has unearthed archaeological resources within the project site, work will cease immediately and the appropriate agencies will be notified. Work will be moved to another area of the project site, and the archaeologist will determine the extent and significance of the cultural resources. The archeologist will determine the boundaries of the cultural deposit, and the project will utilize the above listed non-invasive protocols to avoid further disturbance.

7.0 Restoration Site Selection by Habitat

The habitat locations to be restored have been designed to reduce the amount of edge between habitat types while avoiding impacts to southern tarplant. The design is intended to (1) reduce the invasion of weed species into restoration areas; (2) reduce the invasion of native shrubs into native grassland; and (3) create contiguous native habitats for wildlife use. Restoration methods have been designed to avoid impacts to sensitive plant species, wildlife species, and archaeological resources. The habitat restoration design is shown on Figure 8.

7.1 Native Grassland

Native grassland will be restored in areas that are currently non-native grassland. Native grassland will occur continuously throughout the restoration area to reduce the amount of edge with other habitats. Native grassland habitat will be restored adjacent to the eucalyptus grove ESHA to provide foraging habitat contiguous to nesting and roosting habitat for raptors. Native grassland will also be located adjacent to coastal sage scrub to provide an ecotone for species that use both habitats.

7.1.1 Southern Tarplant Enhancement Areas/Native Grassland

Southern tarplant enhancement areas will be established by restoring native grassland in areas known to contain southern tarplant populations. These locations may change from year to year, as southern tarplant populations are “not consistent from year to year in terms of numbers or occupied area” (Roberts 2007). In these areas, native grassland plant species will be seeded by hand rather than planted with container stock to avoid disturbance to the southern tarplant seed bank. Native plant associates of southern

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- Restoration Area
- Gates
- Trails
- Nursery
- Composting & Grassland Seed Harvesting Facility
- Tarplant Observations

Proposed Habitat

- Alkali Marsh-Upland Transition (2.25 acres)
- Coastal Sage Scrub (20.85 acres)
- Mule Fat Scrub (2.78 acres)
- Native Grassland (47.39 acres)
- Southern Tarplant Enhancement/Native Grassland (22.57 acres)
- Raptor Roosting & Nesting (3.42 acres)
- Seasonal Pond (4.90 acres)

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FIGURE 8

Habitat Types to be Restored

tarplant that are not overly competitive will be used. Only volunteers that have received training to identify southern tarplant in all of its growth stages will be allowed in the southern tarplant enhancement areas under the supervision of BCLT staff for weed eradication and planting activities (see Sections 9.1 and 9.5).

7.2 Raptor Roosting & Nesting Habitat

The eucalyptus grove ESHA will be enhanced through the addition of tree species native to California, including western sycamore and southern California black walnut. The existing population of eucalyptus is currently dying. Additional trees are required so that raptor nesting, perching, and roosting habitat is sustained and enhanced. This plan recommends the use of trees native to California instead of non-native eucalyptus. An understory of native grasses and shrubs will also be planted within the ESHA. The native grassland understory will serve to restrict non-native plant species cover within the ESHA and create habitat for raptor prey species.

Artificial platforms on top of poles may be installed to provide additional nesting habitat. Artificial platforms have been successful in providing nest replacement and habitat enhancement for osprey, ferruginous hawks, red-tailed hawks, peregrine falcons, great horned owls, barn owls, and American kestrels (Bentley et al. 2005). The nesting platform for osprey at Upper Newport Bay Ecological Reserve was installed in 2006. Over the next 5 years, a total of 17 chicks have successfully fledged. A platform was erected at the San Joaquin Marsh in 2010, and a female osprey from the 2008 Newport clutch successfully fledged one chick.

7.3 Seasonal Pond

Seasonal pond habitat will be enhanced in the northwestern portion of the site to expand the current southern tarplant habitat and increase wetland habitat for wildlife. This area is the most ideal location on-site for the seasonal pond as it currently contains surface sheet flows and saturated soils in times of heavy rains as well as the facultative species Italian ryegrass and the facultative-wetland species curly dock.

If alkaline soils are excavated during pond creation, alkali marsh habitat will be created instead of seasonal ponds. In addition, if natural depressions are found to be present in the restoration area after dethatching, the depressions will be enhanced to create vernal swale habitat.

7.4 Coastal Sage Scrub

Coastal sage scrub habitat will be restored in areas that currently contain isolated shrubs and are adjacent to existing coastal sage scrub habitats. This includes the coastal sage scrub restoration area adjacent to the fence and the remnant coastal sage scrub just south of the restoration area. The placement of the coastal sage scrub will maximize the acreage of continuous coastal sage scrub habitat for wildlife. This will also reduce the amount of edge between coastal sage scrub and native grassland.

The coastal sage scrub will be planted to promote an open canopy rather than a dense closed canopy. This will allow interspaces for southern tarplant to colonize and raptors to forage. In addition, coastal sage scrub will not be planted adjacent to ponds to prevent the invasion of shrubs into these areas. This is important because native shrub species could colonize seasonal pond habitat and can convert it to coastal sage scrub.

Within the coastal sage scrub, native shrub species that are known to be aggressive colonizers will not be planted or seeded. These species include, but are not limited to, coastal goldenbush, coyote brush, broom baccharis (*Baccharis sarothroides*), saltbush species (*Atriplex* spp.), and everlasting species (*Pseudognaphalium* spp.). California sagebrush will be planted in low densities to decrease the chance of colonizing native grassland.

7.5 Alkali Marsh-Upland Transition

Warner Pond is currently dominated by alkali heath and pickleweed, and further surrounded by non-native grasses in the adjacent upland. The upland habitat bordering the southern edge of Warner Pond will be restored to an alkali marsh-upland transition habitat to enhance the overall plant diversity of this area. Alkali tolerant upland species will be used, including southwestern spinyrush (*Juncus acutus* ssp. *leopldii*) and alkali sacaton (*Sporobolus airoides*). Native grassland species will be planted along the outer perimeter of the alkali marsh-upland transition area.

7.6 Mule Fat Scrub

Mule fat scrub will be restored on the toe of the slope along the northeastern edge of the restoration area. This area is anticipated to receive runoff from the Brightwater Homes development and water from natural seepage through the hillside. Therefore, scrub species that are more water tolerant than coastal sage scrub species will be planted in this area. The mule fat scrub will be planted at the same density as the coastal sage scrub to allow for interspaces for southern tarplant to colonize and raptors to forage.

8.0 On-site Nursery and Seed Harvesting Grounds

8.1 On-site Nursery

It is expected that over 230,000 container plants will be needed for planting within the restoration areas throughout this ten year restoration project. For projects of this magnitude, it is typical that onsite nurseries be established for container plant propagation. There are several benefits to onsite nurseries including: the ability to grow plants under local climactic conditions prepares the plants for translocation and reduces transplant shock; the use of native soils as a planting medium are readily available onsite; plants may be grown outdoors and under full sunlight; eliminates transportation and shipping costs of plant materials; consolidates restoration and plant propagation into one location.

In addition to these primary functions, the on-site nursery will provide several other beneficial functions that are unique to this project. These functions include a composting operation, a location for volunteer assembly and training, and opportunities for education and outreach. Each of these functions is described separately below.

8.1.1 Nursery Facility and Temporary Structures

The temporary nursery site is anticipated to be no more than one acre (43,560 square feet). The location of the nursery was selected based on access and avoidance of sensitive plant and animal species and cultural resources that are known to occur within the Bolsa Chica mesa. The proposed location of the nursery is currently occupied by non-native grasses as described in Section 3.1. In order to create the temporary nursery facility, the immediately surrounding area and the nursery site will first be cleared and scraped using a light tractor. No more than 800 cubic yards of surface soil will be moved to the nursery perimeter in order to create small mounds or hummocks that will help conceal the temporary nursery structures and create other on-site nursery functions. Erosion and sediment control BMPs will be implemented and include covering (tarping) any stockpiled materials or soils, constructing silt fences, straw bale barriers, fiber rolls, or other structures around stockpiles and disturbed areas as necessary to ensure that no erosion or runoff will result from the nursery. Adjacent ancillary facilities include up to a 2,000-square-foot area for rainwater harvesting and an 18,000-square-foot area for native grass seed bulking. The created mounds on the periphery of the nursery will be no more than 4 feet high at their peak and will be planted and seeded with native vegetation that is included in the restoration plant palette.

The nursery, and all of its components, will be temporary in nature such that it can be picked up and moved if sensitive species are encountered within the nursery vicinity. The nursery will consist of a temporary shade structure composed of wood or metal posts and shade cloth (Photograph 13). The shade structures will be short in height to avoid visual impacts from the surrounding area. Benches or plant tables will be created to protect plants from herbivory on the ground, and barrels and boxes will be used for composting and vermiculture. Other on-site nursery features include: a storage container for tools and supplies; portable lavatory(ies) for workers and volunteer use; and four 2,825-gallon rainwater harvesting storage tanks for plant propagation (each approximately 8 feet in height and 8 feet in diameter). Temporary fencing will encompass the nursery work area in order to protect it from vandalism and herbivory from small mammals. At the completion of the project, the nursery site will be revegetated with species listed in the restoration plan palette.

8.1.2 Plant Production

Hardy container plants will be propagated in the on-site nursery at the restoration area. Species that are more difficult to grow may be germinated at an off-site nursery and then transported to the onsite facility so they mature into their final container size. Only species native to coastal Orange County will be planted or seeded in the restored habitats with the exception of the tree species for the Eucalyptus ESHA. Species for container plants and their planting densities are specified below in Tables 4–9. Additional plant species native to coastal Orange County that can be used in the restoration area can be found in Attachment 2. Seed used for plant production will be from local sources, to the greatest extent feasible, and species collected will be based on availability from nearby stands of native vegetation.

The nursery will be run by BCLT staff and Stewards (volunteers who have completed the Stewards Training Program). BCLT volunteers may participate in plant production during work days. Seeds should be planted in containers at least six to eight months prior to planting. Container plants will be propagated under controlled drought conditions and using locally sourced seed, native soils, and processed compost, when feasible based upon availability. Native soil will be salvaged during excavation and grading activities and used when feasible, although potting soil will be used when native soils aren’t available.

PHOTOGRAPH 13
Typical Temporary Nursery Facility and Structures

Using locally sourced seed ensures that plant species are adapted to local environmental conditions and reduces stress during transplanting. Native plant species are adapted to native soils that have naturally low nutrient content and contain beneficial organisms such as mycorrhizal fungi. Mycorrhizal fungi inhabit the root systems of many plant species and increase the uptake of water and nutrients in host plants (Bornstein et al. 2005). The low nutrient content in native soils also naturally inhibits weed growth.

TABLE 4
NATIVE GRASSLAND CONTAINER PLANTINGS

Species	Recommended Planting Density (# of plants per acre)	Recommended Container Size
Purple needlegrass (*Stipa* [=*Nassella*] *pulchra*)	2,500	1-gallon
Western blue-eyed-grass (*Sisyrinchium bellum*)	200	6-inch
Wishbone bush (*Mirabilis laevis* var. *crassifolia*)	100	1-gallon
Gumplant (*Grindelia camporum* var. *bracteosa*)	50	6-inch
Lilac mariposa (*Calochortus splendens*)	50	6-inch
Blue wildrye (*Elymus glaucus*)	50	1-gallon
Common goldenstar (*Bloomeria crocea*)	50	6-inch
Blue dicks (*Dichelostemma capitatum* ssp. *capitatum*)	50	6-inch
California-aster (*Corethrogyne filaginifolia*)	25	6-inch
Shooting star (*Dodecatheon clevelandii* ssp. *clevelandii*)	25	6-inch
Coast paintbrush (*Castilleja affinis*)	25	6-inch
Final Planting Density	3,125	

TABLE 5
COASTAL SAGE SCRUB CONTAINER PLANTINGS

Species	Recommended Planting Density (# of plants per acre)	Recommended Container Size
Black sage (*Salvia mellifera*)	50	1-gallon
Coast California buckwheat (*Eriogonum fasciculatum* var. *fasciculatum*)	300	1-gallon
Deerweed (*Acmispon glaber* [=*Lotus scoparius*])	25	1-gallon
California sagebrush (*Artemisia californica*)	500	1-gallon
Bladderpod (*Peritoma* [=*Isomeris*] *arborea*)	50	1-gallon
Red bush monkeyflower (*Mimulus aurantiacus* var. *puniceus*)	50	1-gallon
Laurel sumac (*Malosma laurina*)	20	1-gallon
Wishbone bush (*Mirabilis laevis* var. *crassifolia*)	100	1-gallon
Narrowly leaved bedstraw (*Galium angustifolium*)	50	1-gallon
Golden-yarrow (*Eriophyllum confertiflorum* var. *confertiflorum*)	50	6-inch
Western blue-eyed-grass (*Sisyrinchium bellum*)	100	6-inch
California-aster (*Corethrogyne filaginifolia*)	25	6-inch
Purple needlegrass (*Stipa pulchra*)	1,500	1-gallon
Final Planting Density	2,820	

