Habitat Creation, Conservation, and Enhancement Plan for the Willow Road Extension/U.S. 101 Interchange, Nipomo, San Luis Obispo County, California

Prepared for:

County of San Luis Obispo
Department of Public Works

Prepared by:

SWCA Environmental Consultants

May 2010

(Revised May 6, 2010)

HABITAT CREATION, CONSERVATION, AND ENHANCEMENT PLAN
FOR
WILLOW ROAD EXTENSION/U.S. 101 INTERCHANGE

Prepared for:

COUNTY OF SAN LUIS OBISPO
DEPARTMENT OF PUBLIC WORKS
County Government Center, Room 207
San Luis Obispo, CA 93408
Contact: John Farhar

Prepared by:

SWCA Environmental Consultants
1422 Monterey Street, Suite C200
San Luis Obispo, CA 93401
Contact: Travis Belt

May 2010

SWCA Project Number: 15114.04

TABLE OF CONTENTS

1. INTRODUCTION 1
1.1 Project Background 1
1.2 Project Description 1
1.2.1 Phase One 1
1.2.2 Phase Two (Caltrans Oversight) 5
1.3 Project Site Description 5
2. PROJECT IMPACTS AND MITIGATION REQUIREMENTS 5
2.1 Impacts to Sensitive Habitats 6
2.1.1 Coast Live Oak Dominated Communities 6
2.1.2 Central Maritime Chaparral 7
2.2 Impacts to Special-status Plant Species 7
2.3 Impacts to Waters of the United States 7
2.4 Required Mitigation 7
2.4.1 Habitat Creation 8
2.4.2 Habitat Enhancement 8
2.4.3 Oak Tree Replacement Standards 9
3. MITIGATION STRATEGY 9
3.1 Oak Woodland Habitat Creation 9
3.1.1 Biological Benefits 9
3.1.2 Public and Cultural Benefits 9
3.1.3 Oak Woodland Creation Site Description 10
3.1.4 Rationale for Expecting Success 10
3.1.5 Created Oak Woodland Protection 11
3.2 Maritime Chaparral Habitat Enhancement 11
3.2.1 Maritime Chaparral Enhancement Site Description 11
3.2.2 Rational for Expecting Success 11
3.2.3 Enhanced Maritime Chaparral Protection 11
4. OAK WOODLAND CREATION AND MONITORING PLAN 12
4.1 Oak Woodland Creation Plan 12
4.1.1 Cultural Resources Protection Measures 12
4.1.2 Materials Collection and Treatment 12
4.1.3 Site Preparation 13
4.1.4 Planting Methods 13
4.1.5 Maintenance 14
4.2 Oak Woodland Monitoring Plan 15
4.2.1 Performance Standards and Final Success Criteria 15
4.2.2 Monitoring Methods 16
4.2.3 Reporting 17
4.3 Oak Woodland Creation and Monitoring Schedule 17
5. MARITIME CHAPARRAL ENHANCEMENT PLAN 20
5.1 Special-status Plants and Oak Tree Plantings 20
5.1.1 Materials Collection and Propagation 20
5.1.2 Site Preparation and Planting Methods 21
5.2 Exotic Species Removal 22
5.3 Chaparral Species Seeding 22
5.4 Maintenance 22
6. MARITIME CHAPARRAL ENHANCEMENT MONITORING PLAN 23

6.1 Performance Standards and Success Criteria 23
6.2 Monitoring Methods 24
6.2.1 Qualitative Assessments 24
6.2.2 Quantitative Assessments 25
6.3 Reporting 25
6.4 Maritime Chaparral Enhancement and Monitoring Schedule 26
7. CONTINGENCY PLAN 26
8. REFERENCES 29

TABLES

Table 1. Summary of Impacts by Project Phase 6
Table 2. Oak Woodland Creation Area Seed mix 14
Table 3. Oak Woodland Creation Annual Performance Goals and Final Success Criteria 16
Table 4. Dana Adobe Oak Woodland Creation Schedule 18
Table 5. Maritime Chaparral Enhancement Annual Performance Goals and Final Success Criteria 24
Table 6. Maritime Chaparral Enhancement Schedule 27

FIGURES

Figure 1. Project Vicinity Map 2
Figure 2. Project Location Map 3
Figure 3. Dana Adobe Oak Woodland Creation Map 19
Figure 4. Maritime Chaparral Enhancement Map 28

ATTACHMENTS

Attachment A. Photo Documentation
Attachment B. Oak Trial Study
Attachment C. Recommended Monitoring Protocols
Attachment D. Willow Road Extension Habitat Mitigation and Monitoring Plan

1. INTRODUCTION

SWCA Environmental Consultants (SWCA) has prepared this Habitat Creation, Conservation, and Enhancement Plan (HCCEP) at the request of Mr. John Farhar of the County of San Luis Obispo (County) Department of Public Works. The intent of this HCCEP is to provide a plan for mitigating impacts to special-status habitats and species resulting from the Willow Road Extension/U.S. 101 Interchange Project (project). This HCCEP discusses the project and related impacts, develops a mitigation strategy, and details a methodology for implementing the mitigation strategy.

1.1 PROJECT BACKGROUND

The project is located in Nipomo, southern San Luis Obispo County, California (refer to Figure 1). The project will extend Willow Road from its existing terminus (approximately 1,000 feet west of Pomeroy Road) to Thompson Avenue (approximately 2,000 feet east of U.S. 10l) (refer to Figure 2). The project represents a part of a long-range circulation improvement program for the South County Planning Area and is an integral component of the area's future transportation network.

In January 1995, the Board of Supervisors considered six alternative alignments for the project. At that time, the County selected to conduct additional analyses on two of the six alignments, which led to the preparation of a Tier 1 Environmental Impact Report (EIR). In 1998, a Tier 1 EIR for the project was completed and released for public review. In March 1999, the Final EIR was adopted by the County Board of Supervisors and a preferred alignment and interchange were selected. The Final EIR specified that subsequent design refinements for the road extension, interchange, and frontage road would be evaluated in a Tier 2 construction-level environmental document. In April 2006, the County prepared a Supplemental EIR (SEIR) to satisfy the requirements for evaluating the preferred project alternative in a Tier 2 construction-level environmental document. In addition to the SEIR prepared by the County, the California Department Transportation (Caltrans) prepared an Environmental Assessment and Natural Environmental Study for the proposed interchange (Phase II). The preparation of this HCCEP is a formal requirement of the SEIR and EA.

1.2 PROJECT DESCRIPTION

The project consists of two phases that includes the extension of Willow Road from its existing terminus to Thompson Avenue; construction of a frontage road between Willow Road and Sandydale Drive; and construction of a new U.S. 10l/Willow Road interchange between post-mile (PM) 5.75 and PM 6.0.

1.2.1 Phase One

Phase One is scheduled to start in 2010 and will require 12 months to complete. This phase will include extending Willow Road to the proposed interchange, developing the proposed frontage road, and constructing necessary drainage systems. The Willow Road extension will be a 40-foot, two-lane roadway contained within a 100-foot right-of-way. The new road will include a 14-foot-wide center auxiliary lane in selected areas, 8-foot shoulders, and an 8-foot area set aside for a future equestrian path.

A 0.8-mile frontage road and associated 60 foot right-of-way would be constructed between Willow Road and Sandydale Drive (refer to Figure 2). The frontage road and right-of-way would accommodate two 12-foot auto lanes and two 8-foot bicycle lanes. The project also includes improving a 1,000-foot section of Cherokee Place to connect it with the proposed frontage road. Cherokee Place would be graded and paved to meet County standards. Although, the proposed frontage road is part of the projects first phase, construction of the frontage road may be delayed due to funding and property ownership issues.

Figure 1. Project Vicinity Map

Figure 2. Project Location Map

Feet
0 1,000 2,000 4,000

Meters
0 250 500 1,000

N
1:22,000

Data Source: Tele Atlas, ESRI

Willow Road Extension
Habitat Creation, Conservation and Enhancement Plan

SWCA
ENVIRONMENTAL CONSULTANTS

This page intentionally left blank.

Due to the additional impermeable surfaces, the improvements would result in increased stormwater runoff. Per County requirements, two infiltration basins and associated drainage swales will be constructed along the Willow Road alignment to accommodate the increased runoff.

1.2.2 Phase Two (Caltrans Oversight)

Construction of Phase Two is expected to start in 2011 and will require approximately 24 months to complete. This phase involves constructing a new interchange at Highway 101 and extending Willow Road east of the new interchange to Thompson Road. The interchange project would directly affect Highway 101; therefore, Caltrans is providing oversight of the environmental review and construction of the interchange. The interchange would be an under-crossing and include: northbound and southbound two-lane concrete bridges to carry U.S. 101 traffic over Willow Road, approach slabs, and on/off-ramps. The interchange will be constructed to accommodate future widening of U.S. 101 and Willow Road, as well as an 8-foot set-aside for a future equestrian trail.

1.3 PROJECT SITE DESCRIPTION

The total project area is approximately 100 acres (40 hectares) and supports a variety of land uses including agricultural, nurseries, recreation, low-density residential uses, pasture lands, and open space. The open space areas are dominated by oak woodlands, but also include annual grassland, maritime chaparral, ruderal herbaceous, coastal sage scrub, freshwater marsh, willow riparian, eucalyptus groves, and ornamental landscaping. The low-density residential areas contain homes on relatively small lots, to which access is provided by rural roads.

2. PROJECT IMPACTS AND MITIGATION REQUIREMENTS

The project would result in permanent and temporary impacts to sensitive habitats, waters of the U.S., and special-status plant species. Most of the impacts are expected to be permanent and will be mitigated by restoring existing habitats and creating new habitats. Temporarily disturbed areas will be restored by hydroseeding with the appropriate seed mix.

A suite of environmental documents have been prepared for the project, all of which have estimated impact calculations based on partially completed project designs. As of March 2010, the County has finalized the project designs and recalculated the project impacts. In some instances, project refinement resulted in reduced impacts when compared to the SEIR and the Caltrans environmental documents. The following table summarizes the finalized impacts by project phase and identifies the associated mitigation requirement. Discussions of the impacted resources follow Table 1.

Table 1. Summary of Impacts by Project Phase

Resource	Phase 1 Impact	Phase 2 Impact (Caltrans Oversight)	Total Impact	Proposed mitigation
Oak Woodland	7.28 acres	15.52 acres	22.80 acres	Create 22.80 acres of oak woodland habitat by planting 3,187 oaks at the Dana Adobe Historical Park. Plant 167 oaks within the new interchange and habitat enhancement area. A total of 3,354 oaks will be planted at the two sites.
Oak Trees	211 oaks removed / 1 oak trimmed	614 oaks removed / 26 oaks trimmed	825 oaks removed / 27 oaks trimmed	
Maritime Chaparral	0.64 acre	1.27 acres	1.91 acres	Enhance 3.89 acres of maritime chaparral habitat adjacent to the impact area.
Federal and State Jurisdictional Waters	0.00 acre	0.0993 acre	0.0993 acre	On-site/in-kind restoration of 0.1156 acres (refer to attached HMMP).
sand almond	5	28	33 individuals	Install approximately 87 sand almond and 65 sand mesa manzanita plantings within and adjacent to the enhanced habitat area.
Sand mesa manzanita	3	21	24 individuals	
California spineflower	39,940	185	40,125 individuals	Salvage seeds and soil seed bank from the impact area and relocate to the enhancement site.

2.1 IMPACTS TO SENSITIVE HABITATS

2.1.1 Coast Live Oak Dominated Communities

The project would result in 22.80 acres of permanent and temporary impacts to coast live oak (*Quercus agrifolia*) dominated communities. The oak communities that would be impacted consist of approximately 8.10 acres of oak woodland, 1.80 acres of oak savannah, 0.70 acre of mixed oak woodland/maritime chaparral, and 12.20 acres disturbed oak woodland/maritime chaparral ecotone. The tree density in these communities averages approximately 23 trees per acre (tpa). The structure of these communities varies throughout the site, although the trees tend to be grouped and cover most of the 22.8 acres. The oaks appear to be highly successful in the project area, exhibiting a strong regeneration capability. The oak dominated habitats are somewhat marginalized by the U.S. 101 corridor and surrounding residential and agricultural uses, but overall appear to function well.

The structure within the oak dominated communities is variable throughout the site and includes areas with shrub and herb strata. Dense to sporadic maritime chaparral occurs in the shrub stratum and includes coast ceanothus (*Ceanothus cuneatus* var. *fascicularis*), Nipomo ceanothus (*Ceanothus impressus* var. *nipomensis*), California coffeeberry (*Rhamnus californica* ssp. *californica*), and poison oak

(*Toxicodendron diversilobum*). The herbaceous stratum is typically annual grassland or ruderal with wild oat (*Avena* sp.), long-beaked filaree (*Erodium botrys*), telegraph weed (*Heterotheca grandiflora*), and California croton (*Croton californicus*).

2.1.2 Central Maritime Chaparral

Based on the final design plans, the project is anticipated to impact approximately 1.9 acres of maritime chaparral located west of the Willow Road/Hetrick Avenue intersection. This area is dominated by coast ceanothus and Nipomo ceanothus. Other subdominants include black sage (*Salvia mellifera*), bush monkey flower (*Mimulus aurantiacus*), chamise (*Adenostoma fasciculatum*), poison oak, coyote bush (*Baccharis pilularis*), Douglas' nightshade (*Solanum douglasii*), and chaparral nightshade (*Solanum xantii* var. *obispoense*). Herbaceous understory species in this community include narrow-leaved spineflower (*Chorizanthe angustifolia*), California everlasting (*Gnaphalium californicum*), and milkweed (*Asclepias* sp.)

2.2 IMPACTS TO SPECIAL-STATUS PLANT SPECIES

The oak dominated communities and central maritime chaparral located in the project area support sand almond (*Prunus fasciculata* var. *punctata*), sand mesa manzanita (*Arctostaphylos rudis*), and California spineflower (*Mucronea californica*). These species are considered rare by the California Native Plant Society (CNPS) and will be impacted by project activities.

Sand almond is a perennial shrub in the Rosaceae family that is endemic to California. It is included on the CNPS list 4.3. Species included on List 4.3 have a limited distribution and are "not very endangered in California" (CNPS 2009). A total of 33 individual sand almond plants were identified during project surveys and may be impacted by project activities.

Sand mesa manzanita is a perennial shrub in the Ericaceae family and is endemic to California. It is included on the CNPS list 1B.2. Species included on List 1.2 are considered rare, threatened, or endangered with 20 to 80 percent of their occurrences threatened (CNPS 2009). A total of 24 individual sand mesa manzanitas were identified during project surveys and may be impacted by project activities.

California spineflower is an annual herb in the Polygonaceae family that is endemic to California. It is included on the CNPS list 4.2. Species included on List 4.2 have a limited distribution and are fairly endangered with 20% to 80% of their occurrences threatened. Approximately 40,825 California spineflower plants were identified during project surveys and may be impacted by project activities.

2.3 IMPACTS TO WATERS OF THE UNITED STATES

Development of the new Willow Road/U.S. 101 interchange (Phase 2) would result in permanent and temporary impacts to Nipomo Creek. The SEIR identified Nipomo Creek as jurisdictional waters of the U.S.; therefore, the impacts will be mitigated through the development and implementation of a Habitat Mitigation and Monitoring Plan (HMMP). An HMMP that addresses these impacts and associated mitigation is attached to this HCCEP.

2.4 REQUIRED MITIGATION

The SEIR specified mitigation that required the preparation and implementation of this HCCEP. Pursuant to the SEIR this HCCEP shall include the following elements:

> *"A Habitat Creation, Conservation, and Enhancement Plan shall be prepared to mitigate maritime chaparral and oak woodland habitats, as well as any riparian habitats associated with Nipomo Creek, impacted or removed during construction in accordance*

with agency and County requirements. This Habitat Creation, Conservation, and Enhancement Plan shall be prepared and at least initially implemented prior to initiation of construction. The plan shall discuss not only the creation, conservation, or enhancement of habitat, but the re-creation, conservation, or enhancement of the original ecological function of habitats impacted by the project. To accomplish this, the plan shall include identification of areas where native habitats are to be restored, conserved, or enhanced or other means of ensuring no net loss of sensitive native habitats. In addition, this plan shall identify the potential occurrence of the sensitive plant species such as sand almond, sand mesa manzanita, and California spineflower to provide the opportunity to include the mitigation for project-related impacts to these sensitive botanical resources."

The SEIR provided three options for the County to pursue in order to mitigate for the impacts to oak woodland, maritime chaparral, and special-status plant species. These options included habitat creation, habitat conservation, and habitat enhancement all of which may be used individually or in combination to fulfill the mitigation requirements. The County has chosen to implement the Habitat Creation option to mitigate impacts to oak woodlands and the Habitat Enhancement option to mitigate impacts to special-status plants and maritime chaparral. The two options are described below.

2.4.1 Habitat Creation

- *"Habitat creation shall be implemented at a 1:1 ratio. This option provides an opportunity to replace impacted chaparral and fulfill the County tree replacement standards by planting oak trees for habitat creation."*
- *"Oak trees should be replaced using locally collected acorns or other propagules, preferably collected from within the area of the proposed construction."*
- *"Sensitive plant species, including sand almond, sand mesa manzanita, and California spineflower shall be propagated from local seed stock, preferably from seed or propagules salvaged from within the proposed alignment."*
- *"Sufficient topsoil shall be stockpiled for use in the revegetation areas."*
- *"Grazing or other vegetation-disturbing activities shall not be permitted within areas proposed as mitigation."*
- *"These areas would be set aside in perpetuity after creation."*
- *"Monitoring by a qualified individual for no less than three years."*

2.4.2 Habitat Enhancement

- *"Habitat Enhancement shall be implemented at a 2:1 ratio as this option includes sensitive habitats that are already owned by the County and preserved that are not part of any other mitigation program."*
- *"Oak trees should be replaced using locally collected acorns or other propagules, preferably collected from within the area of the proposed construction."*
- *These areas would be monitored by a qualified individual for no less than three years and set aside in perpetuity after enhancement."*

2.4.3 Oak Tree Replacement Standards

County oak tree replacement standards require a project proponent to prepare and implement an oak tree replacement plan. The plan must provide for the in-kind replacement, at a 4:1 ratio, of all oak trees removed as a result of the project. In addition, the plan must provide for the in-kind planting, at a 2:1 ratio, of all oak trees impacted but not removed. The replacement trees must be monitored for seven years after planting.

3. MITIGATION STRATEGY

The mitigation strategy outlined in this HCCEP addresses the mitigation requirements for impacts to oak trees, oak woodland, maritime chaparral, and special-status plant species. Impacts to waters of the U.S. associated with Nipomo Creek are addressed in the attached HMMP. The basis of the mitigation proposed by this HCCEP is summarized in Table 1.

3.1 OAK WOODLAND HABITAT CREATION

The County is proposing to implement an off-site in-kind oak woodland creation project to mitigate impacts to oak trees and oak woodlands. The oak woodland creation project would be located at the Rancho Nipomo Dana Adobe Historical Park (Dana Adobe Park). This option and location was chosen based on the desire to mitigate project impacts in close proximity to the impact area and to achieve a long term objective of no net loss of oak woodland habitat. The County Parks and Recreation Department's (County Parks) recent acquisition of the Dana Adobe Park supports the conservation component of the habitat creation option.

The goal of the oak woodland creation project is to create a minimum of 22.80 acres of oak woodland habitat supporting at least 3,187 oak trees (140 tpa). Upon completion, the proposed oak woodland creation project would benefit the public by enhancing biological and cultural resources located at the Dana Adobe Park. Several of these benefits are listed below:

3.1.1 Biological Benefits

- Provide enhanced oak woodland and riparian transitional zones on Adobe and Carrillo creeks, while creating a buffer zone around seasonal wetlands and riparian areas associated with Nipomo Creek;

- Enhance wildlife corridors associated with the Nipomo Creek Watershed by extending the boundaries of the Dana Adobe Riparian Restoration Project that is currently being implemented by the Land Conservancy of San Luis Obispo County (Land Conservancy);

- Enhance existing resource areas located along the Pacific Coast Flyway by providing a buffer around stop over sites.

3.1.2 Public and Cultural Benefits

- The overall Rancho Nipomo Dana Adobe project enjoys enthusiastic support of the local community, public schools, and cultural tourists who visit the site. The created oak woodland area will enhance the view shed for visitors of the historic park.

- The park managers collaborate with numerous Federal, State, and local agencies and non profit organizations that are assisting efforts to rehabilitate the site and develop a living historical park.

The oak woodland creation project would enforce the existing collaboration and contribute to the enhancement of the park.

- A portion of the proposed oak woodland creation area will be visible from the 101 corridor; offsetting some of the lost scenic view shed resulting from the Willow Road Extension project.

- The Rancho Nipomo Historical Park master plan includes the development of an educational/interpretive trail program. The planned trail would be an approximate 0.75-mile loop that would travel through the creation area. The creation area would provide an opportunity to educate visitors about oak woodlands.

- A Chumash ethno-botanical garden and outdoor interpretive area is planned within the creation area, which is walking distance from the Adobe. This would provide educational opportunities for casual visitor's school programs.

3.1.3 Oak Woodland Creation Site Description

The Dana Adobe Park is a 100-acre parcel that is bordered by Nipomo Creek and located east of U.S. 101, between South Oakglen and Thompson Roads. Historically, the property was utilized for agricultural purposes. Currently, the property is owned by the County and is leased to the Dana Adobe Nipomo Amigos (DANA). DANA is a nonprofit, 501(c)3 organization that owns the historic Dana Adobe (California Historic Landmark #1033) located on an adjacent parcel (Refer to Figure 3 and Attachment A).

The oak woodland creation area includes approximately 22.80 acres consisting of annual grasslands located upslope of riparian systems. The Historic Property Survey Report prepared for the oak woodland creation project documents evidence of extensive oak woodland existing on the Dana Adobe Park and adjacent areas (Applied Earthworks 2010). Based on the findings of the Historic Properties Survey Report and the property's existing conditions, historic land uses likely have resulted in the loss of oak woodland on the property. Other resources at the creation site include two tributaries of Nipomo Creek, a seasonal wetland, agricultural lands, and important cultural resources.

3.1.4 Rationale for Expecting Success

Prior to choosing the Dana Adobe Park Oak Woodland Creation site, the County conducted field surveys and a background review on the property to determine its suitability for the creation project. John Farhar (County Biologist), Carolyn Leach (horticultural consultant), Kaila Dettman (Land Conservancy Staff biologist), and Bob Hill (Land Conservancy Conservation Director) conducted field surveys on the site. The group determined the site to have soils, aspect, and drainage patterns suitable to sustain the proposed oak plantings.

The soil at the Dana Adobe Park is comprised of Zaca clay (9 to 15% slopes). This is a deep, well-drained soil that was formed from weathered sandstone, mudstone, or shale. Zaca clay naturally supports annual grasses, forbs, and hardwoods (Natural Resources Conservation Service [NRCS] 1984). The areas proposed for oak tree planting are located on gently sloping to flat terrain adjacent to ephemeral drainages. The gentle slope provides northern and southern aspects; and the ephemeral drainages provide seasonal hydrology to the site. The rolling topography and seasonal hydrology are indicative of oak woodland habitat.

Ms. Leach and the County conducted a trial oak tree planting study on the property. The focus of the study was to determine the site's suitability and the best methods for planting the oak trees. 240 sample plots were planted with oak seedlings or oak acorns. The results of the trial showed that almost 95% of

the acorns planted with gopher baskets or other root protection survived the initial monitoring period. This indicates the site will support the plantings as long as they are properly protected. It should be noted that seedlings installed during the study had a much lower success.

In a 2004 survey report, the Land Conservancy identified the property as a crucial acquisition required to protect sensitive resources in the Nipomo Area. In addition, the Land Conservancy's 2005 Nipomo Creek Watershed Management Plan considers the property suitable for a multi-year watershed restoration project that aims to improve water quality and cultural resources protection. DANA is working closely with the Land Conservancy, who is currently restoring riparian vegetation along two streams located on the properties.

3.1.5 Created Oak Woodland Protection

County Parks owns the proposed mitigation site and currently leases it to DANA for management as a historical park. The County intends to manage the land as an historical park in perpetuity and the Land Conservancy has agreed to hold a permanent conservation easement on the oak woodland creation area.

3.2 MARITIME CHAPARRAL HABITAT ENHANCEMENT

The County is proposing to implement an on-site in-kind maritime chaparral enhancement project to mitigate impacts to maritime chaparral and special-status plant species. The maritime chaparral enhancement project would be located directly adjacent to the new Willow Road Highway 101 interchange site (refer to Figure 4). The enhancement area will not be impacted by project activities, but will be within the interchange. This option and location was chosen based on the desire to mitigate project impacts in close proximity to the impact area and to maximize the potential for mitigation success.