TABLE 6
SEASONAL POND CONTAINER PLANTINGS

Species	Recommended Planting Density (# of plants per acre)	Recommended Container Size
Southern tarplant (*Centromadia parryi* ssp. *australis*)	200 container plants for proposed seasonal ponds area	1-gallon
Alkali sacaton (*Sporobolus airoides*)	1,200	1-gallon
Saltgrass (*Distichlis spicata*)	300	1-inch
Bigelow's glasswort (*Salicornia bigelovii*)	200	1-gallon
Alkali heath (*Frankenia salina*)	200	6-inch
Spiny rush (*Juncus acutus* ssp. *leopoldii*)	25	1-gallon
Final Planting Density	2,125	

TABLE 7
ALKALI MARSH / UPLAND TRANSITION CONTAINER PLANTINGS

Species	Recommended Planting Density (# of plants per acre)	Recommended Container Size
Alkali sacaton (*Sporobolus airoides*)	50	1-gallon
Saltgrass (*Distichlis spicata*)	100	6-inch
Spiny rush (*Juncus acutus* ssp. *leopoldii*)	15	1-gallon
Purple needlegrass (*Stipa* [=*Nassella*] *pulchra*)	2,000	1-gallon
Western blue-eyed-grass (*Sisyrinchium bellum*)	200	6-inch
Gumplant (*Grindelia camporum* var. *bracteosa*)	50	6-inch
Lilac mariposa (*Calochortus splendens*)	50	6-inch
Common goldenstar (*Bloomeria crocea*)	50	6-inch
Blue dicks (*Dichelostemma capitatum* ssp. *capitatum*)	50	6-inch
Final Planting Density	2,565	

TABLE 8
MULE FAT SCRUB CONTAINER PLANTINGS

Species	Recommended Planting Density (# of plants per acre)	Recommended Container Size
Mule fat (*Baccharis salicifolia*)	300	1-gallon
Alkali sacaton (*Sporobolus airoides*)	1,000	6-inch
Saltgrass (*Distichlis spicata*)	550	6-inch
Mugwort (*Artemisia douglasiana*)	100	6-inch
Salt-marsh fleabane (*Pluchea odorata* var. *odorata*)	50	6-inch
Final Planting Density	2,000	

TABLE 9
RAPTOR ROOSTING AND NESTING HABITAT CONTAINER PLANTINGS

Species	Recommended Planting Density (# of plants per acre)	Recommended Container Size
Western sycamore (*Platanus racemosa*)	50	1-gallon
Southern California black walnut (*Juglans californica*)	50	1-gallon
Blue elderberry (*Sambucus nigra* ssp. *caerulea* [=*mexicana*])	25	1-gallon
Purple needlegrass (*Stipa* [=*Nassella*] *pulchra*)	1,000	1-gallon
Final Planting Density	1,125	

In addition, an added benefit of using native soil during production includes improved water retention.

Plants will also be subject to controlled drought situations in the nursery. By limiting water intake during production, plants will be pre-conditioned for limited water availability at the Lower Mesa. By using these techniques, plants will be conditioned to the environmental stresses present in their natural habitat and have an increased chance of surviving after transplanting.

8.1.3 Volunteer Assembly and Training

BCLT has a large number of volunteers that will be utilized during this restoration plan. It is important to plan activities appropriately for age and skill set, since some activities require the use of mechanical equipment, dealing with sensitive areas, and/or specialized knowledge. For the purposes of this plan, two types of volunteers will be utilized: general volunteers and Stewards.

General volunteers will participate in community work days. Activities appropriate for work days include plant propagation, hand-weeding, removal of weed debris, and planting. A volunteer orientation will be conducted at the beginning of each work day to teach volunteers how to minimize impacts to soil, plants, and wildlife, as well as how to safely and properly conduct the day's activities. BCLT staff will be responsible for organizing work days and recruiting volunteers. BCLT staff and BCLT Stewards will provide supervision during work days to ensure that activities are being conducted safely and correctly. BCLT staff will also organize work days specifically for volunteer groups as long as BCLT staff and Stewards are present to provide training, assistance, and supervision.

Stewards will undergo additional training prior to community work days so that they are able to assist BCLT staff in supervising general volunteers, managing the on-site nurseries, and implementing the maintenance and monitoring programs. It is important that the Stewards' training program is completed before restoration activities commence to ensure that there is adequate supervision on-site during volunteer work days. The Stewards' training program will be held as deemed necessary by BCLT staff so that new volunteers are able to participate in restoration steward activities. Stewards training topics are listed in Table 10.

BCLT staff and Stewards will adequately train all volunteers and will be responsible for recruiting volunteers, creating educational materials, and to include additional training by the Restoration Biologist when necessary.

TABLE 10
STEWARDS TRAINING TOPICS

Topics
Orientation, principles of habitat restoration, explanation of restoration plan, explanation of restoration steward responsibilities, plant production and nursery management
Weed identification, native plant & sensitive species identification, weed removal techniques
Restoration planting techniques, maintenance procedures
Monitoring procedures & reporting

8.1.4 Education and Outreach

Using a community-based restoration approach, this project will enable the community to participate in the restoration of the Lower Mesa. As stated by Reed Noss, Department of Biology, University of Central Florida; Ted Case, Department of Biology, University of California – San Diego; and Robert Fischer, U.S. Geological Survey:

> One of the potentially greatest values of the Bolsa Chica Mesa is as an educational resource to the human community of Orange County and beyond. The restoration of the Mesa will also provide scientific benefits for the young but rapidly growing field of restoration ecology. At Bolsa Chica, there is an opportunity to engage students from primary through graduate education in an ongoing experiment in restoration ecology. We are not aware of any place in Southern California better suited for this educational opportunity (Case et al. 2002).

The creation of the nursery and seed harvesting and composting facilities are designed to provide educational opportunities in the restoration area. Through on-site education, curriculum development, an interactive web site, and actual participation, this project provides the opportunity for the community to be engaged in this process.

Students of all ages will be invited to learn through participation in this project. They will assist in nursery operations, planting, monitoring, and maintenance in the restoration area. Partnerships with local community colleges and universities will be developed so that curriculum and on-site practicums can be created for students pursuing degrees in ecology, horticulture, biology, and other relevant fields.

This project also has the potential to provide an opportunity for students to participate in biological surveying and academic research. Potential projects could include surveys of avian, small mammal, reptile, and amphibian populations prior to and during the restoration project to establish baseline information and monitor populations as the restoration project is implemented. Potential survey methodology could include avian point counts, bird searches, the establishment of an avian productivity and survivorship banding station, Sherman trap lines, and/or pitfall arrays. These projects would be performed in compliance with all CDFG and USFWS laws and regulations. All necessary permits would be furnished by the educators.

8.2 Seed Harvesting Grounds and Composting

The seed harvesting grounds and composting facilities will be similar in size and shape as the temporary nursery facility and its seed harvesting area, but will serve different functions for the restoration project. The primary functions of these areas are to produce enough native grass seed for dispersal throughout the project footprint and to break

down the biomass collected from ongoing weed removal efforts so that it may be recycled within the project itself. It is anticipated that up to three of these facilities will be needed throughout the course of the 10-year project, and once completed, these areas will be revegetated with species contained in the restoration plan palette. A description of the primary functions of these areas is found separately below.

8.2.1 Seed Harvesting and Composting Facility and Temporary Structures

The seed harvesting and composting facility will be prepared and graded in the same manner as the temporary nursery facility area and consist of all temporary structures that can be moved easily if sensitive species appear in the area or once the site is decommissioned and revegetated. The primary components will include a minimum of 18,000 square feet of growing grounds for native grass seed bulking, a 2,000-square-foot area for rainwater harvesting, and a 9,000-square-foot area for weed biomass composting. The only structures on-site would be four 2,825-gallon rainwater harvesting tanks, a low-profile shade structure to conceal the water tanks, and a similar 600-square-foot shade structure that would house the vermiculture-processing barrels.

8.2.2 Seed Harvesting Grounds

The seed harvesting grounds will function to bulk native grass seed that will be used for container plant propagation and hand-seeding of the restoration areas. In order to accomplish this, native seeds will be sewn into the growing grounds and cultivated to produce seed. Once ripe, the seeds will be collected, rough cleaned, and stored for later use. The perennial grasses that will be used for revegetation may produce several seed harvests per year from which seed can be collected. Other annual grass and herbaceous species that are planned for container propagation and/or seeding may only be collected once per year.

8.2.3 Composting

A portion of the on-site nursery area and seed harvesting and composting facilities will be used for composting biomass that is generated through the initial dethatching and ongoing by-hand weed removal efforts. Composting the biomass on-site has several benefits, including: diverting waste away from landfills, eliminating the need for trucking materials off-site, providing planting media for container plant propagation, use as a soil additive in coastal sage scrub restoration areas, and providing an educational opportunity for volunteers and visitors to BCLT.

Composting practices will use vermiculture (worms) as a primary means to break down the weed biomass. In short, worms eat anaerobic bacteria and excrete an aerobic bacteria that is odorless. However, vermicomposting is much more complex than worms

eating and excreting organic material. Vermiculture is a highly complex chain of chemical, biochemical, and biological interactions and reactions. The process is based on a natural food chain which has evolved over hundreds of millions of years. Worms play a vital role in creating the optimum conditions for beneficial organisms to establish and reproduce. These beneficial organisms compete with and dominate the more harmful microbes. As a result, the biomass waste is reduced in volume and increased in nutrient value. The use of the worm casting compost will increase a balanced biological activity to deeper soil depths, which in turn increases air and water to deeper depths, which will aid in the growth of deeper plant root systems.

The vermiculture sites located within the project area will be designed for the efficient collection and breakdown of the green waste resulting from this restoration project. The use of red wigglers (*Eisenia foetida* or *Eisenia andrei*) will not cause problems with existing worm populations on the Mesa. Any vermiculture worm that may go beyond the confines of the vermiculture bin would not survive the dry Mesa soils, as they require consistent moisture (James 2010).

9.0 Restoration and Implementation

Initial restoration activities to occur for each Phase are discussed below. The implementation schedule is outlined in Table 3. All maintenance and monitoring procedures are described in Section 11.0.

9.1 Weed Eradication & Removal

During the site preparation stage in Year 1 of each Phase, weed species will be removed prior to planting. Weed control methods during the Initial 5-year Maintenance and Monitoring Program are discussed separately in Section 11.1.2. Specific species for removal include (but are not limited to) the following: Italian ryegrass, non-native barley, wild oats, ripgut grass, curly dock, tocalote, radish, and short-pod mustard. It is important to target weed species prior to the development of seed to deplete the seed bank and prevent the re-infestation by the species. Therefore, weed species should be targeted prior to the flowering stage to ensure weeds do not set seed. Initial control of weed species at the site preparation stage will reduce long-term maintenance efforts by volunteers and improve survivorship of the native vegetation from reducing resource competition. Options for methods of weed treatment include mechanical, hand removal, and, if these methods prove to be insufficient, limited and controlled chemical techniques. When selecting which method of treatment to use, it is important to choose techniques that minimize soil disturbance because disturbance often favors the growth of weed species and can trigger higher rates of germination in some weed species (Farrell et al. 2004).

The approach used at Bolsa Chica may utilize all three of these techniques for weed treatment. Specifically, each area would be initially dethatched and followed up by volunteers removing new weeds by hand as they emerge and, if hand removal methods fail, weeds may be treated with glyphosate. This combination of methods would create the least soil disturbance while utilizing the volunteer labor force that is available at Bolsa Chica.

9.1.1 Mechanical Weed Control

Weeds will initially be removed by mechanical dethatching. Dethatching is a technique commonly implemented by restoration practitioners that removes the buildup of non-native grasses and herbs so that exotic species are controlled and openings within the habitat can be re-created. The schedule for the dethatching effort is timed to minimize impacts to any native vegetation. Dethatching will be performed in late summer or early fall after native species have become dormant for the season. Seed will be collected from southern tarplant populations in the restoration area prior to dethatching (See Section 9.4).

A majority of the mechanical work will be completed by a tractor-mounted deck mower (Photograph 14). A deck mower is a 3-5 foot wide implement that is attached to the front end of a rubber-tracked, or rubber-tired tractor. The height of the mowing deck can be adjusted from just a few inches to one-foot above the ground surface and will cut/mulch the dead weed biomass as it passes over the restoration area. The mowers do not disturb the soil surface and the material left behind can be easily raked into piles. In areas where native vegetation is present or in tight spaces where the deck mower cannot reach, line trimmers can be used to trim the weedy vegetation while the native species are preserved (Photograph 15). All mechanical work will be performed by a combination of BCLT Stewards and contracted crews who are trained to recognize native and non-native species. All cut biomass will be raked and hauled to the on-site nursery and seed harvesting and composting facilities for composting (Photograph 16).

9.1.2 Hand Removal

Following the initial summer/fall mechanical weed removal efforts, new weeds will begin to germinate from the weed seed bank that is stored in the soils. Intensive weeding will be necessary during Years 1 and 2 of each Phase in order to deplete the weed seed bank, which will eventually allow the target native species to outcompete the non-native species. For hand removal weed control efforts, the BCLT volunteer force will be utilized.

PHOTOGRAPH 14
Mechanical Weed Removal by Use of Tractor-mounted Deck Mower

PHOTOGRAPH 15
Mechanical Weed Removal Around Sensitive Vegetation Using Line Trimmers

PHOTOGRAPH 16
Raking Cut Biomass into Small Piles for Removal

Prior to hand removal weed control efforts, the Restoration Biologist will survey the restoration sites for southern tarplant occurrences. This is necessary because southern tarplant favors reduced competition from disturbance. In favorable conditions, southern tarplant seeds can germinate along recently added trail boundaries and newly cleared habitat. Initial habitat disturbance or 'successional' type disturbance will probably benefit the plant (Roberts 2007). Therefore, new southern tarplant occurrences will be flagged prior to hand removal weed control efforts to prevent impacts from volunteer efforts.

Hand removal will consist of cutting vegetation at the base and removing the dead biomass from the restoration area. Careful attention will be paid towards not disturbing the soil surface by uprooting the plant materials. Volunteers will be trained on recognizing anticipated and abundant weed species they will commonly encounter such as non-native grasses, mustard (*Brassica* spp.), radish, and Russian thistle (*Salsola tragus*). If new weeds are discovered, work crews will be trained to recognize those species appropriately. Only volunteers that have received training to identify southern tarplant in all of its growth stages will be allowed in the southern tarplant enhancement areas under the supervision of BCLT staff for weed eradication and planting activities.

Volunteer work days for weed removal will be timed appropriately, after weeds have germinated but before they are able to set seed. It is likely that hand weeding will occur during the growing season from late winter through spring depending on rainfall patterns. If removing weeds by hand has not been completed by the time weed species begin to set seed, weed eradication activities may be implemented by a restoration crew.

9.1.3 Herbicide Application

If non-chemical methods of weed removal are not successful and the weeds threaten the survivorship of the native vegetation, BCLT staff, the Restoration Biologist, and CDFG will confer as to the use of herbicide. As a last resort, any weeds that cannot be controlled through hand removal or mechanical efforts prior to flowering and setting seed will be treated through herbicide applications by contracted workers. Herbicide applications are an inexpensive and effective method for weed control. Herbicide will be applied by hoses extending from skid mounted spray trucks or backpack sprayers so that spot treatments can be made directly to foliage of weed species avoiding contact with native and sensitive species. Any herbicide used must be approved for use by CDFG for use in natural areas and its use will follow all CDFG rules and regulations.

Glyphosate is the preferred chemical for controlling the weed species present at the restoration area since it is a broad-spectrum contact herbicide that treats hundreds of different types of commonly encountered weed species. Two formulas of glyphosate are appropriate for weed control at the restoration area: AquaMaster® and Prosecutor® (or other commercial equivalents). Both herbicides are approved for use in natural areas by USFWS and CDFG and must be applied by a licensed applicator. Prosecutor® can be

used in upland areas and AquaMaster® is approved for use in aquatic sites. Glyphosate, however, will not be sprayed directly into any wetlands or aquatic regions.

Glyphosate is strongly adsorbed to soil particles and breaks down very rapidly in the environment, which makes it unlikely to enter water sources through surface runoff or leaching and prevents it from being taken up from the soil by non-target plant species. Due to its mode of action, glyphosate is also of low toxicity to birds, mammals, and fish (Hurd et al. 2001) and has the lowest toxicity category to humans and domestic animals of all types of herbicides.

9.2 Seasonal Pond Creation

All grading and excavation activities for the creation of seasonal ponds will occur in Year 2 of the project. Additionally, if natural depressions are exposed during dethatching, they will be enhanced using mechanized equipment or by hand using shovels. The mechanized equipment will be limited to the use of a small bobcat with rubber tires to minimize soil disturbance. An archaeologist and biologist will be present during excavation activities. They will be responsible for halting the project and contacting the appropriate authorities should sensitive biological or archaeological resources become present. Planting will occur in Phase 2, 3, and 4 (see Figure 7).

9.3 Irrigation

Water for irrigation will be piped in through a mainline that runs around the perimeter of the restoration area in a “loop” system. Approximately every 30 to 40 feet, a quick coupler will be installed where a hose can be attached for watering. Supplemental irrigation may be applied by volunteers who are trained in the appropriate way to irrigate for native vegetation. Careful attention will be given to avoid overwatering and the creation of surface erosion. Also, supplemental watering will focus on container plantings and not broadcast over an entire area as the extra unseasonal water may stimulate weed seed germination.

Supplemental irrigation is anticipated to be needed for the first three years following planting in all habitat types. Supplemental irrigation is intended to extend the growing season. Supplemental irrigation will also be used in the winter if there are long periods between rains. The amount of supplemental irrigation will be tapered off for all grass, shrub, and herbaceous species so that once plants are established supplemental irrigation will not be necessary. Supplemental irrigation may be necessary for an extended period of time to ensure the survival of tree species in the raptor nesting and roosting enhancement area and will be used when trees exhibit signs of drought stress following the first three years after planting.

9.4 Native Seed Collection

Seeds will be collected by the Restoration Biologist from local native plant populations on or near the site containing species listed in the plant palette. The Consortium of California Herbaria and on-line Floras were searched to determine additional species that were or may have been historically present within native grasslands, seasonal ponds/alkali marsh, and within the eucalyptus grove (CCH 2011; Muns et al. 2004; Chester 2002; Chester et al. 2006; Roberts 2008). The plant palette is listed in Tables 4 through 9 and Attachment 2. The species listed in Attachment 2 are suggested species that have been known to historically occur within Bolsa Chica Ecological Reserve or other nearby locations such as Upper Newport Bay, Crystal Cove State Park, Seal Beach National Wildlife Refuge, and Dana Point Headlands.

Seed will be collected from sites with the closest proximity of Bolsa Chica Ecological Reserve. Collecting seed from local sources ensures that the genetic integrity and variability of each plant species is maintained. In addition, using local genetics ensures that the appropriate pollinators and insects are attracted and that plants are adapted to local environmental conditions (USFS 2010). Seed source locations will be determined in the field prior to the donor populations flowering. The seed may be collected from Bolsa Chica Ecological Reserve, Seal Beach National Wildlife Refuge, Upper Newport Bay, Crystal Cove State Park, and Dana Point Headlands, pending permission from land managers. Southern tarplant seed will be collected from the restoration area prior to mowing and stored at a local nursery. The southern tarplant seed will be used to propagate at least 200 individuals and will be directly seeded into the seasonal pond area.

The seed source populations will be monitored to determine when seed is ready to be collected. Seed collection may occur in late spring/early summer and fall depending on when the seed has ripened. Seed will be roughened and cleaned at a native plant nursery using screens and/or a seed blower. Seed will then be dried and stored at the on-site nursery. If the conditions at the on-site nursery are not suitable, then seeds will be stored at an appropriate native plant nursery. Seeds must be protected from excess heat, moisture, herbivory, and temperature fluctuations to prevent loss of viability (USFS 2010).

9.5 Plant Installation

In most cases, plants will be installed following dethatching. Volunteers will participate in the plant installation under the supervision of BCLT staff and Stewards during work days described in Section 8.1.3. The Restoration Biologist, BCLT staff, and Stewards may use colored coded flags to mark locations for each vegetation community prior to the commencement of work days. Planting will be performed during Year 1 of each Phase at

a density of 1,200 plants per acre to allow for supplemental weeding and planting the following year. Supplemental container planting will occur in Year 2 of each Phase to achieve the final planting densities specified in Tables 4 through 9. Following container planting, annual species will be directly seeded by hand in Year 2 and/or Year 3 after the weed seed bank has been reduced. If necessary, supplemental container planting may also occur in Year 3, 4, and 5 to achieve final success criteria, described in Section 11.4. Flagged areas known to contain southern tarplant populations will be directly seeded by hand by volunteers who have received special training.

10.0 Responsibilities

10.1 California Department of Fish & Game

CDFG is a state agency whose mission is “to manage California's diverse fish, wildlife, and plant resources, and the habitats upon which they depend, for their ecological values and for their use and enjoyment by the public” (CDFG 2011d). CDFG is the landowner and manager of the Lower Mesa. As such, CDFG will provide oversight during the implementation, maintenance, and monitoring of the restoration plan. CDFG will be directly responsible for:

- Acting as the lead agency for the preparation of CEQA documents.
- Providing final approval of the restoration plan for the Lower Mesa.
- Obtaining any permits necessary for the implementation of the restoration plan.
- Issuing access permission letters to BCLT, the Restoration Biologist, and subcontractors.
- Participating in Project Management Team meetings.
- Reviewing maintenance reports.
- Reviewing annual reports from the monitoring program.
- Long-term monitoring and maintenance.

10.2 Bolsa Chica Land Trust

BCLT is a non-profit organization dedicated to the restoration and conservation of the mesa, lowlands, and wetlands of Bolsa Chica through land acquisition and education.

BCLT entered into an agreement through a Memorandum of Understanding (MOU) with CDFG to restore the Lower Mesa. Therefore, BCLT is responsible for the implementation of the restoration plan. BCLT staff will be specifically responsible for:

- Managing project funds for the planning, implementation, and monitoring of the restoration plan.
- Ensuring project compliance with CDFG policies, rules, and regulations for the Bolsa Chica Ecological Reserve.
- Ensuring compliance with the final habitat restoration plan approved by the CDFG.
- Coordinating a Project Management Team consisting of BCLT, CDFG, and the Restoration Biologist.
- Recruiting, coordinating, and supervising volunteers.
- Developing educational and monitoring materials for volunteers.
- Coordinating Stewards training program.
- Nursery assembly and management.
- Hiring subcontractors, as necessary.
- Implementing monitoring and management plan.
- Writing annual reports documenting progress towards success criteria.
- Long-term monitoring and maintenance.

Under the supervision of BCLT staff, volunteers will be responsible for:

- Nursery activities such as planting, transplanting, and irrigation.
- Initial planting of native plants.
- Supplemental planting of native plants.
- Supplemental weeding.
- Supplemental irrigation.
- Monitoring activities.
- Management activities.

10.3 Restoration Biologist

The Restoration Biologist(s) will be an individual or team of individuals with demonstrated experience in habitat restoration for annual rare plant species, native grassland restoration, coastal sage scrub restoration, seasonal pond or vernal pool restoration, and large scale weed abatement in southern California. The Restoration Biologist(s) must demonstrate an understanding of grassland communities and have expertise in rare plant identification and ecology. The Restoration Biologist must have access to a restoration crew licensed to apply herbicide. The Restoration Biologist(s) will specifically be responsible for:

- Collaborating with BCLT to prepare remedial measures and adaptive management strategies to meet the success criteria laid out in this restoration plan if success criteria are not met.
- Attending site visits with BCLT staff, Stewards, and/or CDFG regarding the progress of general maintenance activities and/or to assist in the development of remedial measures and adaptive management strategies, when necessary.
- Participating in the Project Management Team with CDFG and BCLT.
- Conducting annual quantitative monitoring for southern tarplant for the duration of this restoration plan.
- Providing a habitat restoration crew if necessary to complete weed eradication or planting activities.
- Serving as the biological monitor during grading and excavation activities.
- Attending pre-grading meetings to consult with and to educate the grading contractor on restoration goals and habitat sensitivity.
- Flagging sensitive biological and archaeological resources prior to maintenance activities.
- Collecting native seed including southern tarplant.
- Assisting in training Stewards and general volunteers.

10.4 California Coastal Commission

The Commission is a state agency that plans and regulates the use of land and water in the coastal zone in California. Under the California Coastal Act, the Commission must issue coastal development permits for any activity considered to be development in the

coastal zone. To obtain a permit, the Commission must be able to find the project consistent with Section 30240 of the Coastal Act.

11.0 Maintenance and Monitoring

Site checks will occur weekly by BCLT staff to assess maintenance needs during the Initial 5-year Maintenance and Monitoring Program. The maintenance and monitoring program will be implemented by trained volunteers under the supervision of BCLT staff and Stewards. BCLT staff will submit an annual report to CDFG describing maintenance and monitoring activities conducted over the past year and projected future work for the following year.

11.1 Maintenance Methods

Regular maintenance of the restoration areas will be required during the establishment period of the target vegetation and over the long-term to ensure successful restoration. Maintenance activities will include (but are not limited to) weed control, supplemental weeding, supplemental irrigation, and supplemental planting. Beyond the Initial 5-year Maintenance and Monitoring Program, maintenance requirements within the restoration area are anticipated to be minimal; Only periodic weeding may be necessary to maintain the restoration areas.