The goal of the maritime chaparral enhancement project is to enhance and protect 3.89 acres of existing maritime chaparral habitat and introducing special-status species into the enhancement area. Upon completion, the enhancement area would support viable populations of sand almond, sand mesa manzanita, and California spineflower.

3.2.1 Maritime Chaparral Enhancement Site Description

The site chosen for the maritime chaparral enhancement project is located within the proposed Willow Road/U.S. 101 interchange site. The SEIR characterized the habitat in the area as an ecotone between oak woodland and maritime chaparral communities. The area is typical of a sparse oak woodland or savannah with a non-native grassland understory. The non-native grassland consists of veldt grass (*Ehrharta calycina)* and wild oats with remnant occurrences of maritime chaparral species scattered throughout. The scattered occurrences of maritime chaparral indicate that the area once supported a healthy maritime chaparral community.

3.2.2 Rational for Expecting Success

The site chosen to mitigate impacts to maritime chaparral and special-status plants currently supports these resources. The existing conditions at the site are conducive to the proposed habitat enhancement and will provide a suitable substrate for the special-status species plantings.

3.2.3 Enhanced Maritime Chaparral Protection

The maritime chaparral enhancement area would be located within the California Department of Transportation (Caltrans) right-of-way associated with the Willow Road U.S. 101 interchange. The County and Caltrans have acknowledged that the area would be designated as a mitigation area and would

be unavailable for future improvements. The status of the mitigation area will be documented in an agreement negotiated and prepared by the County and Caltrans.

4. OAK WOODLAND CREATION AND MONITORING PLAN

4.1 OAK WOODLAND CREATION PLAN

The County will implement the oak woodland creation project utilizing methods that are based on the findings of the Dana Oak Trial Study (refer to Attachment B) conducted by Ms. Leach and the County. According to the Dana Oak Trial Study, planting germinated acorns yielded a greater success rate than planting 2-inch seedlings. Consequently, the methods outlined in this HCCEP focus on planting acorns rather than seedlings.

This HCCEP proposes to plant 3,824 oak acorns for an approximate 167 plantings per acre (261 square feet per planting). Twenty percent of the plantings are expected to be lost due to natural attrition, resulting in 3,187 successful plantings. The specific methods utilized to install the plantings will be determined by the County Restoration Specialist (restoration specialist); however, they must follow the basic guidelines provided below.

4.1.1 Cultural Resources Protection Measures

The proposed restoration areas are in close proximity to several sensitive cultural resources. These areas must be avoided during site improvement activities including mechanical equipment operation, non-native species eradication, and oak tree planting. Avoidance will be achieved by delineating the boundary of the oak planting areas and coordinating planting activities with a qualified archaeologist. Prior to installation of the oaks, the boundary of the planting areas will be delineated with pin flags. A qualified archaeologist will be on-site to field fit the pin flag boundary, ensuring that planting activities do not encroach on the sensitive cultural resources. Oak installation activities will be limited to areas within the pin flag boundary.

To minimize the potential for impacts to unknown sensitive cultural resources, soil disturbances will be limited during installation and maintenance of the oak woodland creation area. All components of the irrigation system will be installed above ground to negate the need for trenching. Preparation of each planting and seeding plot would be limited to removing exotic vegetation within a 3-foot diameter planting plot and auguring a planting hole. Exotic vegetation removal would require disturbing the upper 6 inches of soil. An approximately 2-foot deep by 8-inch diameter planting hole would be augured in the center of the weeded plot. The area these activities would disturb would be approximately 14 square feet per planting; the volume of soil disturbed would be approximately 3 cubic feet. No soil would be removed from the property.

4.1.2 Materials Collection and Treatment

The County will collect and stratify a sufficient amount of acorns to establish 3,824 plantings in the creation area (assumes 20% attrition). Acorns will be collected in the fall from coast live oak trees found adjacent to the Dana Adobe Park and from the Willow Road Extension Project site. Research shows collecting acorns from the trees rather than the ground will yield a greater percentage of viable acorns. The acorns should be immediately processed for stratification. Processing will include cleaning, removing the caps and checking for viability. To check for viability, the acorns should be dropped into a bucket of water; acorns that float are probably damaged; acorns that sink are most likely viable.

Immediately following collection, the acorns will be cold stratified for approximately three months or until the acorns begins to sprout. Cold stratification includes placing wet acorns in a sealed container and placing the container in a refrigerator. The refrigerator should be kept between 35 and 41 degrees Fahrenheit (°F). This process requires checking the acorns periodically to ensure they remain moist and to determine if they have germinated. The acorns should be sown immediately following first signs of germination.

4.1.3 Site Preparation

The acorn planting plots will be prepared prior to sowing the acorns. Site preparation will include installing above ground drip irrigation and removing exotic species from the planting plots. The irrigation system would be connected to the existing wellhead on the site and should be installed prior to initiating planting activities. Immediately prior to auguring the planting hole, all exotic vegetation within a 3-foot diameter plot should be removed by scraping the plot with a McCloud (or power tiller). Once the plot is free of exotic vegetation, a planting hole will be augured in the center of the plot.

The coastal scrub seeding plots will be prepared in the same manner as the acorn planting plots; however, auguring a planting hole will not be necessary.

4.1.4 Planting Methods

Based on the findings of the Dana Oak Trial Report, the chosen planting method should utilize mulch and tree tubes. Germinated acorns will be placed in the augured hole with the tree tube and three inches of mulch will be applied around the planting. The mulch should cover the entire 3-foot diameter plot. If hay or straw mulch is used, the mulch should be crimped into the soil so that it is not blown away by the wind.

Coastal Scrub Species Seeding

In an attempt to facilitate the growth of a shrub stratum within the oak woodland creation area, the County will sow seeds of common coastal scrub species among the oak plantings. Coastal scrub seed will be broadcast in 650 three-foot diameter plots; the seeding plots will be prepared pursuant to Section 4.1.3 above. Supplemental irrigation will not be supplied to the seeding plots. To minimize seed loss by predation and maximize soil moisture retention, the broadcast seed will be covered with seed free hay mulch. The coastal scrub species mix is provided in Table 2 below.

Table 2. Oak Woodland Creation Area Seed mix

Scientific Name	Common Name	Pounds per Acre
Artemisia californica	California sagebrush	2.0
Eriophyllum confertiflorum	golden yarrow	3.0
Salvia mellifera	black sage	2.0
Mimulus aurantiacus	sticky monkey flower	2.0
Lotus scoparius	deerweed	8.0
Eriogonum fasciculatum	California buckwheat	12.0
Hordeum brachyantherum	meadow barley	10.0
Nassela pulchra	purple needlegrass	2.0
Vulpia microstachys	California fescue	8.0
Lupinus succulentis	succulent lupine	4.0
Eschscholzia californica	California poppy	2.0

4.1.5 Maintenance

Maintenance during oak establishment is necessary to ensure success of the mitigation effort. The maintenance period will begin immediately upon completion of the plantings, and will continue throughout the life of the seven year program. An implementation and maintenance schedule is provided in Table 4. The maintenance program will ensure that watering, weed control, debris removal, vandalism control, replanting, plant protection, and site protection are performed adequately. The County will be responsible for maintaining the site.

Watering

Water will be supplied to planted acorns during the first three years of the seven year program. Supplemental water will be supplied on an as needed basis via a drip irrigation system. Watering should be controlled so only enough is used to initially establish the tree, and reduced to zero over the three year period. To avoid over watering in the winter months, the irrigation system will be turned off prior to December 1 of the first three years of the maintenance program. All supplemental watering will be performed in a manner that ensures deep penetration of water to the soil around the oak rootball (not on the foliage). Typically, oak acorns need enough water to keep the soil moist; saturated soils will result in root rot.

Weed Control and Herbicide Use

Weed control is necessary to minimize competition from exotic plants. Exotic species will be removed during site preparation; however, additional weed abatement will be required throughout the seven year program. Manual and chemical methods will be used to remove weeds. Manual weed control will be implemented within the 3-foot diameter plot around each planting. Chemical weed control efforts can be implemented to combat noxious weed species in areas located outside of the planting plots. Noxious

weeds to be chemically treated may include *Picris echiodes*, *Silybum marianum*, *Carduus pycnocepahlus*, *Ehrharta calycina*, *Centaurea solstitialis*, or any other species listed on the California Invasive Plant Council's Invasive Plant Inventory. Invasive species control should be focused on achieving the identified performance goals for percent cover exotic species (refer to Table 3).

Weeding activities will be coordinated with seasonal germination; therefore, the schedule will depend on the seasons target species. Typically, weed abatement intensity will be highest in the spring and tapering off in the summer and fall. Numerous weed species germinate in the late summer; therefore, late season weed abatement will be necessary.

Debris Removal and Vandalism

Removal of trash and litter will occur during the scheduled maintenance visits. Non-fruiting organic debris created from hand removal of weeds may be left on-site if it will not significantly impact the establishment of the oaks. However, noxious weed debris will be disposed of off-site to avoid further invasions of the noxious species.

Although unlikely, vandalism may be a problem due to the proximity of the creation area to the Dana Adobe and Nipomo. If vandalism occurs and oaks are removed or trampled, the County will replace the individuals and erect exclusion fencing to prohibit further vandalism.

Replanting

If at anytime during the monitoring program the number of surviving oaks drops below 2,120, the County will replant the needed amount of oaks to obtain the required number of oaks to achieve the success criteria. Any replanted trees will be maintained and monitored until the restoration specialist determines that the plantings are self sustaining.

4.2 OAK WOODLAND MONITORING PLAN

The restoration specialist will monitor, evaluate, and report the progress of the mitigation efforts to determine the success of the creation project. The monitoring program will document the plantings survival rate, presence of weeds, effects of herbivores on the plantings, and any other factors important to the success of the mitigation effort. Qualitative assessments of plant vigor, herbivore damage, and exotic species will be conducted quarterly. Quantitative assessments of plant survival and density will be conducted annually.

4.2.1 Performance Standards and Final Success Criteria

The oak woodland creation program must achieve the annual performance standards and final success criteria outlined in Table 3 to be considered successful. If it becomes evident that the mitigation program is not achieving the performance standards, the County will determine the reasons for the deficiencies and adjust management actions, as necessary.

Table 3. Oak Woodland Creation Annual Performance Goals and Final Success Criteria

Attribute	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
Surviving Oak Plantings	3,710	3,599	3,491	3,386	3,311	3,235	3,187
Overall Vigor Rating	1,2	1,2	1,2	1,2	1,2	1,2	1,2
% Cover Exotic species1	<60	<60	<50	<40	<40	<30	<20

Notes:

[1] With exception of non-native annual grasses. Non-native perennial grasses are not excluded.

- Planted oak trees must be self sustaining (no artificial irrigation) for a minimum of three years prior to being considered successful. Any remedial plantings or plantings installed after the implementation period must be monitored until the restoration specialist determines that the individuals are self sustaining.
- At a minimum, the total area of oak woodland creation must equal 22.8 acres and support at least 3,187 surviving oaks to be considered successful.

4.2.2 Monitoring Methods

The monitoring program will provide qualitative and quantitative data to be used in determining the successes of the mitigation program. The restoration specialist will collect and evaluate data indicating the relationship between actual site conditions and the established performance criteria.

Qualitative Assessments

Qualitative assessments will be conducted quarterly and will include evaluations of oak seedling vigor, damage, exotic species competition, and photo documentation. These attributes will be evaluated to determine the need to adjust management actions such as increasing or decreasing supplemental water, applying pesticides, enhancing ungulate exclusion, and increasing weed abatement. Oak seedling vigor will be evaluated as follows:

- 1 = excellent – vigorous healthy seedling (no necrotic or chlorotic leaves);
- 2 = good – seedling is healthy with limited signs of vigorous growth;
- 3 = adequate – seedling is healthy with no signs of vigorous growth and some necrosis or other damage present;
- 4 = poor – low vitality, or main stem dead but basal sprouts emerging; and
- 5 = dead – no evidence of recovery.

On average the plantings should maintain vigor ratings of 1 or 2 throughout the seasons. If the vigor rating for individuals or portions of the population falls below 2, adjustments in management actions will be necessary.

Permanent photo points will be established throughout the mitigation site to assist in tracking the success of the mitigation program and provide photo documentation in the annual reports. Permanent photo

points will be established during the preparation of the site. Ground view photos will be taken during each monitoring year from the same vantage points.