11.1.1 Maintenance Schedule

After initial planting, sites will be checked weekly, at minimum, by BCLT staff and Stewards to assess what maintenance activities are necessary. Maintenance activities will follow the Initial 5-year Maintenance and Monitoring Program schedule outlined in Table 3. Each Phase of the project will follow this maintenance schedule. Monthly site visits regarding the progress of general maintenance activities may occur with BCLT staff, Stewards, CDFG, and the Restoration Biologist.

11.1.2 Weed Removal

The control of weed species will occur as needed during the Initial 5-year Maintenance and Monitoring Program. Weed species should be treated prior to the development of seed to decrease the seedbank. Weeding requirements are expected to decrease after Year 3 of each Phase following planting as outlined in Table 3.

Weed removal activities will be implemented by BCLT Stewards under the supervision of BCLT staff. The Stewards training program will teach volunteers how to distinguish weeds from native species so that restoration plantings and sensitive species will not be

damaged by weeding activities. Training will also include how to limit ground disturbance while using hand removal techniques to control weed species. The Restoration Biologist will work in collaboration with BCLT to determine what weed species require control and when weed treatment should occur.

Specific species for removal include (but are not limited to) the following: Italian ryegrass, non-native barley, wild oats, ripgut grass, curly dock, tocalote, radish, and short-pod mustard. Native species observed to exhibit weedy characteristics at the restoration area will also be removed if they appear to negatively impact other native species. Coyote brush, horseweed (*Erigeron* [=*Conyza*] *canadensis*), and telegraph weed, are examples of native species that can out-compete other native species and decrease overall plant diversity. These species may require control until other native species within the plant palette become fully established. Fascicled tarplant may also be removed by BCLT staff and Stewards that have received special training to distinguish fascicled tarplant from southern tarplant. Fascicled tarplant will only be removed once it is easily distinguishable from southern tarplant to avoid accidental removal of southern tarplant. Fascicled tarplant can be distinguished by its proximally toothed leaves and tightly grouped inflorescences, as opposed to the glandular leaves and inflorescences characteristic of the southern tarplant.

11.1.3 Shrub Thinning & Removal

Shrub thinning and removal may be required to prevent the conversion of the native grassland, seasonal pond, and alkali marsh–upland transition habitats to coastal sage scrub. According to Fred Roberts, Jr. in his 2007 Bolsa Chica mesa southern tarplant survey report:

> Shrub cover should be established on open centers (increased spacing between shrubs), in patches, or in mosaic patterns. A mosaic pattern would mix dense stands with open grasslands, increasing the potential for southern tarplant to occur within open habitat. An open coastal sage scrub arrangement would probably allow southern tarplant to survive in the spaces between plants. Dense coastal sage scrub sites should be monitored and restricted to designated areas. If it spreads beyond these areas, thinning or removal may be necessary.

All native and non-native shrub species that encroach on native grassland, seasonal pond, and alkali marsh–upland transition habitats will be removed. Opportunistic shrub species include (but are not limited to) coyote brush and California sagebrush. Furthermore, should southern tarplant colonize interspaces in the coastal sage scrub or mule fat scrub habitats or any other previously unoccupied locations, those areas will be managed for southern tarplant and may require additional thinning. Shrub thinning will occur outside of the nesting season (January to August) to avoid impacts to migratory

birds. Native shrubs that exist in the restoration area prior to restoration activities will be conserved.

11.2 Monitoring Methods

11.2.1 Monitoring Program

A habitat monitoring program will be conducted by BCLT staff and Stewards in conjunction with the maintenance program. The monitoring program is intended to document the progress of the restoration efforts as well as to fulfill the requirements of any permit conditions. Monitoring materials will be developed by BCLT staff for use by BCLT volunteers. At minimum, materials will include: (1) instructions on how to conduct qualitative and quantitative monitoring, (2) datasheets to record observations for qualitative and quantitative monitoring, and (3) a field guide with pictures and descriptions of all native and weed species present at the site.

A monitoring program will be implemented following planting in Year 2 of each Phase. The monitoring program is designed to gather information on the success of plant establishment and habitat development and, subsequently, recommend any remedial actions. Annual reports will also be included as part of the plan.

11.2.1.1 Technical Assessment Methods

The monitoring program will emphasize qualitative and quantitative monitoring to determine the status of the success criteria in this restoration plan. The monitoring schedule is outlined in Table 3. Initial monitoring activities commence at the beginning of each restoration Phase and conclude at the end of Year 5. Monitoring methods are discussed below.

11.2.1.1.1 Qualitative Monitoring

Following implementation, qualitative monitoring will be conducted by BCLT staff and Stewards weekly for the first two months and monthly for the remainder of Year 1. Following Year 1, qualitative monitoring will be conducted quarterly. BCLT staff and volunteers will survey restoration areas for plant vigor and weed species encroachment. To aid in qualitative assessments of percent cover of native plant species and weed species, percent cover diagrams for cover estimation are provided in Attachment 3. BCLT staff will also develop photo points to track seasonal and annual changes in vegetation. The photo point locations will be documented with a Global Positioning System (GPS) unit for repeatability. BCLT staff and volunteers will implement remedial actions, if necessary. The Restoration Biologist will provide recommendations to BCLT regarding what remedial actions should be taken.

A list of wildlife species observed in the restoration area will be compiled quarterly during qualitative monitoring visits. A description of wildlife use will be included in each annual report.

11.2.1.1.2 Quantitative Monitoring

Quantitative monitoring will be performed to measure development of vegetation and to document areas that achieve success criteria as defined by the performance standards. Monitoring will be conducted in the spring for native grassland, coastal sage scrub, mulefat scrub, raptor roosting and nesting habitat, and alkali marsh-upland transition in order to record the maximum number of species present. Monitoring for seasonal pond habitat will be performed in summer, after the pond is no longer inundated. Beginning in Year 2, permanent point-intercept transects will be established within each restoration site to measure annual changes in plant cover and diversity. The number and length of transects will be determined by the size of each habitat. Most areas will consist of 50 meter long transects; however, shorter transects would be more appropriate for the seasonal pond and alkali marsh-upland transition. For large areas, a minimum of three transects will be established. Stewards will note all species present and classify the height (i.e., herb, shrub, or tree) at each interval. This data will be used to determine species density and diversity. The average cover value from all transects will be used to determine if success criteria are being met. Each transect endpoint will also be used for a photo point to record the progress of restoration over the monitoring period. For raptor roosting and nesting habitat, data regarding survivorship of tree and shrub species will be recorded in addition to plant cover and diversity data.

11.2.1.1.3 Southern Tarplant Monitoring

Southern tarplant monitoring will occur throughout the restoration site annually for the duration of the Initial 5-year Maintenance and Monitoring Program. All southern tarplant individuals growing in the restoration area will be counted in the summer when the species is in flower, and continue throughout the Initial 5-year Maintenance and Monitoring Program. Total live plants and flowering individuals will be counted and the locations and full extent of the populations will be mapped and measured with a GPS unit. Permanent photo points will be established at suitable locations. Weed and native species growing in association with southern tarplant will also be noted so that they can be controlled. If population size exceeds 2,000 individual plants, the number of individuals over 2,000 will be estimated within 25 percent of the true population size.

An important aspect of monitoring the success of southern tarplant restoration will be in documenting the associated pollinators. Insect visitations to southern tarplant will be photographed and noted. Pollinators at the reference site will also be photographed and compared to those from the restoration area. Many various native bees, skipper butterflies and bee flies utilize the inflorescences of southern tarplant and it appears to

be an important late season nectar source for these and other native insects (see Photographs 6 through 8). As stated by Roberts:

> Little is known [about]…aspects of southern tarplant reproductive biology such as seed viability or its pollinators. Pollinators are important to maintain population and genetic diversity and preserving habitat for necessary pollinators could be critical. According to Gardiner (1997), southern tarplant is likely to be strongly self-incompatible, meaning that pollinators are crucial to its survival. However, nothing is known about specific pollinators for southern tarplant. Gardiner (1997) cites Baldwin as reporting several species of native bees as being the pollinators for related species of sunflowers. Many native bee populations are also in severe decline as habitat diminishes. This will have a direct impact on southern tarplant population health and vigor (Roberts 2007).

A natural reference population of southern tarplant will be chosen in coastal Orange County for comparative purposes. This reference population will be used to assess and compare annual population fluctuations at both Bolsa Chica and the reference site. Data from annual population counts at the reference site will be used to assess the effects of seasonal rainfall on the number of individuals of southern tarplant present in a particular season. In dryer than average rainfall years population numbers would be expected to be lower than in years of normal or above normal rainfall. The population trend at the reference site the Initial 5-year Maintenance and Monitoring Program will be compared to the population trend at Bolsa Chica.

Southern tarplant restoration will be considered successful if:

- An increase in occupied area by at least 4 acres is documented by the end of the Initial 5-year Maintenance and Monitoring Program.

- A 15 percent increase in population size based on the maximum number of individuals recorded at the Lower Bench of the Bolsa Chica Mesa. The maximum population size recorded was 8,000 individuals (LSA 2001); therefore, the population size will increase to 9,200 individuals.

- The population throughout the restoration area does not show a decline in Years 6 through 10 unless the population at the reference site exhibits the same pattern and magnitude of decline over those same years.

If the success criteria listed above are not reached, CDFG, BCLT, and the Restoration Biologist will discuss appropriate adaptive management strategies.

11.3 Annual Reporting

Annual reports presenting maintenance tasks and monitoring results will be prepared by BCLT and submitted to CDFG. These reports will assess the progress of each Phase toward the final success criteria. Annual reports will be submitted following each of the five monitoring years approximately 90 days after the completion of vegetation monitoring transects. Annual reports will include: (1) a list of names, titles, and organizations of all persons who prepared the content of the annual report and participated in the monitoring activities for that year; (2) analysis of all quantitative monitoring data; (3) a summary of maintenance activities, including any remedial actions taken; (4) projected future work for the following year; (5) digital copies of all monitoring photographs; and (6) an overall evaluation of the habitat development.

11.4 Success Criteria

Performance standards are established to ensure that the restoration plan will result in the creation of self-sustaining habitat. These criteria include the establishment of native grassland, raptor roosting and nesting habitat, seasonal ponds, mule fat scrub, and alkali marsh-upland transition as site conditions permit. Restoration will be considered successful when the final performance standards have been met. The habitat must sustain itself for a minimum of two years in the absence of significant maintenance measures. Significant maintenance measures include major replanting efforts, irrigation, reseeding, eradication of major weed infestations, and major erosion repairs. Weed control, trash removal, and inspection and repair of any protective fences should be implemented to improve the long-term viability of the site. Final success criteria regarding species composition and percent cover are described below.

11.4.1 Target Vegetation Cover and Composition

Target vegetation cover and composition will be determined using quantitative monitoring methods (see Section 11.2.1.1.2). Interim performance standards and final success criteria regarding target vegetation cover and composition have been designed to approximate the cover and composition of native habitat in the area.

Final success criteria will be achieved at the end of Year 5 of the maintenance and monitoring program. At the completion of this plan in 2022, not all Phases will have completed the Initial 5-year Maintenance and Monitoring Program. Therefore, at the completion of this plan, Phases will meet their respective interim performance standards. However, these Phases will meet the final success criteria following the same maintenance and monitoring schedule as the restoration area will be monitored and maintained by BCLT beyond the life of this plan.

Table 11 shows interim performance standards and final success criteria for native cover and composition. For all habitat types, cover from non-native species will be 10 percent or less at the end of Year 5. In addition, no perennial species with a rating of moderate or high and no annual or perennial species with a red alert designation on the California Invasive Plant Inventory (CAL-IPC) Database will be present at the end of Year 5.

TABLE 11
INTERIM PERFORMANCE STANDARDS AND FINAL SUCCESS CRITERIA FOR EACH PHASE

Habitat	Year 2	Year 3	Year 4	Year 5[1]
Native grassland				
Survivorship (container plantings)	80%	100%	100%	100%
Native cover (minimum)	5%	15%	30%	50%
Native grass cover (minimum)	5%	13%	20%	30%
Raptor roosting & nesting habitat				
Survivorship (container plantings)	80%	100%	100%	100%
Native grass cover (minimum)	2%	5%	10%	15%
Seasonal pond				
Survivorship (container plantings)	80%	100%	100%	100%
Native cover (minimum)	15%	30%	45%	60%
Coastal sage scrub				
Survivorship (container plantings)	80%	100%	100%	100%
Shrub cover (maximum)	5%	15%	25%	30%
Native herbaceous cover (minimum)[2]	5%	10%	15%	25%
Alkali marsh-upland transition				
Survivorship (container plantings)	80%	100%	100%	100%
Native cover (minimum)	10%	20%	30%	40%
Mulefat scrub				
Survivorship (container plantings)	80%	100%	100%	100%
Shrub cover (maximum)	5%	15%	25%	30%
Native herbaceous cover (minimum)[2]	5%	10%	15%	25%

[1]Final success criteria

[2] Any remaining percent surface cover will be bare ground to allow for southern tarplant colonization and raptor foraging.

Note for non-native species: For Years 1 through 5—no perennial plant species with a CAL-IPC rating of moderate or high, no annual or perennial species with a CAL-IPC red alert; total non-native species cover less than or equal to 10 percent cover in Year 5.

11.4.2 Survivorship

Success criteria of the species planted in the raptor roosting and nesting habitat in the eucalyptus grove ESHA will be based on survivorship. Final success criterion is 80 percent survivorship at the end of Year 5 for all species planted in Year 1.

11.5 Adaptive Management

Adaptive management strategies may be recommended by the Restoration Biologist to BCLT and CDFG. The purpose of the annual reporting is to evaluate the successes and challenges for achieving success criteria within this restoration plan as site conditions change so that management actions may be adjusted accordingly. Situations where adaptive management actions may be necessary include (but are not limited to):

- Appearance of new weed species
- Appearance of new sensitive species
- Invasion of weedy native species
- Presence of natural depressions in areas not designed for seasonal pools
- Limited access to water for nursery activities and irrigation
- Not meeting planting time frames
- Mechanical and hand-weeding techniques not sufficient to control weeds and achieve success criteria
- Phases not achieving the interim performance standards or final success criteria

Adaptive management strategies that may be implemented include (but are not limited to):

- Developing new weed control measures
- Changing the plant/seeding palette
- Changing the planting density or seeding rate
- Utilizing restoration crews more frequently to perform weed abatement and/or planting
- Developing new maintenance procedures
- Extending the monitoring and management programs

11.6 Notification of Completion

If the final success criteria have been met by the completion of the Initial 5-year Maintenance and Monitoring Program, notification of these events will be provided as part of the final annual report by BCLT.

11.7 Agency Confirmation

Following receipt of the report, BCLT will walk through the site with CDFG and the Restoration Biologist to confirm adequate completion of the permit requirements.

11.8 Long-term Monitoring and Maintenance

Long-term monitoring and maintenance is necessary to ensure successful restoration. Qualitative monitoring techniques described in Section 11.2.1.1.2 will be used annually to determine if weed control, shrub thinning or removal, or supplemental planting are necessary. The following criteria will trigger maintenance measures:

- 20 percent or more cover from non-native weed species
- Presence of perennial species with a rating of moderate or high on the California Invasive Plant Inventory Database
- Presence of annual or perennial species with a red alert designation on the California Invasive Plant Inventory Database
- More than 40 percent shrub cover in coastal sage scrub or mule fat scrub habitats

Additional long-term maintenance will be performed in perpetuity in accordance with natural open space maintenance procedures established by CDFG. Maintenance tasks at minimum will include periodic trash removal and inspection and repair of any protective fences. Long-term maintenance tasks will be performed by CDFG staff, BCLT staff, and volunteers.

11.9 Contingency Measures

If the final success criteria are not met, the Restoration Biologist will prepare an analysis of the cause(s) and propose remedial action for approval. If the restoration area has not met the performance standards, BCLT's maintenance and monitoring obligations will continue until CDFG gives final project confirmation or the MOU between BCLT and CDFG is terminated. In the event the MOU is terminated, CDFG will be responsible for all maintenance and monitoring obligations at the Lower Mesa.

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1993 Savannah Sparrow (*Passerculus sandwichensis*). *In* The Birds of North America, No. 45 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, and the American Ornithologists' Union, Washingon, D.C.

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ATTACHMENTS

ATTACHMENT 1

Potential for Occurrences of Other Sensitive Species

The following species have been known to either occur within the Bolsa Chica Ecological Reserve or within a 5-mile radius of the restoration area (CDFG 2011a). Their potential for occurrence within the restoration area is evaluated below.

1.0 Plant Species

1.1 Lower Mesa—Present or Potentially Present

Estuary seablite (*Suaeda esteroa*)—a CNPS 1B.2 species. Estuary seablite is a member of the goosefoot family (Chenopodiaceae) (JFP 2011). It occurs in coastal salt marshes and swamps between sea level and 15 feet AMS. This perennial herb blooms from May through January (CNPS 2011). It is a CNPS list 1B.2 species (rare, threatened, or endangered in California and elsewhere; fairly endangered in California) (CNPS 2011; CDFG 2011b). One occurrence of estuary seablite at Bolsa Chica State Beach last observed in 1973 is listed through CNDDB. This occurrence was presumed extant during the 2002 record update (CDFG 2011a). Estuary seablite has also been vouchered from the Bolsa Chica Wetlands within the southwest portion of the Bolsa Chica Ecological Reserve in 2006 (CCH 2011). Estuary seablite has potential to occur within the salt marsh pond within the Warner Pond ESHA.

Davidson's saltscale (*Atriplex serenana* var. *davidsonii*)—a CNPS 1B.2 species. Davidson's saltscale is a member of the goosefoot family (Chenopodiaceae). It is a CNPS list 1B.2 species (rare, threatened, or endangered in California and elsewhere; fairly endangered in California) (CNPS 2011; CDFG 2011b). This annual herb occurs in alkaline soils within coastal bluff scrub and coastal scrub from 30 to 650 feet AMS. It blooms from April through October (CNPS 2011). One occurrence is listed from Seal Beach in California Natural Diversity Database (CNDDB). There is no associated observation date. This occurrence was presumed extant when the data were entered in 2003. Suitable alkaline soils are present for Davidson's saltscale to occur within the Warner Pond ESHA.

Coulter's saltbush (*Atriplex coulteri*)—a CNPS 1B.2 species. Coulter's saltbush is a member of the goosefoot family (Chenopodiaceae). It is a CNPS list 1B.2 species (rare, threatened, or endangered in California and elsewhere; fairly endangered in California) (CNPS 2011; CDFG 2011b). This perennial herb blooms from March through October (CNPS 2011). It utilizes alkaline or clay soils within coastal bluff scrub, coastal dunes,

coastal scrub, and valley and foothill grassland between 10 and 1,500 feet AMS (CNPS 2011). One occurrence is listed on CNDDB from 2001 at Seal Beach National Wildlife Refuge. The population was located within a wet depression in salt marsh). Coulter's saltbush has potential to occur in the salt marsh of the Warner Pond ESHA.

San Bernardino aster (*Symphyotrichum defoliatum*)—a CNPS 1B.2 species. San Bernardino aster is a member of the sunflower family (Asteraceae) (JFP 2011). It is a CNPS list 1B.2 species (rare, threatened, or endangered in California and elsewhere; fairly endangered in California) (CNPS 2011; CDFG 2011b). It occurs in grasslands and disturbed places (JFP 2011) and ranges in elevation from 5 to less than 6,700 feet AMS. This perennial rhizomatous herb blooms from July through November (CNPS 2011). California Natural Diversity Database lists two occurrences near the restoration area: the 1932 Bryant Ranch Flood Control at Long Beach is considered extirpated and the 1933 Lomita Gun Club Anaheim Marsh is thought to be possibly extirpated. The restoration area primarily consists of non-native disturbed habitat. Historical localities at Bolsa Chica Ecological Reserve were not present through the Consortium of California Herbaria or CNDDB (CCH 2011; CDFG 2011a). Suitable habitat may have been present historically at the restoration area, therefore there is potential for this species to occur.

Woolly seablite (*Suaeda taxifolia*)—a CNPS 4.2 species. Woolly seablite is listed as occurring within the Bolsa Chica Ecological Reserve by BCLT (BCLT 2011). It is a CNPS 4.2 species (uncommon in California; fairly endangered in California) (CNPS 2011; CDFG 2011b). Woolly seablite occurs within the Bolsa Chica Ecological Reserve in the salt marsh west of Bolsa Bay south of Warner Avenue.

Woolly seablite is a member of the goosefoot family goosefoot family (Chenopodiaceae). It occurs on coastal bluffs and the margin of salt marshes and ranges in elevation from 0 to 50 feet AMS (JFP 2011). Rarely will it grow in the peripheral scrublands adjacent to salt marshes or as isolated individuals along beaches. It ranges from southern California to Baja California. In Orange County, this species grows in Newport Back Bay; a few plants were observed near Dana Point and along the sea cliffs at San Clemente State Beach. Additional herbarium vouchers are from Huntington Beach. Woolly seablite generally has hairs on the leaves unlike estuary seablite (*Suaeda esteroa*) and generally grows at higher elevations in the salt marsh (Reiser 2001). There is potential for woolly seablite to be present within the salt marsh in the Warner Pond ESHA.

1.2 Lower Mesa—Unlikely to Occur

Southwestern spiny rush (*Juncus acutus* ssp. *leopoldii*)—a CNPS 4.2 species. Southwestern spiny rush is listed as occurring within the Bolsa Chica Ecological Reserve by BCLT (BCLT 2011). Southwestern spiny rush is a member of the rush family (Juncaceae). This species occurs within the Bolsa Chica Salt Marsh (CCH 2011). It is a

CNPS list 4.2 species (uncommon in California; fairly endangered in California) (CNPS 2011; CDFG 2011b). Moist saline places, salt marshes, and alkaline seeps are where this species can be found (CNPS 2011).

California box-thorn (*Lycium californicum*)—a CNPS 4.2 species. California box-thorn is listed as occurring within the Bolsa Chica Ecological Reserve by BCLT (BCLT 2011). California box-thorn is a member of the nightshade family (Solanaceae). It occurs along the edge of the southern bluff, within the remnant coastal sage scrub (personal observations of botanists Mark Dodero and Anna Bennett). This species is a CNPS list 4.2 species (uncommon in California; fairly endangered in California) (CNPS 2011; CDFG 2011b). California-box thorn occurs along coastal bluffs and within coastal sage scrub. It blooms from March through August (JFP 2011).

Coast woolly-heads (*Nemacaulis denudata* var. *denudata*)—a CNPS 1B.2 species. Coast woolly-heads is listed as occurring within the Bolsa Chica Ecological Reserve by BCLT (BCLT 2011). Coast woolly-heads is a member of the buckwheat family (Polyganaceae). It occurs within beaches (JFP 2011) and coastal dunes (CNPS 2011). It is a CNPS list 1B.2 species (rare, threatened, or endangered in California and elsewhere; fairly endangered in California) (CNPS 2011; CDFG 2011b). This species has been observed within Rabbit Island in the Bolsa Chica Ecological Reserve (CCH 2011). Coast woolly-heads would not be expected to occur within the restoration area due to the absence of sandy beach habitat. One occurrence at Bolsa Chica Ecological Reserve is listed through CNDDB. The occurrence is from 2001 at Bolsa Bay/Bolsa Chica Beach Area along edge of Bolsa Chica Ecological Reserve.

Santa Barbara morning-glory (*Calystegia sepium* ssp. *binghamiae*)—a CNPS 1A species. Santa Barbara morning-glory is a member of the morning-glory family (Convolvulaceae) (JFP 2011). This California endemic species occurs only in Orange, Los Angeles, Santa Barbara, and Ventura counties and is a CNPS list 1A species (presumed extinct in California) (CNPS 2011; CDFG 2011b). This perennial rhizomatous herb blooms from April through May (CNPS 2011). It occurs in coastal marshes and riverbanks below 65 feet AMS (JFP 2011). Although this is a CNPS list 1A species, CNPS lists the Seal Beach quadrant in Orange County as the only historical locality not considered to be presumed extirpated (CNPS 2011). California Natural Diversity Database lists one occurrence from 1932 described at Bolsa Chica. This occurrence has not been relocated. The updated record in CNDDB from 2002 noted that the occurrence was presumed extant and needed field work. However, suitable habitat consisting of coastal marshes and riverbanks does not occur within the restoration area. Santa Barbara morning-glory is not expected to occur within the restoration area.

Ventura marsh milk-vetch (*Astragalus pycnostachyus* var. *lanosissimus*)—a CNPS 1B.1 species. Ventura marsh milk-vetch is a member of the legume family (Fabaceae) (JFP 2011). This California endemic species occurs only in Orange, Los Angeles, Santa Barbara, and Ventura counties (CNPS 2011). It is a California and federally endangered

species and CNPS list 1B.1 species (rare, threatened, or endangered in California and elsewhere; seriously endangered in California) (CNPS 2011; CDFG 2011b). Coastal dunes, coastal scrub, marshes, and swamps less than 115 feet AMS are where Ventura marsh milk-vetch historically grew (CNPS 2011). California Natural Diversity Database further describes this species as occurring within the reaches of high tide or protected by barrier beaches, more rarely occurring near on seeps near sandy bluffs (CDFG 2011b). This species was thought to be extinct until 1997 when a single natural occurrence composed of 30 to 50 reproductive plants was rediscovered near Oxnard (CNPS 2011). Ventura marsh milk-vetch is presumed to be extirpated from Orange County (CNPS 2011). One occurrence is listed through CNDDB at Bolsa Bay. The updated CNDDB record from 1998 states that the population is possibly extirpated and was not observed during the 1987 field search. It was last seen at this location in 1882. Suitable habitat does not occur within the restoration area, therefore, Ventura marsh milk-vetch is not expected to occur.