Quantitative Assessments

Quantitative Assessments will be conducted annually and will measure seedling survivorship and percent cover of native and non-native species. These attributes will be evaluated to ensure that a sufficient number of seedlings are surviving to achieve the target annual survival rate and that the created habitat does not exceed the threshold for exotic species cover (refer to Table 3).

The restoration specialist will count all surviving seedlings on an annual basis. A seedling will be considered "surviving" if at least half of the foliage is green and flexible (Vigor of 1 to 4). At the end of each monitoring year, the number of surviving oaks must be equal to or greater than the established annual goal (refer to Table 3). The established annual goals allow for a gradual annual loss that amounts to approximately 20% loss over the seven year program. If at any time, the number of surviving oaks is lower than the established annual goal, the County will replant the appropriate number of oaks needed to meet or exceed the annual goal.

The restoration specialist will sample the percent native and exotic species cover in the 22.8 acre creation area. This data will be collected to ensure the threshold for exotic species cover is not exceeded. Percent cover calculations must be determined by a documented method. The method can be chosen by the restoration specialist; however, this HCCEP recommends utilizing the Step Point Method as describe by *Sampling Vegetation Attributes* (NRCS 1996). A discussion of the Step Point Method is provided in Attachment C. If at any time, the percent cover of exotic broadleaf species and exotic perennial grass species exceeds the annual threshold, the County will implement the appropriate weed control efforts to reduce the amount of exotic species cover. Exotic annual grasses will not be included in the exotic species percent cover calculations.

4.2.3 Reporting

The restoration specialist will prepare quarterly and annual monitoring reports detailing the progress of the mitigation efforts. Short quarterly reports will be submitted to the County Department of Public Works by January 31, April 30, July 31, and October 31 of each monitoring year. The quarterly reports will briefly discuss the past quarters management actions, qualitatively evaluate the status of the site, and recommend necessary adjustments to management actions.

Annual reports will be submitted to County Department of Public Works, County Department of Planning and Building, Caltrans, and California Department of Fish and Game (CDFG) by December 31 of each year. Annual reports will evaluate the site conditions in relation the established performance standards and success criteria. Discussions of the oak survival rates and percent native and exotic species cover will be included. In addition, the annual reports will include photos taken from the permanent photo points.

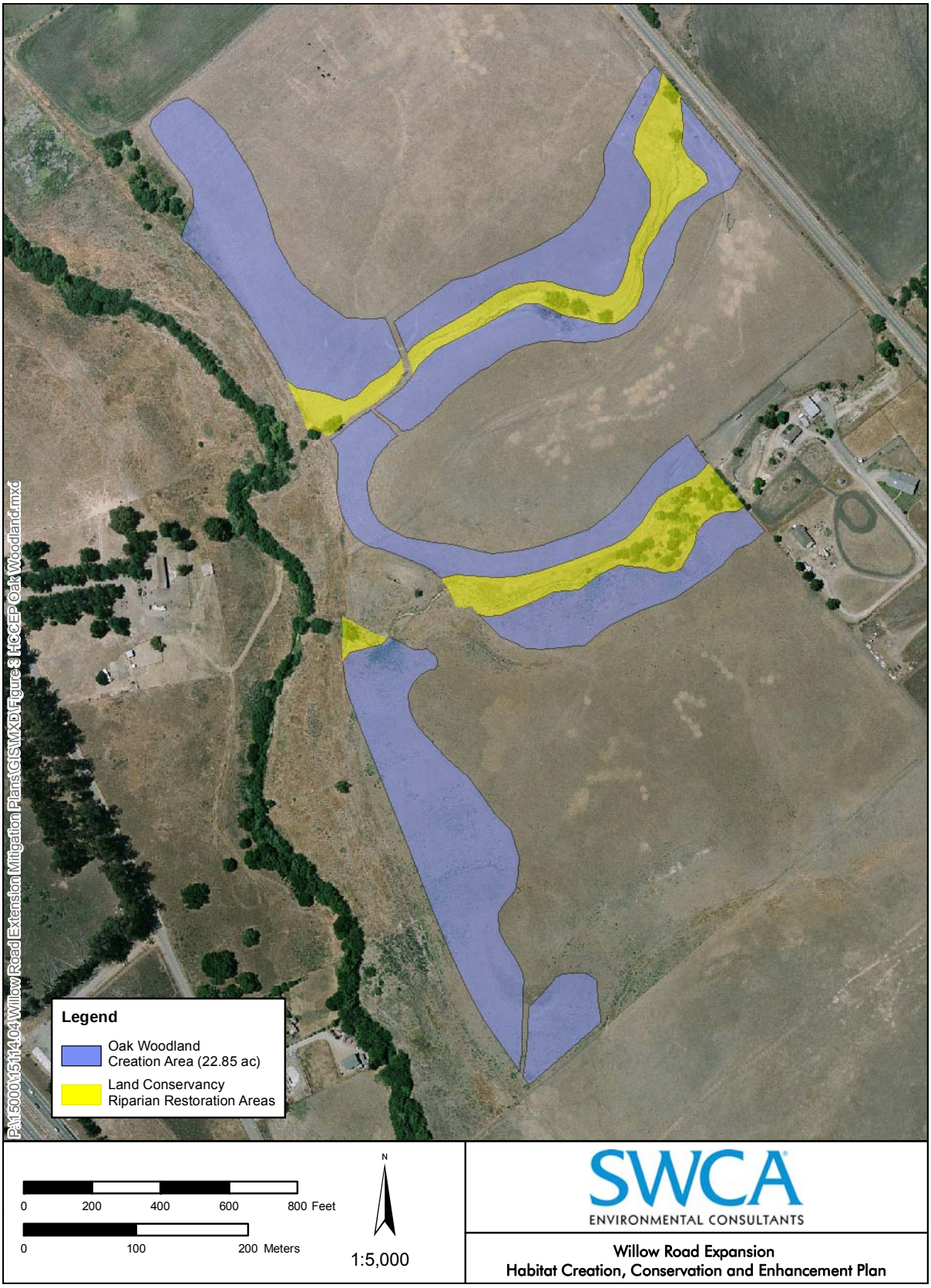
4.3 OAK WOODLAND CREATION AND MONITORING SCHEDULE

The seven year maintenance and monitoring program will commence following completion of the implementation tasks. Table 4 provides an estimated schedule for the mitigation project.

Table 4. Dana Adobe Oak Woodland Creation Schedule

IMPLEMENTATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Acorn Collection and Processing											X	
Estimated Stratification Period	X	X									X	X
Site Preparation	X	X										
Planting and Seeding		X	X	X								
YEAR 1:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Weed Abatement/Watering (as needed)		X	X		X	X	X	X		X		X
Qualitative Assessments	X			X			X			X		
Quantitative Assessments				X								
Annual Report												X
YEAR 2:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Weed Abatement/Watering (as needed)			X	X	X		X		X		X	
Qualitative Assessments	X			X			X			X		
Quantitative Assessments				X								
Annual Report												X
YEAR 3:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Weed Abatement/Watering (as needed)			X	X	X		X		X		X	
Qualitative Assessments	X			X			X			X		
Quantitative Assessments				X								
Annual Report												X
YEAR 4:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Weed Abatement			X	X		X			X		X	
Qualitative Assessments	X			X			X			X		X
Quantitative Assessments				X								
Annual Report												X
YEAR 5:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Weed Abatement			X	X		X			X		X	
Qualitative Assessments	X			X			X			X		X
Quantitative Assessments				X								
Annual Report												X
YEAR 6:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Weed Abatement			X	X		X			X		X	
Qualitative Assessments	X			X			X			X		X
Quantitative Assessments				X								
Annual Report												X
YEAR 7:	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Weed Abatement			X	X		X			X		X	
Qualitative Assessments	X			X			X			X		X
Quantitative Assessments				X								
Final Report												X

Figure 3. Dana Adobe Oak Woodland Creation Map



5. MARITIME CHAPARRAL ENHANCEMENT PLAN

The proposed project will impact 1.91 acres of maritime chaparral that supports several rare plant species. To compensate for these impacts, this HCCEP provides for the enhancement of 3.89 acres of maritime chaparral and the reintroduction of rare plants into the maritime chaparral enhancement area. The enhancement area will be located in the proposed interchange and within existing maritime chaparral oak woodland ecotone that will not be impacted by project activities. The maritime chaparral enhancement project will be conducted over five years and will focus on reintroducing special-status species and oak trees in the enhancement area, removing exotic species, and seeding with common chaparral species.

5.1 SPECIAL-STATUS PLANTS AND OAK TREE PLANTINGS

The enhancement project will include collecting and propagating sand almond, sand mesa manzanita, and California spineflower materials from the Willow Road impact area and reintroducing them into the enhancement area. In addition, the County will plant 167 coast live oak trees in and adjacent to the enhancement area. The methods to be utilized for the plantings are discussed below.

5.1.1 Materials Collection and Propagation

Special-status plant materials will be collected from the impact area and processed for re-introduction into the enhancement area. The three target special-status species have different requirements for propagation, which are addressed below.

Sand Almond

Sand almond is a perennial species that readily germinates from seed. This species flowers from March through April with the fruit maturing June to July. The fruit is a typical rose hip and should be collected when it is red to red-brown in color. According to *Seed Propagation of Native California Plants* (Emery 1988), no specific seed treatment is necessary to propagate the species. The seed will be processed for propagation and grown by an experienced horticulturalist, which will generate a minimum of 87 one-gallon containers.

Sand Mesa Manzanita

Sand Mesa manzanita is a perennial species that should be propagated by vegetative cuttings. The County restoration specialist will collect a sufficient amount of sand mesa manzanita cuttings from the proposed impact area to propagate a minimum of 65 one-gallon containers. The cuttings should be taken from young terminal shoots and should include approximately two inches of woody stem material. The cuttings should be treated with a rooting hormone and placed in a moist sand-peat mixture. Once rooted, the cuttings should be transplanted into one-gallon containers. Manzanita tends to be susceptible to transplant shock; therefore, the cuttings must be maintained in the pots until extensive root development has occurred. Once a vigorous root system is established, the individuals should be planted in the enhancement area; planting should occur in the late fall or early winter.

California Spineflower

California spineflower is a short-lived annual species that will be imported by broadcast seeding and relocating the soil seed bank. Seed to be broadcast in the mitigation area will be collected from the proposed impact area prior to start of construction. Seed collection should begin in August and continue through September, or when seed production ceases. All available seed should be collected from plants located in the proposed impact areas. Any additional seed collection from populations outside of the impact area must follow CNPS and CDFG guidelines, which limit such collection to 25% of the seed

stock present. Collected seed should be air-dried to less than five percent moisture content, separated from inert materials, and stored in a refrigerator at 45°F until implementation of the mitigation plan.

Soil from proposed impact areas containing California spineflower seed will be relocated to the enhancement area. To accomplish this, the upper six inches of soil located within one meter of existing California spineflower individuals will be removed from the impact area immediately following completion of seed collection activities, and prior to the first rainfall. To avoid potential loss of seed from overheating or germination during storage, soil removed from donor (impact) sites should be placed directly onto the receptor (enhancement) site.

The relocated soil and collected seed will be spread over an approximately 11,000 square foot (0.25 acre) plot (refer to Figure 4). The California spineflower plot should be flagged to facilitate annual monitoring. Seed collected from the impact area will be broadcast over the relocated soil, and then the plot will be lightly raked and compacted to cover the added seed.

Coast Live Oak

The County proposes to install 167 coast live oak saplings (5-gallon container stock) in and adjacent to the enhancement area. The coast live oak saplings will be purchased from a local nursery and planted per the approved project landscape plans.

5.1.2 Site Preparation and Planting Methods

Preparation of the planting areas will consist of installing an above ground temporary irrigation system, clearing exotic vegetation from the planting plots, and planting the special-status species and oak tree materials. A temporary above ground irrigation system will be installed prior to installing any plantings. The location of the irrigation system will be determined by the restoration specialist. A permanent water source is not available to supply the irrigation system; therefore, the restoration specialist will connect the system to a water truck.

The special-status plant and oak tree materials will be planted in an existing maritime chaparral oak woodland ecotone that supports numerous exotic plant species. Prior to installing the plantings, all exotic vegetation within a three-foot radius of the planting plot should be manually removed.