Coulter's goldfields (*Lasthenia glabrata* ssp. *coulteri*)—a CNPS 1b.1 species. Coulter's goldfields is a member of the sunflower family (Asteraceae) (JFP 2011). It is a CNPS list 1B.1 species (rare, threatened, or endangered in California and elsewhere; seriously endangered in California) (CNPS 2011; CDFG 2011b). This species occurs in saline places and vernal pools (JFP 2011). It is an annual herb that typically blooms from February through June (CNPS 2011). California Natural Diversity Data Base lists a 1932 occurrence of Coulter's goldfields from the general location of Bolsa Chica Salt Marsh. This occurrence was presumed extant in 2001 when the record was last updated in CNDDB. Suitable saline habitat is present within the restoration area for Coulter's goldfields to occur, however, there are no recent (within at least the last 10 years) records of this species occurring within the Bolsa Chica Ecological Reserve (CCH 2011; CDFG 2011a).

Salt marsh bird's-beak (*Chloropyron maritimum* ssp. *maritimum* [=*Cordylanthus maritimus* ssp. *maritimus*)—a CNPS 1B.2 species. Salt marsh bird's-beak is a member of the broom-rape family (Orobancaceae) (JFP 2011). It is a hemiparasitic, annual herb that occurs in coastal dunes, marshes, and swamps between sea level and 100 feet AMS (CNPS 2011). Shore grass (*Distichlis littoralis* [=*Monanthochloe littoralis*]) is a known host plant for salt marsh bird's-beak (USFWS 2009). It is a California and federally endangered species as well as a CNPS list 1B.2 species (rare, threatened, or endangered in California and elsewhere; fairly endangered in California) (CNPS 2011; CDFG 2011b). Salt marsh bird's-beak blooms from May through October (CNPS 2011). One occurrence at Bolsa Marsh from 1932 is listed through CNDDB. The Bolsa Marsh occurrence has not been observed since 1932 and has possibly been extirpated from Bolsa Chica Ecological Reserve (CDFG 2011b). Salt marsh bird's-beak is not expected to occur within the restoration area. During its bloom period, this is a conspicuous species.

Sanford's arrowhead (*Sagittaria sanfordii*)—a CNPS 1B.2 species. Sanford's arrowhead is a member of the water-plantain family (Alismataceae) (JFP 2011). This perennial rhizomatous herb occurs in marshes and swamps between sea level and 2,000 feet AMS (CNPS 2011). It is a CNPS list 1B.2 species (rare, threatened, or endangered in California and elsewhere; fairly endangered in California) (CNPS 2011; CDFG 2011b). It blooms from May through October (CNPS 2011). One occurrence is listed on CNDDB from 1975. Sanford's arrowhead was observed growing along the bank of the flood control channel of the East Garden Grove–Wintersburg canal north of Warner Street (CDFG 2011a). In 2011, CNPS lists this species as being extirpated from southern California (CNPS 2011). Sanford's arrowhead is not expected to occur within the restoration area, since it has not been observed at the closest locality since 1975 and is believed to be extirpated from southern California.

Los Angeles sunflower (*Helianthus nuttallii* ssp. *parishii*)—a CNPS 1A species. Los Angeles sunflower is a member of the sunflower family (Asteraceae) (JFP 2011). It is a perennial rhizomatous herb that occurs in marshes and swamps (both fresh water and coastal salt) between 15 and 5,500 feet AMS. This California endemic species blooms from August through October. The last know occurrence was documented in 1937 and has been extirpated due to urbanization (CNPS 2011). It is a CNPS list 1A species (presumed extinct in California) (CNPS 2011; CDFG 2011b). One occurrence from Wintersburg in 1924 is listed through CNDDB. Los Angeles sunflower is not expected to occur at the restoration area, since it has not been observed in California in almost 75 years.

Salt spring checkerbloom (*Sidalcea neomexicana*)—a CNPS 2.2 species. Salt spring checkerbloom is a member of the mallow family (Malvaceae) (JFP 2011). It occurs in alkaline mesic habitats including chaparral, coastal scrub, lower montane coniferous forest, Mojavean desert scrub, and playas between 50 and 5,000 feet AMS (CNPS 2011). This perennial herb blooms from March through June (CNPS 2011). It is a CNPS 2.2 listed species (rare, threatened, or endangered in California, but more common elsewhere; fairly endangered in California) (CNPS 2011; CDFG 2011b). One occurrence from 1936 at Bryant Ranch east of the San Gabriel Flood Control Channel in Long Beach is listed through CNDDB. This occurrence was presumed extant when the record was last updated in 1996. Salt spring checkerbloom is not expected to occur within the restoration area, since it is a conspicuous perennial species.

Mud nama (*Nama stenocarpum*)—a CNPS 2.2 species. Mud nama is a member of the borage family (Boraginaceae) (JFP 2011). It is a CNPS list 2.2 species (rare, threatened, or endangered in California, but more common elsewhere; fairly endangered in California) (CNPS 2011; CDFG 2011b). This annual/perennial herb blooms from January through July (CNPS 2011). It occurs in intermittently wet areas (JFP 2011) such as marshes, swamps, lake margins, and river beds (CNPS 2011). California Natural Diversity Database lists a single occurrence within 2 miles of the restoration area. This

occurrence is from 1932 at the Anaheim Marsh and describes the habitat as a dry pond bottom. Mud nama has not been observed within the Bolsa Chica Ecological Reserve. Suitable habitat is not present within the restoration area to support mud nama, therefore it is not expected to occur.

Gambel's water cress (*Nasturtium gambelii*)—a CNPS 1B.1 species. Gambel's water cress is a member of the mustard family (Brassicaceae). This perennial rhizomatous herb occurs in marshes streambanks and lake margins between 15 and 1,100 feet AMS (CNPS 2011). It is a California endangered and federally threatened species as well as a CNPS list 1B.1 species (rare, threatened, or endangered in California and elsewhere; seriously endangered in California) (CNPS 2011; CDFG 2011b). This species blooms from April through October. Gambel's water cress is nearly extinct from the United States and is known from only four occurrences in California (CNPS 2011). One occurrence from 1908 is listed at Huntington Beach through CNDDB. This occurrence has been extirpated (CDFG 2011a). Gambel's water cress is not expected to occur within the restoration area. It is not historically known from Bolsa Chica Ecological Reserve.

2.0 Wildlife Species

2.1 Lower Mesa—Present or Potentially Present

2.1.1 Birds

Yellow-breasted chat (*Icteria virens*)—a CDFG Species of Special Concern. The yellow-breasted chat is a seasonal resident of southern California from March to September and has been reported within the Bolsa Chica Mesa by BCLT (BCLT 2011). Yellow-breasted chats are considered to have become "increasingly rare" in Orange County and breeding populations have greatly declined throughout southern California. Yellow-breasted chats breed during April through August in dense brush or scrub, usually along streams or marshes. Their nesting habitat is considered sensitive (Gardali and Shuford 2008).

Tricolored blackbird (*Agelaius tricolor*)—a CDFG Species of Special Concern and USFWS Bird of Conservation Concern. The tricolored blackbird ranges throughout the lowland regions and surrounding foothills of southern California (Beedy et al. 1999) and has been reported within the Bolsa Chica Mesa by BCLT (BCLT 2011). Tricolored blackbirds are typically found in large flocks in freshwater marsh habitat dominated by cattails, willows, mule-fat, or tamarisk. They forage in agricultural and disturbed areas, along lakeshores, and in wet meadows. Tricolored blackbirds are opportunistic feeders,

consuming a diet of grasshoppers, grains, snails, small clams, and agricultural resources.

2.1.2 Mammals

Western mastiff bat (*Eumops perotis californicus*)—a CDFG Species of Special Concern. This species has been known to occur within 5 miles of the restoration area and was presumed extant in 2007 (CDFG 2011a). This species is likely to occur within the restoration area due to the occurrence of suitable habitat. Suitable habitat includes coastal sage scrub and grassland.

2.1.3 Invertebrates

Monarch butterfly (*Danaus plexippus*). Although the monarch butterfly is not federally or state protected, it occurs on the CDFG Special Animals List where it ranks secure (G5) and vulnerable (S3) (CDFG 2011c). The monarch butterfly was identified in the Bolsa Chica Ecological Reserve in a eucalyptus grove within 2 miles of the restoration area in 1989. Occurrences within 2 miles of the restoration area occur in other areas surrounding the reserve dating as recently as 1997 (CDFG 2011a). This species is likely to occur within the restoration area in the eucalyptus grove ESHA. Monarch butterflies form roosting aggregations is large trees, primarily eucalyptus, with water sources nearby (Hogue 1993).

2.2 Lower Mesa—Unlikely to Occur

2.2.1 Birds

Belding's savannah sparrow (*Passerculus sandwichensis beldingi*)—State listed as an endangered. Belding's savannah sparrow is known to occur within the Bolsa Chica Ecological Reserve (Hoecker et al. 1998; Zembal and Hoffman 2010) and in marshes within 5 miles of the restoration area (CDFG 2011a). According to Zembal and Hoffman (2010), 280 territories were observed in 2010 making the subpopulation at Bolsa Chica the fourth largest subpopulation in California. Of the 280 territories, 199 were found in the tidal basins along the east side of the Bolsa Chica Ecological Reserve, 41 around inner Bolsa Bay, and a couple around outer Bolsa Bay (Zembal and Hoffman 2010).

This species is likely to occur within the restoration area due to the presence of foraging habitat within the restoration area and nesting habitat in the adjacent salt marsh. Belding's savannah sparrows nest in tidal salt marshes or around lagoons in low vegetation dominated by pickleweed. Foraging occurs in nearby mudflats, beaches, rocks, and low coastal strand vegetation (Wheelwright and Rising 1993).

Yellow warbler (*Dendroica petechia brewsteri*)—a CDFG Species of Special Concern and USFWS Bird of Conservation Concern. In California, yellow warblers are an obligate riparian species, nesting and foraging almost exclusively in riparian habitats (Harmsworth Associates 1999). This species is an uncommon summer resident in coastal lowland south of Los Angeles County where breeding species have declined considerably (Dunn et al. 1981). Although this species was reported within the Bolsa Chica Mesa by BCLT (BCLT 2011), this species is considered unlikely to occur within the restoration area due to a lack of suitable habitat as well as the decline in population.

Yellow-headed blackbird (*Xanthocephalus xanthocephalus*)—a CDFG Species of Special Concern. The yellow-headed blackbird is an uncommon to fairly common spring transient in Orange County. This species breeds and nests only in freshwater marshes (Dunn et al. 1981). Although this species was reported within the Bolsa Chica Mesa by BCLT (BCLT 2011), this species is considered unlikely to occur within the restoration area due to a lack of suitable habitat.

Northern cardinal (*Cardinalis cardinalis*)—a CDFG Watch List species. Cardinals native to California and Mexico occur only marginally in the Colorado River Valley. Other populations are of introduced subspecies from the eastern United States (CDFG 2011e). Although this species was reported within the Bolsa Chica Mesa by BCLT (BCLT 2011) this species is likely to be an exotic subspecies due to the known range of the native northern cardinal (CDFG 2011e).

California least tern (*Sterna antillarumbrowni*)—federally listed as endangered, state listed as endangered, and a CDFG fully-protected species. California least terns are known to nest within 2 miles of the restoration area within the Bolsa Chica Ecological Reserve and other locations (CDFG 2011a). According to O'Reilly and Knapp (2011), 80 pairs of California least terns had a total of 167 nests distributed among five nest sites located at the Bolsa Chica Ecological Reserve. Of 268 eggs counted, 160 hatched with an estimated survival of 66 to 95 chicks (O'Reilly and Knapp 2011).

This species is unlikely to occur within the restoration area due to a lack of suitable nesting and foraging habitat. Breeding and nesting occurs on open sandy shores, gravelly shores, or artificial surfaces with nearby foraging habitat. Foraging occurs over bays, estuaries, tidal channels, and harbors (Dunn et al. 1981).

Light-footed clapper rail (*Rallus longirostris levipes*)—federally listed as endangered, state listed as endangered, and a CDFG fully-protected species. The light-footed clapper rail is known to occur in the Bolsa Chica Ecological Reserve within 2 miles of the restoration area (CDFG 2011a; Zembal et al. 2010, 2011). According to Zembal et. al (2011), light-footed clapper rail individuals were observed in the Bolsa Chica Ecological Reserve in 2011. Additionally, a pair exhibiting breeding behavior was detected adjacent to Outer Bolsa Bay in 2010 (Zembal et al. 2010).

This species is unlikely to occur within the restoration area due to a lack of suitable nesting and foraging habitat, but is likely to occur in the coastal salt marsh adjacent to the restoration area. Light-footed clapper rails nest and forage in coastal salt marsh dominated by cordgrass (Unitt 2004).