After the irrigation system is in place and the planting plot is cleared of exotic vegetation, the restoration specialist will install the plantings. The layout for the plant materials will be determined in the field by the restoration specialist; however, the following guidelines should be considered during the installation:

- Oak plantings should be grouped in three. The oaks within each group should be planted approximately 20 feet from each other.
- Special-status species plantings should be placed in a patchy mosaic that resembles natural patterns. Special-status plants should be planted at least ten feet from each other.
- All planting holes should be equal the depth and 0.5 times the width of the plant rootball.
- The soil in each planting hole should be saturated prior to planting.
- The planting should be installed so that the backfill can be pressed firm around the rootball and watered; the crown of the rootball should be at or above the surrounding finish grade.
- A watering basin should be created around the plant rootball.

5.2 EXOTIC SPECIES REMOVAL

The existing oak woodland and maritime chaparral ecotone located in the enhancement area supports a dense ground cover of exotic grasses. Exotic grasses observed in the area included veldt grass, ripgut brome (*Bromus diandrus*), and various other exotic species. In order to enhance the existing habitat, the County will implement an exotic species removal program that will target the exotic grass species. The exotic species removal program will rely on the use of grass specific herbicides such as Fusilade (Fluazifop-p) or similar. Other non-selective herbicides such as Glyphosate can be used to control broadleaf exotics if necessary. The exotic species removal will be implemented by an individual in possession of a Qualified Applicators License and with experience managing exotic species. Although the Qualified Applicator will determine the appropriate timing for the herbicide applications, it is estimated that two applications per year will be necessary to affectively reduce the exotic grass populations. Pre-emergent herbicides should not be used, because they would likely reduce the success of the chaparral seeding efforts.

5.3 CHAPARRAL SPECIES SEEDING

To increase the native plant density and composition in the enhancement area, the County restoration specialist will hand broadcast seed of common maritime chaparral species. The seed will be applied throughout the enhancement area in the fall of each year. Once applied, the seed should be lightly raked into the soil surface or otherwise covered to minimize losses by predation.

Although the County may collect some of the seed from plants located near or within the site, it is likely that most of the seed will be purchased from a seed supplier. The seed will consist of the following species and should be applied at the suppliers recommended rates.

- Buckbrush (*Ceanothus cuneatus* var. *fascicularis*)
- black sage (*Salvia mellifera*)
- California coffeeberry (*Rhamnus californica* ssp. *Californica*)
- Chamise (*Adenostoma fasciculatum*)
- holly-leaved cherry (*Prunus ilicifolia* ssp. *ilicifolia*)
- Nipomo Mesa ceanothus (*Ceanothus impressus* var. *nipomoensis*)
- sticky monkey flower (*Mimulus aurantiacus*)
- white Yarrow (*Achillea millefolium*)
- purple owls-clover (*Castilleja exserta*)

5.4 MAINTENANCE

On-going maintenance will be necessary to ensure success of the habitat enhancement efforts. The maintenance period will begin immediately following installation of the plantings and will continue throughout the five-year program. An implementation and maintenance schedule is provided in Table 6. The maintenance program will ensure that watering, weed control, debris removal, vandalism control, replanting, plant protection, and site protection are performed adequately. The County will be responsible for maintaining the site.

Supplemental Watering

Water will be supplied to the plantings on an as needed basis determined by the restoration specialist. Supplemental water will be supplied by a drip irrigation system; water supply for the drip irrigation system will be delivered via a water truck. Watering should be controlled so only enough is used to initially establish the plantings, and reduced to zero over the life of the program. To avoid over watering

in the winter months, the irrigation system should be turned off prior to December 1 of each year. All supplemental watering will be performed in a manner that ensures deep penetration of water to the soil around the rootball (not on the foliage).

Weed Control and Herbicide Use

Weed control is an essential element of the maritime chaparral enhancement project. As discussed in Section 5.2, weed control efforts will largely be based on herbicide applications; however, it is likely the manual removal of exotic species will be necessary in the immediate vicinity of the plantings. The restoration specialist in coordination with the Qualified Applicator will determine the need for manual weed control efforts on an as needed basis.

Debris Removal and Vandalism

Debris removal and vandalism control will occur during the scheduled maintenance visits pursuant to Section 4.1.5, Maintenance, of this HCCEP. In addition, the enhancement area will be located within and adjacent to the new interchange. Due to its location, the site will be subject to human encroachment from the roads and nearby private lands. To minimize disturbances from human encroachment, the County will install the appropriate highway fencing along the right-of-way.

Replanting

If at anytime during the monitoring program the survival rate of the plantings falls below 80%, the County will replant the needed number of containers to obtain the required 80% survival rate. All supplemental plantings will be maintained and monitored until the restoration specialist determines that the plantings are self sustaining.

6. MARITIME CHAPARRAL ENHANCEMENT MONITORING PLAN

The County will monitor, evaluate, and report the progress of the mitigation efforts to determine the success of the enhancement project. The restoration specialist will assess the survival of the plantings; as well as presence of weeds, effects of herbivores, and any other factors important to the success of the mitigation effort. Qualitative assessments of plant vigor, herbivore damage, and exotic species will be conducted quarterly. Quantitative assessments of plant survival and percent cover of exotic species will be conducted annually.

6.1 PERFORMANCE STANDARDS AND SUCCESS CRITERIA

The maritime chaparral enhancement program must achieve the annual performance standards and final success criteria to be considered successful (refer to Table 5). If it becomes evident that the enhancement program is not achieving the performance standards, the County will determine the reasons for the deficiencies and adjust management actions as necessary.

Table 5. Maritime Chaparral Enhancement Annual Performance Goals and Final Success Criteria

Attribute	Year 1	Year 2	Year 3	Year 4	Year 5
Surviving sand almond plantings	≥83	≥79	≥75	≥71	≥66
Surviving Sand mesa manzanita plantings	≥62	≥59	≥56	≥53	≥48
California spineflower cover	≥15%	≥15%	≥15%	≥15%	≥15%
Overall Vigor Rating	1,2	1,2	1,2	1,2	1,2
Percent exotic species cover	Baseline	Baseline Less 5%	Baseline Less 10%	Baseline Less 15%	Baseline Less 20%

Notes:

- Any remedial plantings must be monitored until the restoration specialist determines that the individuals are self sustaining.
- California spineflower plot must contain at least 15% vegetative cover of spineflower.
- Baseline for exotic species cover is the percent cover of exotic species observed in the enhancement area prior to implementation of the enhancement project.

At the end of the five year program, the habitat enhancement area must support at least 66 sand almond plantings and 48 sand mesa manzanita plantings that are alive and self sustaining. This success criterion allows for a 2:1 replacement of impacted individuals. At a minimum, the California spineflower plot must consist of 11,000 square feet containing 15% cover of California spine flower.

The goal of the exotic species removal effort is to gradually decrease the amount of exotic grass species cover in the enhancement area. Therefore, the success criterion for percent cover of exotic species will be based on the existing conditions (baseline) of the site prior to implementation of the habitat enhancement project. At the end of the five-year program, the percent exotic species cover must be 20% less than what is observed prior to implementing the exotic species removal program.

6.2 MONITORING METHODS

The monitoring program will provide qualitative and quantitative data to be used in determining the successes of the enhancement program. The restoration specialist will collect and evaluate data indicating the relationship between actual site conditions and the established performance criteria.

6.2.1 Qualitative Assessments

Qualitative assessments will be conducted quarterly and will include evaluations of the plantings vigor, damage, exotic species competition, and photo documentation. These attributes will be evaluated to determine the need to adjust management actions such as increasing or decreasing supplemental water, applying pesticides, the need for ungulate exclusion, and increasing weed abatement.

Planting vigor will be rated from 1 (excellent) to 5 (dead) pursuant to the ratings provided in Section 4.2.2., Qualitative Assessments. On average the plantings should maintain vigor ratings of 1 or 2

throughout the seasons. If the vigor rating for individuals or portions of the plantings falls below 2, adjustments in management actions will be necessary.

Permanent photo points will be established throughout the enhancement area to assist in tracking the success of the mitigation program and provide photo documentation in the annual reports. Permanent photo points will be established during the preparation of the site, and ground view photos will be taken during each monitoring year from the same vantage points.

6.2.2 Quantitative Assessments

Quantitative Assessments will be conducted annually and will include calculating planting survivorship, evaluating the percent cover in the California spineflower plot, and evaluating the percent cover of exotic species. The County will count all surviving plantings in the enhancement area. A planting will be considered "surviving" if at least half of the foliage or stem (if deciduous) is green and flexible (Vigor of 1 to 4). The number of surviving plantings will be divided by the number of plantings installed. Volunteer plants will be counted if it is reasonable to assume they are offspring of the plantings. This calculation method can result in greater than 100% survival. Percent survival of sand mesa manzanita and sand almond is not listed as a success criterion. However, to achieve the required number of surviving individuals, at least 70% of the plantings should survive the five year program.

To ensure that the California spineflower soil conservation and seeding efforts are successful, the County will assess the seeded plot for percent cover. California spineflower must account for at least 15 percent of the vegetative cover within the seeded plot. Percent cover calculations must be determined by a documented method. The method can be chosen by the restoration specialist; however, this HCCEP recommends utilizing the Daubenmire or Line Intercept Methods as describe by *Sampling Vegetation Attributes* (NRCS 1996). Discussions of these methods are provided in Attachment C. California spineflower is an annual species; therefore, the percent cover should be evaluated between August and September when the individuals will be at the end of their life cycle (refer to Table 7).

The success criterion for percent cover of exotic species will be based on the sites conditions immediately prior to initiating the habitat enhancement program. Percent cover calculations must be determined by a documented method. The method can be chosen by the restoration specialist; however, this HCCEP recommends utilizing the Step Point method (refer to Appendix C). Prior to initiating the habitat enhancement program, the restoration specialist will determine the percent cover of exotic species in the enhancement area. The observed percent cover of exotic species will be used as the baseline for the success criterion. In each subsequent year, the restoration specialist will collect the percent cover data utilizing the same method chosen for the baseline data collection. The annual goal for the project is a 5% reduction in exotic species; the final goal is a 20% reduction over the five year program.

6.3 REPORTING

The County will prepare quarterly and annual monitoring reports detailing the progress of the mitigation efforts. Short quarterly reports will be submitted by January 31, April 30, July 31, and October 31 of each monitoring year. The quarterly reports will briefly discuss the past quarters management actions, qualitatively evaluate the status of the site, and recommend necessary adjustments to management actions.

The County will prepare annual reports to be submitted to the County Department of Planning and Building, Caltrans, and CDFG by December 31 of each year. All annual reports will evaluate the site conditions in relation the established performance standards and success criteria. A discussion of the plantings survival calculations and percent cover of California spineflower will be included. In addition, the annual reports will include photos taken from the permanent photo points.

6.4 MARITIME CHAPARRAL ENHANCEMENT AND MONITORING SCHEDULE

Table 6 provides an estimated schedule for the maritime chaparral enhancement activities. The five-year maritime chaparral enhancement program will commence prior to the initiation of construction activities. Pre-construction activities would include collecting and propagating special-status species materials. After the interchange is built, the propagated materials and the irrigation system would be installed. In an attempt to minimize loss of seed viability, California spineflower seed and soil seed bank will be relocated to the enhancement area immediately following collection. Chaparral seeding should occur annually in the fall to take advantage of natural rain patterns. The restoration specialist should coordinate with the Qualified Herbicide Applicator to ensure that herbicide applications will not affect the seeding efforts.

7. CONTINGENCY PLAN

This HCCEP contains conservation, creation, and enhancement options to provide some flexibility in consideration of land availability, implementation costs, and budgetary limitations. If circumstances result in the habitat creation and enhancement options becoming infeasible an alternative proposal would be prepared based upon the same criteria contained in this plan and submitted to the Environmental Coordinator and Caltrans for review and approval. It is unlikely that any contingency proposals would provide mitigation within the Nipomo area where the benefit would be best realized.

Table 6. Maritime Chaparral Enhancement Schedule

Implementation	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
*Collect Sand Almond Seed						X	X					
*Collect Manzanita Cuttings				X	X	X						
**Spineflower Seed and Soil Collection								X	X			
Site Preparation, Installation, Baseline Data Collection									X	X	X	X
YEAR 1	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
***Maintenance Activities		X		X		X	X	X		X		
Herbicide Applications				X								X
Seed Applications											X	
Qualitative Assessments	X			X			X			X		
Quantitative Assessment									X			
Annual Report												X
YEAR 2	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Maintenance Activities	X		X	X			X	X		X		
Herbicide Applications				X								X
Seed Applications											X	
Qualitative Assessments	X			X			X			X		
Quantitative Assessment									X			
Annual Report												X
YEAR 3	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Maintenance Activities	X			X			X			X		
Herbicide Applications				X								X
Seed Applications											X	
Qualitative Assessments	X			X			X			X		
Quantitative Assessment									X			
Annual Report												X
YEAR 4	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Maintenance Activities	X			X			X			X		
Herbicide Applications				X								X
Seed Applications											X	
Qualitative Assessments	X			X			X			X		
Quantitative Assessment									X			
Annual Report												X
YEAR 5	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Maintenance Activities	X			X			X			X		
Herbicide Applications				X								X
Seed Applications											X	
Qualitative Assessments	X			X			X			X		
Quantitative Assessment									X			
Final Report												X

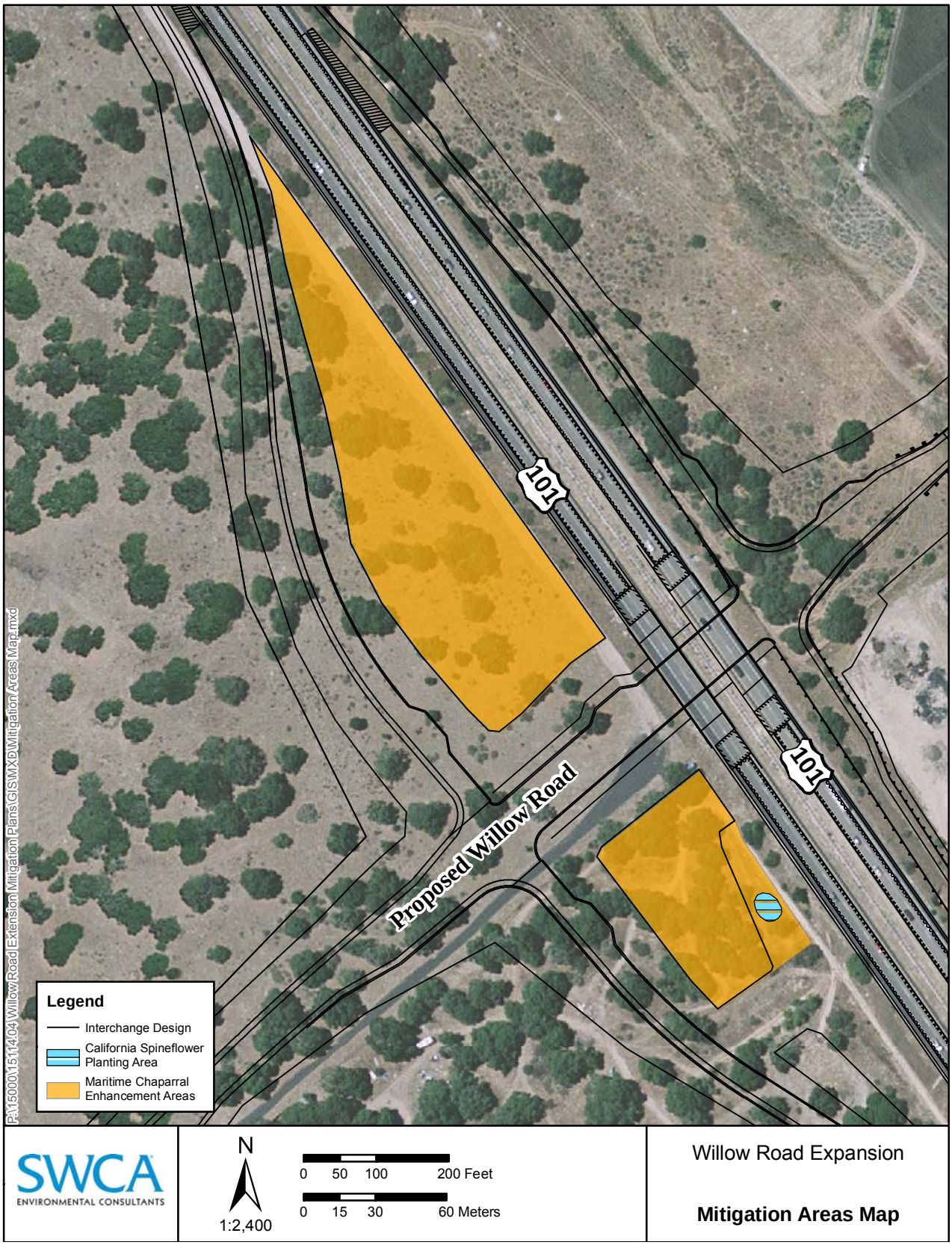
Notes:

*Expect six months to one year for propagating sand almond and sand mesa manzanita materials.

**Spineflower seed and soil should be immediately relocated to spineflower plot in the enhancement area.

***Maintenance activities will include weed abatement, watering, debris removal, and supplemental plantings. These activities will be conducted on an as necessary basis determined by the County restoration specialist.

Figure 4. Maritime Chaparral Enhancement Map



8. REFERENCES

Applied Earthworks (2010). Historical Property Survey Report for the Oak Mitigation Project for the Willow Road Extension, EA 05-47450.

California Natural Diversity Data Base. (CNDDB, 2009). Data Base Search for the Morro Bay South U.S.G.S 7.5-minute Quadrangle. California Department of Fish and Game. Sacramento, California.

California Native Plant Society (CNPS, 2009) online inventory of rare and endangered plants. Online: http://cnps.web.aplus.net/cgi-bin/inv/inventory.cgi. Site visited on numerous occasions in 2009.

Emery, Dara (Emery, 1988). Seed Propagation of Native California Plants. Santa Barbara Botanic Garden.

Hickman, J. Ed. 1993. The Jepson Manual: Higher Plants of California. University of California Press. Berkeley, California.

Holland, Robert F. 1986. Preliminary Descriptions of the Terrestrial Natural Communities of California. California Department of Fish and Game. Sacramento, California.

Hoover, Robert F. 1970. The Vascular Plants of San Luis Obispo County, California. University of California Press. Berkeley, California.

Leach, Carolyn B. (Leach, 2009). Willow Road Extension Oak Trials Study.

LSA Associates June 2005. (LSA, 2005). Biological Assessment Willow Road/US 101 Interchange in the Community of Nipomo, San Luis Obispo California.

LSA Associates, April 2006 (LSA, 2006). Final Supplemental Environmental Impact Report Willow Road Extension/US 101 Interchange.

U.S. Department of Agriculture (NRCS 1996). Sampling Vegetation Attributes an interagency technical reference; published in 1996 by the Cooperative Extension Service, U.S. Department of Agriculture, Natural Resource Conservation Service, Grazing Land Technology Institute, and U.S. Department of the Interior.

U.S. Department of Agriculture (NRCS 1984). Soil Conservation Service. Soil Survey of San Luis Obispo County, California, Coastal Part.

U.S. Fish and Wildlife Service. 2003. Protocol Survey Guidelines for the Morro Shoulderband Snail. U.S. Fish and Wildlife Service, Portland, Oregon.

This page intentionally left blank.

Attachment A.
Photo Documentation

PHOTO 1:

Representative view of the Dana Adobe Oak Woodland Creation site. The rolling hills, north facing slopes, and seasonal hydrology provide ideal conditions for the oak plantings.

Photo taken March 11, 2009.

PHOTO 2:

View of the Oak Trial Study plantings located at the Dana Adobe Oak Woodland Creation site.

Photo taken March 11, 2009.

PHOTO DOCUMENTATION

PHOTO 3:

View of the existing San Luis Obispo Land Conservancy riparian restoration project located at the Dana Adobe site.

Photo taken March 11, 2009.

PHOTO 4:

Representative view of the Maritime Chaparral Enhancement site. Note the presence of chaparral species in the foreground and scattered oaks in the background.

Photo taken May 20, 2009.

Attachment B.
Oak Trial Study

Designated by the National Trust for Historic Preservation As an official Project of

SAVE AMERICA'S TREASURES

Dana Adobe Nipomo Amigos
Rancho Nipomo - 1837

671 Oakglen Avenue, Nipomo, CA 93444
"Re-building Rancho Nipomo's heritage one brick at a time"

CALIFORNIA REPUBLIC

California's Historical Landmark Number 1033

NATIONAL PARK SERVICE NATIONAL REGISTER OF HISTORIC PLACES

DANA

P. O. Box 729
Nipomo, CA 93444
(805) 929-5679

dana@danaadobe.org
www.danaadobe.org

Board of Directors
Herb Kandel
President

Alan Daurio
Vice President

Stephanie Franks
Secretary/Treasurer

David Dana
Joe Dana
Hector Gonzales
Len Hoskins

Advisory Council

Dick Blankenburg
Stephen Cool
Ray Deutsch
Ed Eby
Howard Mankins
Peg Miller
Charles Porter
Carrol Pruett
Rob Rossi
Patrick Sheehy
Paul Teixeira

Adobe Staff
Marina B. Washburn
Executive Director

Ethel Landers
Kathy Kubiak
Aaron Regez

Tax Identification No.

77-0513007

February 4, 2009

Dale Ramey
John Farhar
Department of Public Works
County of San Luis Obispo
County Government Center
San Luis Obispo, Ca 93408

Dear Dale Ramey and John Farhar,

Thank you for your time over the phone on Monday to clarify the process and status of the Willow Road extension - oak mitigation project. As per our brief conversation on Monday, attached please find an updated progress report on the DANA Oak Trial Project taking place on the preserved 100 acres at the Dana Adobe.

We are enthusiastic to share the great progress and rates of success we are seeing thus far. The collection of data was collected by Dana Adobe Nipomo Amigos. The formal data analysis and summary report was compiled and provided by Carolyn B. Leach, of Carolyn B. Leach Consulting, LLC in Nipomo.

Please let us know if we can provide any additional information or data that would enhance understanding or further analyze the project's progress and success.

Thank you for your support. We look forward to your feedback.

Kind Regards,

Marina B. Washburn
Executive Director
DANA

Carolyn B. Leach Consulting, LLC
444 Blume Street, Nipomo, CA 93444
(805)929-9020
W.C.I.S.A. Certified Arborist #727

Jan. 23, 2009

Ms. Marina Washburn, Executive Director
D.A.N.A.
P.O. Box 729
Nipomo, CA 93444

Re: Willow Road Extension Oak Trials Project

Dear Ms. Washburn:

I have reviewed the data collected by your staff on the current success rates for the various planting methods used in our Oak Trials Project. I would now like to discuss the findings.

As you know, the trials were planted in April and June of 2008. We installed 240 plots, using twelve planting methods, with twenty repetitions for each method. Our goals were to try to determine which method, or combination of methods, would be the most successful while at the same time the most economical to install.

All of the acorns were collected in the Nipomo mesa area, during the fall of 2007. They were sorted, washed, and refrigerated for about three months, until we could see the acorns beginning to sprout. This process is known as "stratification" and is a standard procedure for growing oak acorns.

Meanwhile, the site was prepared. An herbicide application was made to the area. The individual plots were evenly marked across the slope, and holes were dug by use of a power auger.

The stratification period was completed in April 2008. Direct planting of acorns occurred at that time. A drip watering system was installed and all plots received the same watering amounts and frequency. Also in April, acorns were taken to a commercial nursery where they were planted into shallow nursery flats filled with potting soil. They received regular watering and care until they were fully sprouted and about two inches tall. They were then delivered to the site in June of 2008, where they were inspected and root pruned to remove kinked and circling roots. They were then immediately planted in our plots and watered with

the same drip system installed on the acorn plots.

It should be noted that annual rainfall in our area has been well below average during the past three winters. The site soil was rapidly drying in April and very dry in June. We had several periods of unusually hot weather following our seedling planting. Supplemental irrigation of the project was critical in allowing our treatments to survive.

We used several planting methods at the test site. Both the acorns and seedling sources began with "control" plots consisting of planting in the plots without other treatments - simply in the site soil. By comparing the two controls, those planted from acorns had a 40% success rate, while those planted from seedling had a much lower 25% success rate.

The next method we tested was using a mulch layer over the plot. The mulch we used was a commercial bark chip product. Using mulch increased the success rate in the acorns to 75% from the control of 40%. In the seedlings, the addition of mulch increased the success rate to 54% from the control of 25%. Clearly, the addition of mulch was beneficial.