Western snowy plover (Charadrius alexandrines nivosus)—federally listed as threatened and a CDFG Species of Special Concern. The western snowy plover has been known to occur within the Bolsa Chica Ecological Reserve and within 2 miles of the restoration area (CDFG 2011a). Although all CNDDB occurrences are recorded as extirpated, a total of 73 nests producing 66 fledglings were observed in 2011 at the Bolsa Chica Ecological Reserve (Knapp and Peterson 2011). Additionally, 45 adults were identified in 2010 in restoration areas in the Bolsa Chica Ecological Reserve (Knapp and Peterson 2010). This species is unlikely to occur within the restoration area due to a lack of suitable nesting or foraging habitat. Western snowy plovers commonly nest above the high tide line on beaches, dunes, estuaries, and lagoons and forage on beaches and foredunes.

Black skimmer (*Rynchops niger*)—a CDFG Species of Special Concern and USFWS Bird of Conservation Concern. Black skimmers are known to occur within 2 miles of the restoration area. In 2011, between 50 and 150 individuals were documented during separate observations in the Bolsa Chica Ecological Reserve; however, nesting was unsuccessful due to predation (O'Reilly 2011). This species is unlikely to occur within the restoration area due to a lack of suitable nesting and foraging habitat. Black skimmers are usually found along beaches, sandbars, shell banks, islands, and marshes and are likely to occur in those respective habitats within the Bolsa Chica Ecological Reserve. Black skimmers nest in the sand or among shells and forage over water consuming fish and crustaceans (Dobkin et al. 1988).

California brown pelican (*Pelicanus occidentalis californicus*)—a CDFG fully protected species. This species has been known to roost within 5 miles of the restoration area (CDFG 2011a). This species is unlikely to occur within the restoration area due to a lack of suitable habitat. The California brown pelican nests on coastal islands outside of the surf line.

Ferruginous hawk (*Buteo regalis*). Although the ferruginous hawk is not federally or state protected, it occurs on the CDFG Special Animals List where it ranks apparently secure (G4) and vulnerable (S3) to apparently secure (S4) (CDFG 2011c). The ferruginous hawk has been known to occur within 5 miles of the restoration area and was presumed extant in 2006 (CDFG2011a). This species is likely to occur within the restoration area. Habitat includes (but is not limited to) open grassland and sagebrush.

2.2.2 Reptiles

Coast horned lizard (*Phrynosoma blainvilli*)—a CDFG Species of Special Concern. The coast horned lizard has been known to occur within 5 miles of the restoration area (CDFG 2011a). However, all occurrences are extirpated or presumed extirpated due to human activities. This species is unlikely to occur within the restoration area. The coast horned lizard frequents many habitats. However, it is unlikely that the coast horned lizard remained present during or after agricultural operations at the restoration area and within the Bolsa Chica Ecological Reserve due to impacts from the surrounding development.

Green turtle (*Chelonia mydas*)—a federally threatened species. The green turtle was documented in the San Gabriel River within 5 miles of the restoration area in 2010 (CDFG 2011a). This species is unlikely to occur within the restoration area due to the lack of suitable habitat. The green turtle is a marine species and is likely to occur in aquatic habitats surrounding the Lower Mesa.

2.2.3 Mammals

South coast marsh vole (*Microtus californicus stephensi*)—a CDFG Species of Special Concern. The south coast marsh vole has been known to occur within 2 miles of the restoration area and was presumed to be extant in 2004 (CDFG 2011a). This species is unlikely to occur within the restoration area due to a lack of suitable habitat but is likely to occur within the salt marsh adjacent to the restoration area. Habitat for this species is saltmarsh.

Southern California saltmarsh shrew (*Sorex ornatus salicornicus*)—a CDFG Species of Special Concern. The southern California saltmarsh shrew is known to occur within dense pickleweed (*Salicornia* sp.) and saltgrass (*Distchlis spicata*) in the Bolsa Chica Ecological Reserve, although the exact location is unknown (Brylski et al. 1998). This species was also recorded within 2 miles of the restoration area in 1968 and presumed to be extant in 2005 (CDFG 2011a). This species is unlikely to occur within the restoration area due to a lack of suitable habitat but is likely to occur within the salt marsh adjacent to the restoration area. Habitat for this species is saltmarsh.

Western yellow bat (*Lasurius xanthinus*)—a CDFG Species of Special Concern. This species has been known to occur within 5 miles of the restoration area and was presumed extant in 2004 (CDFG 2011a). This species is unlikely to occur within the Bolsa Chica Ecological Reserve. Habitat for western yellow bat is valley foothill riparian, desert riparian, desert wash, and palm oasis.

2.2.4 Invertebrates

Mimic tryonia (= California brackishwater snail) (*Tryonia imitator*). Although the mimic tryonia is not federally or state protected, it occurs on the CDFG Special Animals List where it ranks imperiled (G2 & S2) to vulnerable (G3 & S3) (CDFG 2011c).The mimic tryonia was identified within 2 miles of the restoration area at the Bolsa Chica State Beach and Slough in 1968 and was presumed to be extant in 1998 (CDFG 2011a). This species is unlikely to occur within the restoration area due to lack of suitable habitat but is likely to occur in the adjacent salt marsh. Habitat for this species is salt marsh, estuaries, and coastal lagoons.

Wandering (=saltmarsh) skipper (*Panoquina errans*). Although the wandering skipper is not federally or state protected, it occurs on the CDFG Special Animals List where it ranks secure (G5) to apparently secure (G4) and critically imperiled (S1) (CDFG 2011c). The wandering skipper is known to occur within 2 miles of the restoration area within the Bolsa Chica Ecological Reserve and has been documented in a variety of locations including outside the western edge of the eucalyptus grove ESHA in 1989 (CDFG 2011a). This species is likely to occur within the restoration area due to the proximity of suitable habitat for larval development. The wandering skipper requires saltgrass for larval development and typically occurs in coastal salt marsh (Hogue 1993).

Dorothy's El Segundo dune weevil (*Trigonoscuta dorothea dorothea*).Although this species is not federally or state protected, it occurs on the CDFG Special Animals List where it ranks critically imperiled (G1 & S1) (CDFG 2011c). Dorothy's El Segundo dune weevil was identified in 1989 in the Bolsa Chica Ecological Reserve within 2 miles of the restoration area and presumed to be extant in 1998 (CDFG 2011a). This species is unlikely to occur within the restoration area due to a lack of suitable habitat. Habitat for this species is coastal sand dunes.

Western beach tiger beetle (*Cicindela latesignata latesignata*). Although the western tidal-flat tiger beetle is not federally or state protected, it occurs on the CDFG Special Animals List where it ranks apparently secure (G4) and critically imperiled (S1) (CDFG 2011c). The western beach tiger beetle has been known to occur within a 2 mile radius of the restoration area but was considered extirpated in 2005 (CDFG 2011a). This species is unlikely to occur within the restoration area due to a lack of suitable habitat and nearby populations. This species typically inhabits beaches and mudflats.

Western tidal-flat tiger beetle (*Cicindela gabbii*). Although the western tidal-flat tiger beetle is not federally or state protected, it occurs on the CDFG Special Animals List where it ranks apparently secure (G4) and critically imperiled (S1) (CDFG 2011c).The western tidal-flat tiger beetle has been known to occur within a 2 mile radius of the restoration area but was considered extirpated within the Bolsa Chica Ecological Reserve in 2008 (CDFG 2011a). This species is unlikely to occur within the restoration

area due to a lack of suitable habitat and nearby populations. This species typically inhabits estuaries and mudflats.

Sandy beach tiger beetle (*Cicindela hirticollis gravida*). Although the sandy beach tiger beetle is not federally or state protected, it occurs on the CDFG Special Animals List where it ranks secure (G5), imperiled (T2), and critically imperiled (S1) (CDFG 2011c). Records of the sandy beach tiger beetle date from 1945 to 1979 within 5 miles of the restoration area. However, this species was considered extirpated in 2005 (CDFG 2011a). This species is unlikely to occur within the restoration area due to a lack of suitable habitat and nearby populations. The sandy beach tiger beetle inhabits sandy areas adjacent to non-brackish water.

Senile tiger beetle (*Cicindela senilis frosti*). The senile tiger beetle inhabits marine shorelines and salt marsh. Although the senile tiger beetle is not federally or state protected, it occurs on the CDFG Special Animals List where it ranks apparently secure (G4) and critically imperiled (T1 & S1) (CDFG 2011c). This species has been known to occur historically within 5 miles of the restoration area but was considered extirpated in 2005 (CDFG 2011a). This species is unlikely to occur within the restoration area due to a lack of suitable habitat and nearby populations.

ATTACHMENT 2

ATTACHMENT 2
OPTIONAL NATIVE GRASSLAND PLANT PALETTE:
CONTAINER PLANTING AND / OR DIRECT SEED

Scientific Name	Common Name	Comments
ANGIOSPERMS: MONOCOTS		
POACEAE (GRAMINEAE)	**GRASS FAMILY**	
Agrostis exarata Trin.	spike redtop	
Bothriochloa barbinodis (Lag.) Herter	cane bluestem	
Melica imperfecta Trin.	California melic	
ANGIOSPERMS: DICOTS		
APIACEAE (UMBELLIFERAE)	**CARROT FAMILY**	
Apiastrum angustifolium Nutt.	wild-celery	
Daucus pusillus Michx.	American wild carrot	Seed after other species become established and/or plant in low densities to prevent dominance.
ASTERACEAE	**SUNFLOWER FAMILY**	
Achillea millefolium	yarrow, milfoil	
Chaenactis glabriuscula DC.	yellow pincushion	
Cirsium occidentale (Nutt.) Jeps.	thistle	Seed after other species become established or plant in low densities to prevent dominance.
Lasthenia californica DC. ex Lindl.	goldfields	
Layia platyglossa (Fisch. & C.A. Mey.) A. Gray	tidy-tips	
Osmadenia tenella Nutt.	osmadenia	
BORAGINACEAE	**BORAGE FAMILY**	
Cryptantha sp.	cryptantha	Plant in patches.
Phacelia sp.	phacelia	
Plagiobothrys sp.	popcornflower	
FABACEAE (LEGUMINOSAE)	**LEGUME FAMILY**	
Acmispon strigosus (Nutt.) Brouillet [=*Lotus strigosus*]	bishop's/strigose lotus	
Astragalus gambelianus E. Sheld.	Gambel milk-vetch, little blue loco	Seed after other species become established or plant in low densities to prevent dominance.
Lupinus bicolor Lindl.	miniature lupine	
Lupinus succulentus K. Koch	arroyo lupine	
LAMIACEAE	**MINT FAMILY**	
Salvia columbariae Benth.	chia	
ONAGRACEAE	**EVENING-PRIMROSE FAMILY**	
Camissonia sp.	sun cup	
PLANTAGINACEAE	**PLANTAIN FAMILY**	
Plantago erecta E. Morris	dot-seed plantain	
PRIMULACEAE	**PRIMROSE FAMILY**	
Dodecatheon clevelandii Greene ssp. *clevelandii*	shooting star, wild cyclamen	
SCROPHULARIACEAE	**FIGWORT FAMILY**	
Castilleja exserta (A.A. Heller) T.I. Chuang & Heckard	purple owl's clover	

ATTACHMENT 2
OPTIONAL SEASONAL POND PLANT PALETTE:
CONTAINER PLANTING AND/OR DIRECT SEED

Scientific Name	Common Name	Comments
ANGIOSPERMS: MONOCOTS		
JUNCACEAE	**RUSH FAMILY**	
Juncus acutus L. ssp. *leopoldii* (Parl.) Snogerup	spiny rush	
POACEAE (GRAMINEAE)	**GRASS FAMILY**	
Distichlis spicata (L.) Greene	saltgrass	
Distichlis littoralis [=*Monanthochloe littoralis* Engelm.]	shoregrass	Seed after other species become established or plant in low densities to prevent dominance.
Sporobolus airoides (Torr.) Torr.	alkali sacaton	
Hordeum depressum	Alkali barley	Seed after other species become established or plant in low densities to prevent dominance.
Phalaris lemmonii Vasey	Lemmon canary grass	Seed after other species become established or plant in low densities to prevent dominance.
ANGIOSPERMS: DICOTS		
ASTERACEAE	**SUNFLOWER FAMILY**	
Centromadia parryi ssp. *australis*	Southern tarplant	Direct seed and plant 200 individuals from container plants.
Lasthenia glabrata Lindl. ssp. *coulteri* (A. Gray) Ornduff	Coulter's goldfields	
CHENOPODIACEAE	**GOOSEFOOT FAMILY**	
Salicornia sp.	annual pickleweed	
CONVOLVULACEAE	**MORNING-GLORY FAMILY**	
Cressa truxillensis Kunth	alkali weed	Seed after other species become established or plant in low densities to prevent dominance.
FRANKENIACEAE	**FRANKENIA FAMILY**	
Frankenia salina (Molina) I.M. Johnst.	alkali heath	
MALVACEAE	**MALLOW FAMILY**	
Malvella leprosa (Ortega) Krapov.	alkali-mallow, white-weed	Seed after other species become established or plant in low densities to prevent dominance.

ATTACHMENT 2
OPTIONAL COASTAL SAGE SCRUB PLANT PALETTE:
CONTAINER PLANTING AND/OR DIRECT SEED

Scientific Name	Common Name	Comments
ANGIOSPERMS: MONOCOTS		
POACEAE (GRAMINEAE)	**GRASS FAMILY**	
Agrostis exarata Trin.	spike redtop	
Bothriochloa barbinodis (Lag.) Herter	cane bluestem	
Melica imperfecta Trin.	California melic	
APIACEAE (UMBELLIFERAE)	**CARROT FAMILY**	
Apiastrum angustifolium Nutt.	wild-celery	
Daucus pusillus Michx.	American wild carrot	Seed after other species become established and/or plant in low densities to prevent dominance.
APOCYNACEAE	**DOGBANE FAMILY**	
Asclepias fascicularis Decne.	narrow-leaf milkweed	
ASTERACEAE	**SUNFLOWER FAMILY**	
Achillea millefolium	yarrow, milfoil	
Chaenactis glabriuscula DC.	yellow pincushion	
Cirsium occidentale (Nutt.) Jeps.	thistle	Seed after other species become established or plant in low densities to prevent dominance.
Lasthenia californica DC. ex Lindl.	goldfields	
Layia platyglossa (Fisch. & C.A. Mey.) A. Gray	tidy-tips	
Osmadenia tenella Nutt.	osmadenia	
BORAGINACEAE	**BORAGE FAMILY**	
Cryptantha sp.	cryptantha	Plant in patches.
Phacelia sp.	phacelia	
Plagiobothrys sp.	popcornflower	
CACTACEAE	**CACTUS FAMILY**	
Cylindropuntia [=*Opuntia*] *prolifera*(Engelm.) F.M. Knuth	coastal cholla	
Opuntia oricola Philbrick	chaparral prickly-pear	
FABACEAE (LEGUMINOSAE)	**LEGUME FAMILY**	
Acmispon strigosus (Nutt.) Brouillet [=*Lotus strigosus*]	bishop's/strigose lotus	
Astragalus gambelianus E. Sheld.	Gambel milk-vetch, little blue loco	Seed after other species become established or plant in low densities to prevent dominance.
Lupinus bicolor Lindl.	miniature lupine	
Lupinus succulentus K. Koch	arroyo lupine	
LAMIACEAE	**MINT FAMILY**	
Salvia columbariae Benth.	chia	
ONAGRACEAE	**EVENING-PRIMROSE FAMILY**	
Camissonia sp.	sun cup	
PLANTAGINACEAE	**PLANTAIN FAMILY**	
Plantago erecta E. Morris	dot-seed plantain	

ATTACHMENT 2
OPTIONAL COASTAL SAGE SCRUB PLANT PALETTE:
CONTAINER PLANTING AND/OR DIRECT SEED (CONT.)

Scientific Name	Common Name	Comments
ANGIOSPERMS: DICOTS		
PRIMULACEAE	**PRIMROSE FAMILY**	
Dodecatheon clevelandii Greene ssp. *clevelandii*	shooting star, wild cyclamen	
SCROPHULARIACEAE	**FIGWORT FAMILY**	
Castilleja exserta (A.A. Heller) T.I. Chuang & Heckard	purple owl's clover	

ATTACHMENT 2
OPTIONAL RAPTOR ROOSTING AND NESTING HABITAT PLANT PALETTE:
CONTAINER PLANTING AND/OR DIRECT SEED

Scientific Name	Common Name	Comments
ANGIOSPERMS: MONOCOTS		
POACEAE (GRAMINEAE)	**GRASS FAMILY**	
Agrostis exarata Trin.	spike redtop	
Bothriochloa barbinodis (Lag.) Herter	cane bluestem	
Melica imperfecta Trin.	California melic	

ATTACHMENT 3

When collected: All quadrat species
Field width: 1 digit
MQO: No errors, at least 80% of the time

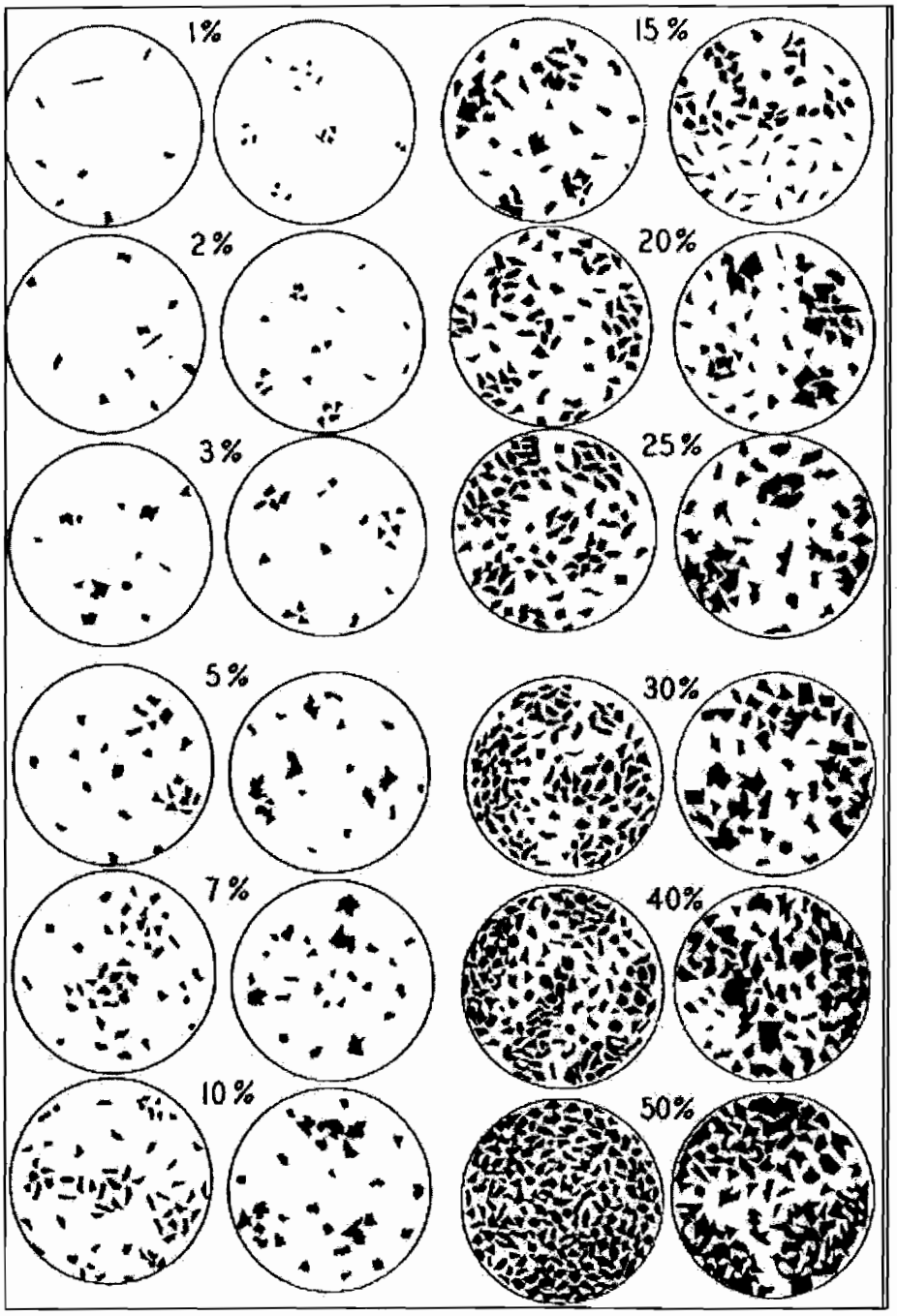

Figure 13-4. Reference plots for cover estimation.

CNPS COVER DIAGRAMS

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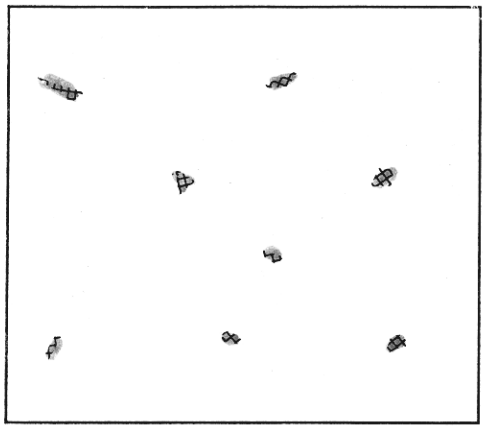

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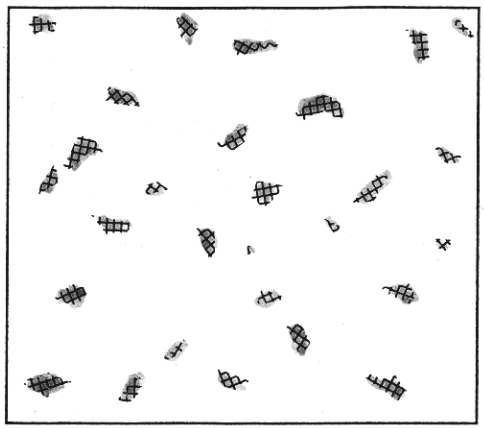

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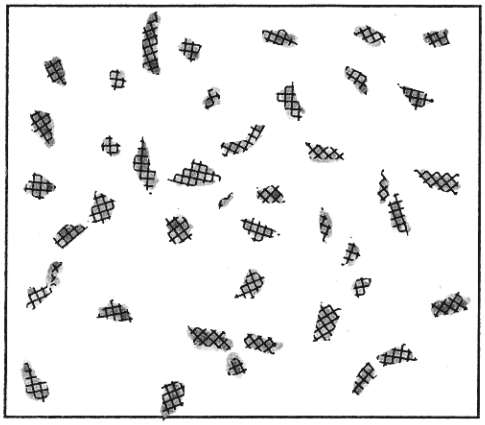

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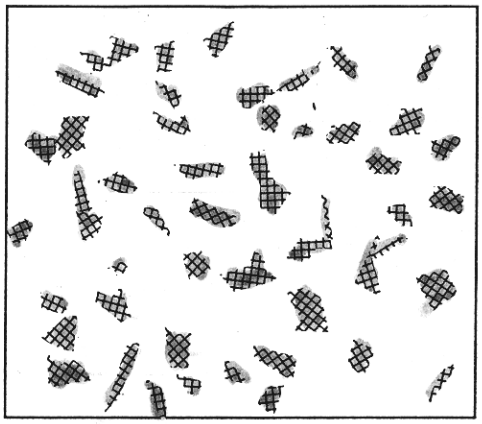

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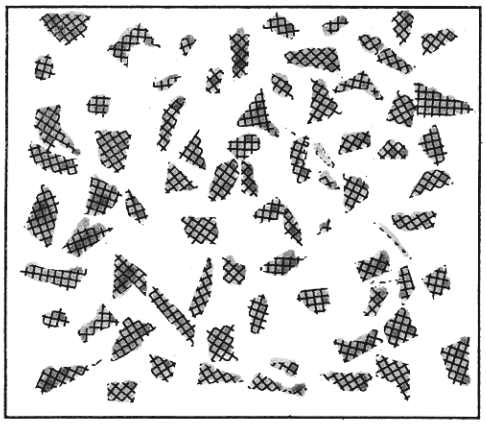

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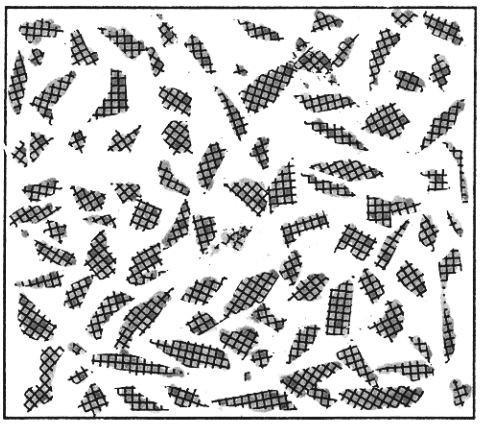

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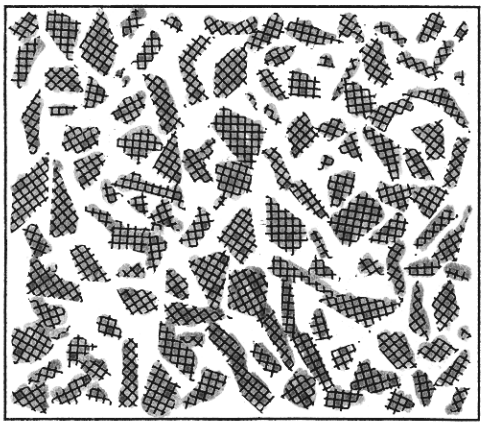

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