Next, we compared the use of wire gopher baskets. These baskets were made of galvanized aviary wire mesh with openings less than ¾ inch in diameter. Each basket was hand cut from the wire roll and bent into the shape of the excavated planting hole. In comparing the effectiveness of this treatment on the acorn planted plots, the success rate increased to 65% from the control of 40%. Additionally, when mulch was added to the gopher basket plots, the success rate increased to 95%. The effectiveness of the gopher baskets was not as prominent in the seedling plots, with 50% success rate - which is less than the 54% success rate of mulch alone.

We also tried installing the aviary wire above ground, as a "dome" over the plots, to see whether protection was needed against grazing by ground squirrels or rabbits. We found no change in the success rates using this method. It should be noted, however, that we concurrently conducted a ground squirrel eradication program using poison bait stations. We can assume that the ground squirrels were at least partially kept at bay because of this effort.

Another method of protection the oaks was by using plastic "tree tubes" . In the acorns, adding tree tubes and mulch increased the success to 90% when compared to 75% for mulch alone.

When gopher baskets were added, there was no benefit to also installing tree tubes. All treatments in such combinations resulted in 90 to 95% success rates.

In the seedling plots, using the tree tubes resulted in slightly better than the

control (40% compared to 25%) but worse than using mulch alone, which was at 54% success.

By accomplishing this trial program, we have now proven that it is possible to grow oak trees successfully at this site and in this soil. Since there were no oaks visible on this 100 acre parcel of land, this is an important fact to prove. Other simple facts became obvious as we implemented the project. Providing supplemental irrigation to the trees ensured that no losses occurred due to drought stress. Control of the rodent population was also important, as the resident ground squirrels could have quickly stripped all the plots of the acorns as soon as we planted them.

As for the planting treatments, It was clear that the planting of acorns was by far more successful than the planting of seedlings. Future plantings of oaks at this site should be carefully timed to coordinate with the time of year that oak acorns are available after they have been stratified. This would mean that sufficient labor force will need to be available to complete the plantings before the acorns spoil.

In looking at the various planting methods used, we found that nearly perfect success is possible under several planting scenarios. Installing gopher baskets was universally successful (90 - 95%), but was extremely labor intensive and more expensive. Handling the sharp ends of the cut wire was unpleasant and increased the risk of injury to the installer. The wire is only meant to provide protection to the tree roots during the first 1-2 years of its growth. After that, the roots have grown into the soil past the wire.

An interesting alternative to gopher wire is the treatment that uses tree tubes plus mulch. These plots showed a success rate of 90%. The installation of the tree tube was a simple, fast, clean, and safe process. The tubes will continue to provide protection to the upper portions of the trees until the foliage grows out the top end of the tube - about 2 years. At that time, the tubes can be removed and reused or recycled. This treatment method appears to be the best combination of reasonable costs and successful results in this trial.

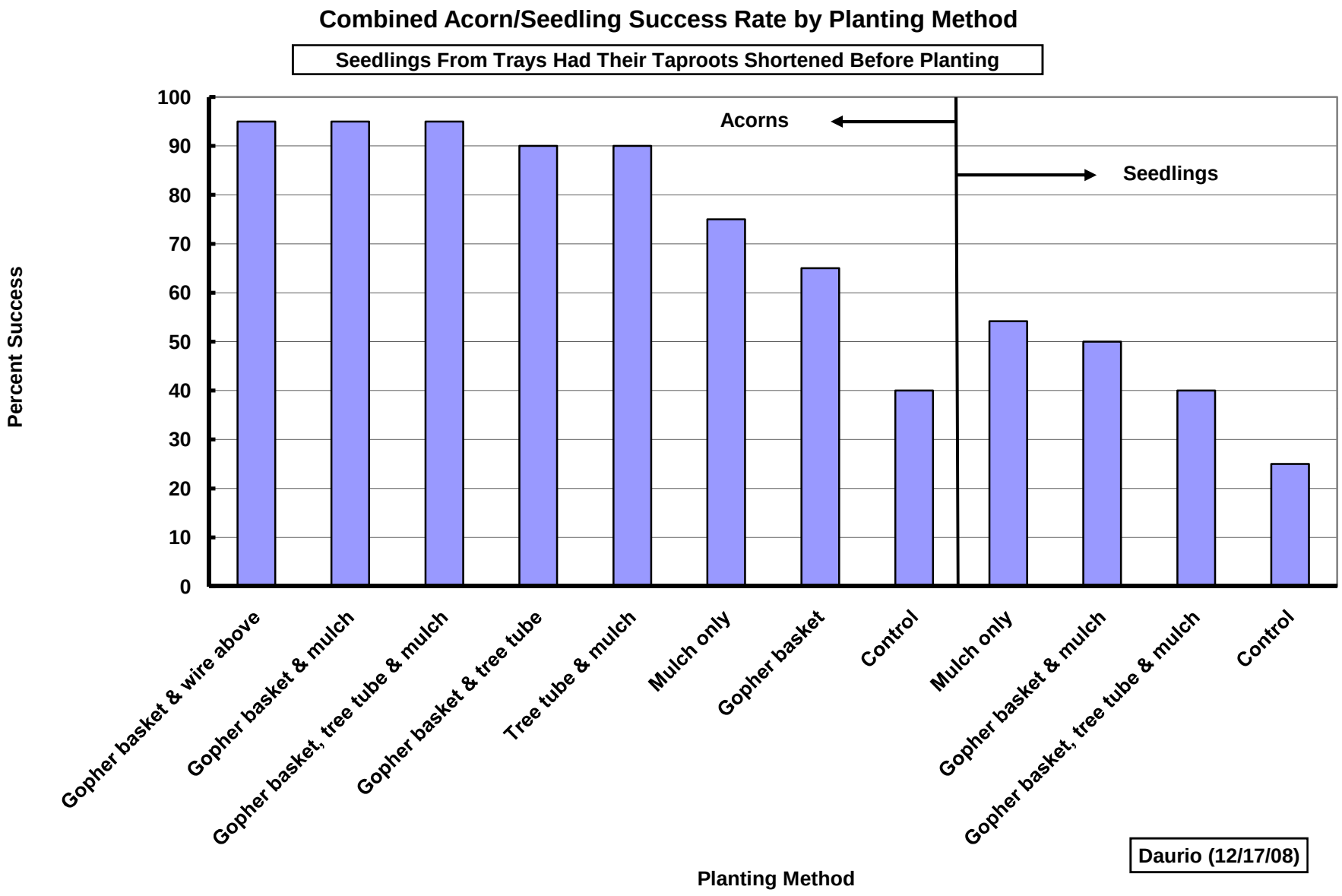
Please note that gophers are a more pressing problem in sandier soil. My recommendations may change for other sites and other soils.

Let me know if you would like additional information regarding this project.

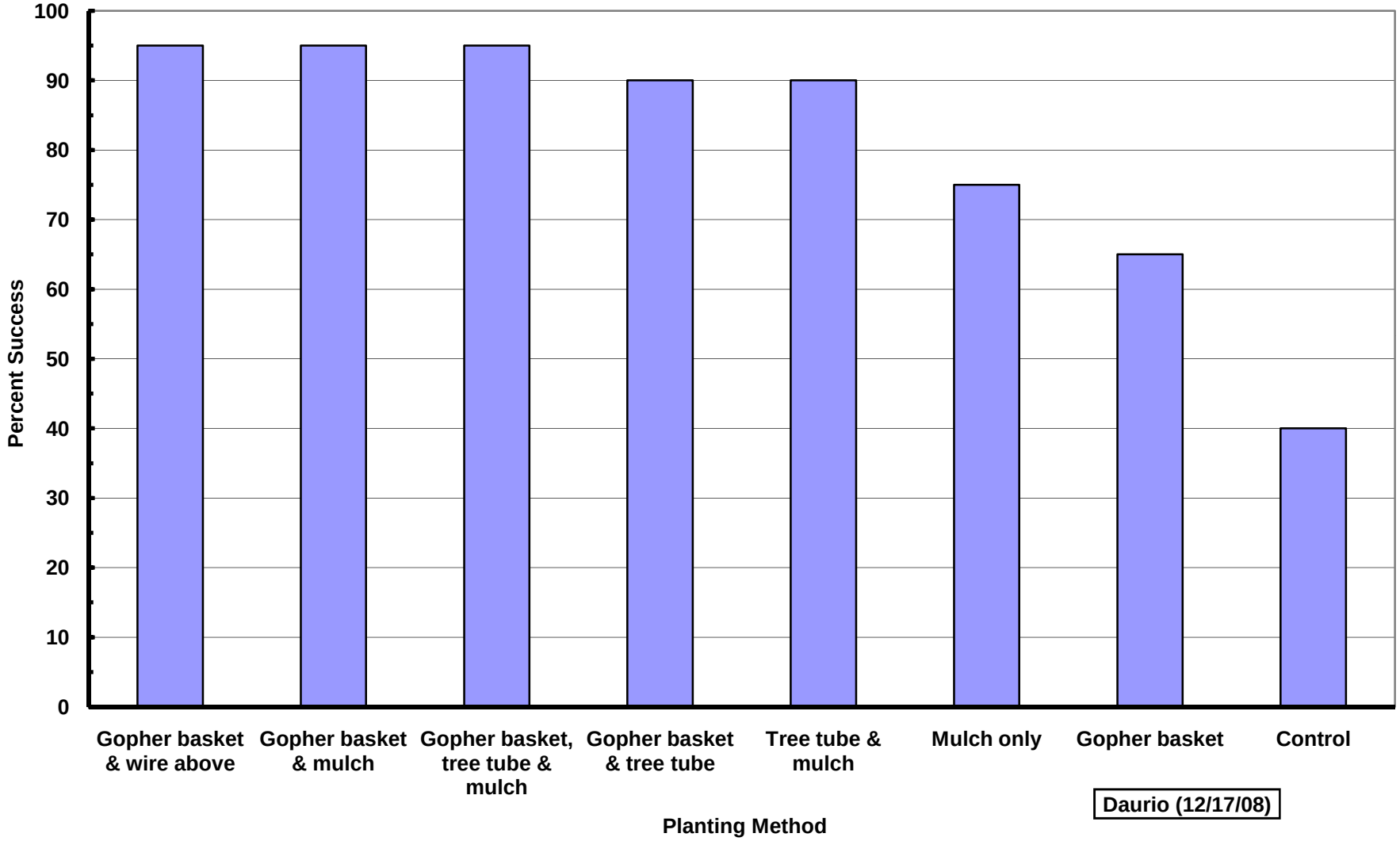
Sincerely,

Carolyn Leach

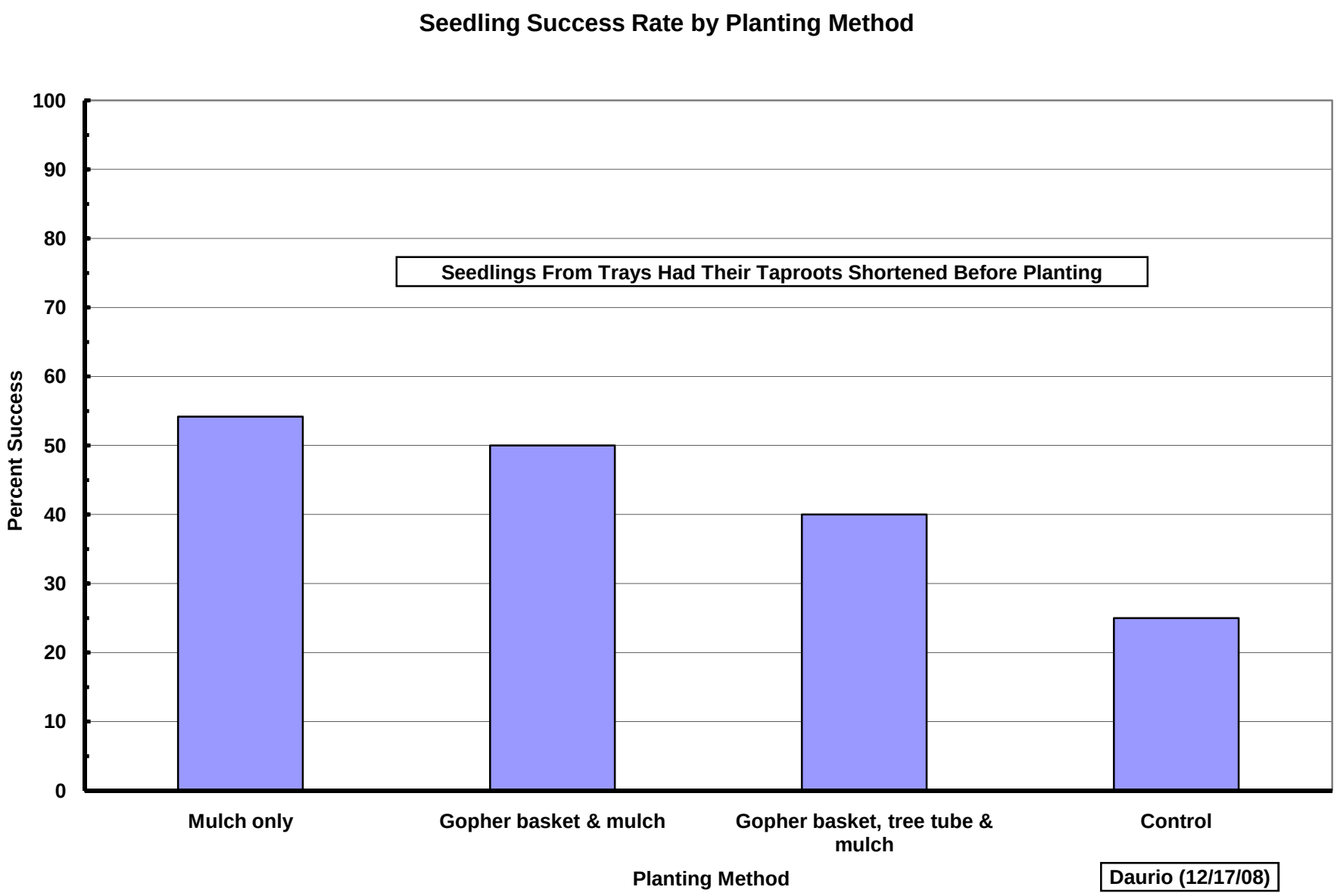
Carolyn Leach
Project Consultant


Combined Acorn/Seedling Success Rate by Planting Method
Seedlings From Trays Had Their Taproots Shortened Before Planting
Percent Success
100
90
80
70
60
50
40
30
20
10
0
Acorns
Seedlings
Gopher basket & wire above
Gopher basket & mulch
Gopher basket, tree tube & mulch
Gopher basket & tree tube
Tree tube & mulch
Mulch only
Gopher basket
Control
Mulch only
Gopher basket & mulch
Gopher basket, tree tube & mulch
Control
Daurio (12/17/08)
Planting Method

Acorn Success Rate By Planting Method



Daurio (12/17/08)


Seedling Success Rate by Planting Method
Seedlings From Trays Had Their Taproots Shortened Before Planting
Percent Success
100
90
80
70
60
50
40
30
20
10
0
Mulch only
Gopher basket & mulch
Gopher basket, tree tube & mulch
Control
Planting Method
Daurio (12/17/08)

All Holes Will Either Have a Success or Failure (1 or 0)

Acorns

	Acorns Per Hole	Success	Failure	% Success
Gopher basket & wire above	5	19	1	95
Gopher basket & mulch	3	19	1	95
Gopher basket, tree tube & mulch	3	19	1	95
Gopher basket & tree tube	5	18	2	90
Tree tube & mulch	3	18	2	90
Mulch only	3	15	5	75
Gopher basket	5	13	7	65
Control	3	8	12	40
Total		129	31	81

Seedlings

	Success	Failure	% Success
Mulch only	13	11	54
Gopher basket & mulch	10	10	50
Gopher basket, tree tube & mulch	8	12	40
Control	6	18	25
Total	37	51	42

DANA Oak Trials Report
September 15, 2008

← five acorns per planting area →						three acorns per planting area ←								
Gopher Basket		Wire Above & G.B.		Tree Tube/Gopher Basket		Soil Only		Mulch/Gopher Basket		Tree Tube/Mulch/G.B.		Mulch Only		Tree Tube
Row 1	Row 2	Row 3	Row 4	Row 5	Row 6	Row 7	Row 8	Row 9	Row 10	Row 11	Row 12	Row 13	Row 14	Row 15
1	0	6	3	5	4	0	0	3	4	0	3	2	3	2
5	6	5	3	4	4	0	2	2	4	2	2	2	3	3
0	0	3	5	2	4	3	3	2	3	2	3	1	3	2
3	2	2	6	5	6	2	0	4	5	2	3	4	1	1
3	2	5	5	2	6	0	0	2	0	2	2	0	1	2
2	1	6	0	5	4	1	2	2	3	3	2	1	0	0
1	2	4	5	5	3	0	0	3	2	1	3	0	0	3
0	0	8	5	4	0	2	4	2	4	3	4	1	1	1
0	1	2	2	5	2	0	0	6	3	3	1	0	3	0
0	3	7	4	0	3	0	0	3	3	3	3	1	4	3

Total Plants Living in Each Row:

15	17	48	38	37	36	8	11	29	31	21	26	12	19	17

Total Plants Living; 424

20 Plantings Per Method:

Gopher Basket	27 Plants	7 No Growth
Wire Above & Below	86 Plants	1 No Growth
Tree Tube/Gopher Basket	73 Plants	1 No Growth
Soil Only	21 Plants	12 No Growth
Mulch & Gopher Basket	60 Plants	1 No Growth
Tree Tube/Mulch/Gopher Basket	47 Plants	1 No Growth
Mulch Only	31 Plants	5 No Growth
Tree Tube & Mulch	31 Plants	2 No Growth

Acorns; Planted April 7, 2008

160 Plantings of Acorns, 30 Plantings with no growth

Seedling; Planted June 16, 2008

108 Seedlings Planted, 12 Seedlings living
68 Potted Seedling Planted, 33 Seedlings Living

DANA Oak Trials Report
September 15, 2008

	Seedlings										
/Mulch	Potted/Soil Only		Gopher Basket		G.Bskt/Tree Tube		Seedling/Soil Only			Potted/Soil Only	Se
Row 16	Row 17	Row 18	Row 19	Row 20	Row 21	Row 22	Row 23	Row 24	Row 25	Row 26	Row 27
1	1	2	0	2	0	1	0	1	0	2	1
2	2	0	0	2	0	2	0	1	0	2	0
2	0	1	0	1	0	1	0	1	0	0	0
1	1	1	0	1	1	2	0	0	0	0	
2	0	0	0	1	0	0	0	0	0		
1	0	1	0	0	0	1					
2	0	1	0	0	0	1					
1	1	0	0	1	0	1					
1	0	1	1	2	0	0					
1	0	2	1	1	0	0					
14	5	9	2	11	1	9	0	3	0	4	1

379 **Total seedling successes planted:**

edling/Soil Only

Row 28	Row 29
0	0
0	0
0	0
0	0
	45

Attachment C.
Recommended Monitoring Protocols

D. Daubenmire Method

1. *General Description* The Daubenmire method consists of systematically placing a 20- x 50-cm quadrat frame along a tape on permanently located transects (see Figure 4 on page 13). The following vegetation attributes are monitored using the Daubenmire method:

   - Canopy cover
   - Frequency
   - Composition by canopy cover

   It is important to establish a photo plot (see Section V.A) and take both close-up and general view photographs. This allows the portrayal of resource values and conditions and furnishes visual evidence of vegetation and soil changes over time.

2. *Areas of Use* This method is applicable to a wide, variety of vegetation types as long as the plants do not exceed waist height.

3. *Advantages and Limitations* This method is relatively simple and rapid to use. A limitation is that there can be large changes in canopy cover of herbaceous species between years because of climatic conditions, with no relationship to the effects of management. In general, quadrats are not recommended for estimating cover (Floyd and Anderson 1987; Kennedy and Addision 1987). This method cannot be used to calculate rooted frequency.

4. *Equipment* The following equipment is needed (see also the equipment listed in Section V.A, page 31, for the establishment of the photo plot):

   - Study Location and Documentation Data form Appendix A)
   - Daubenmire forms (see Illustration 9 and 10)
   - Hammer
   - Permanent yellow or orange spray paint
   - Two stakes: 3/4 - or 1-inch angle iron not less than 16 inches long
   - Tape: 100- or 200-foot, delineated in tenths and hundreds, or a metric tape of the desired length.
   - Steel pins (reinforcement bar) for marking zero, mid, and end points of the transect
   - Frame to delineate the 20- x 50-cm quadrats (see Illustration 11)
   - Compass
   - Steel post and driver

5. *Training* The accuracy of data depends on the training and ability of the examiners. Examiners must be able to identify the plant species. They must receive adequate and consistent training in laying out transects and making canopy coverage estimates using the frame.

6. *Establishing Studies* Careful establishment of studies is a critical element in obtaining meaningful data (see Section III).

   a **Site Selection** The most important factor in obtaining usable data is selecting representative areas (critical or key areas) in which to run the study (see Section II.D). Study sites should be located within a single plant community within a

single ecological site. Transects and sampling points need to be randomly located within the critical or key areas (see Section III).

b **Pilot Studies** Collect data on several pilot studies to determine the number of samples (transects or observation points) and the number and size of quadrats needed to collect a statistically valid sample (see Section III.B.8).

c **Number of Studies** Establish a minimum of one study on each study site; establish more if needed (see Section II.D and III.B).

d **Study Layout** Data can be collected using the baseline, macroplot, or linear study designs described in Section III.A.2 beginning on page 8. The linear technique is the one most often used.

(1) Align a tape (100-, or 200-foot, or metric equivalent) in a straight line by stretching it between the transect location and the transect bearing stakes. Do not allow vegetation to deflect the alignment of the tape. A spring and pulley may be useful to maintain a straight line. The tape should be aligned as close to the ground as possible.

(2) Drive steel pins almost to the ground surface at the zero point on the tape and at the end of the transect. A pin may also be driven into the ground at the midpoint of the transect. (see Figure 4 on page 13)

e **Reference Post or Point** Permanently mark the location of each study with a reference post and a study location stake (see beginning of Section III).

f **Study Identification** Number studies for proper identification to ensure that the data collected can be positively associated with specific sites on the ground (See Appendix B).

g **Study Documentation** Document pertinent information concerning the study on the Study Location and Documentation Data form (see beginning of Section III and Appendix A).

7. *Taking Photographs* The directions for establishing photo plots and for taking close-up and general view photographs are given in Section V.A.

8. *Sampling Process* In addition to collecting the specific studies data, general observations should be made of the study sites (see Section II.F).

a **Cover Classes** This method uses six separate cover classes (Daubenmire 1959). The cover classes are:

Cover Class	Range of Coverage	Midpoint of Range
1	0 - 5%	2.5%
2	5 - 25%	15.0%
3	25 - 50%	37.5%
4	50 - 75%	62.5%
5	75 - 95%	85.0%
6	95 - 100%	97.5%

b **Ten Cover Classes** Where narrower and more numerous classes are preferred, a ten-cover class system can be used.

c **Collecting Cover Data** As the quadrat frame is placed along the tape at the specified intervals, estimate the canopy coverage of each plant species. Record the data by quadrat, by species, and by cover class on the Daubenmire form (see Illustration 9). Canopy coverage estimates can be made for both perennial and annual plant species.

(1) Observe the quadrat frame from directly above and estimate the cover class for all individuals of a plant species in the quadrat as a unit. All other kinds of plants are ignored as each plant species is considered separately.

(2) Imagine a line drawn about the leaf tips of the undisturbed canopies (ignoring inflorescence) and project these polygonal images onto the ground. This projection is considered "canopy coverage." Decide which of the classes the canopy coverage of the species falls into and record on the form.

(3) Canopies extending over the quadrat are estimated even if the plants are not rooted in the quadrat.

(4) Collect the data at a time of maximum growth of the key species.

(5) For tiny annuals, it is helpful to estimate the number of individuals that would be required to fill 5% of the frame (the 71- x 71-mm area). A quick estimate of the numbers of individuals in each frame will then provide an estimate as to whether the aggregate coverage falls in Class 1 or 2, etc.

(6) Overlapping canopy cover is included in the cover estimates by species; therefore, total cover may exceed 100 percent. Total cover may not reflect actual ground cover.

9. *Calculations* Make the calculations and record the results in the appropriate columns on the Daubenmire form (see Illustrations 9 and 10).

a **Canopy Cover** Calculate the percent canopy cover by species as follows:

(1) On the Daubenmire form (Illustration 9) count the number of quadrats in each of the six cover class (by species) and record in the Number column on the Daubenmire Summary form (Illustration 10).

(2) Multiply this value times the midpoint of the appropriate cover class (Illustration 10).

(3) Total the products for all cover classes by species.

(4) Divide the sum by the total number of quadrats sampled on the transect.

(5) Record the percent cover by species on the form.

b Frequency Calculate the percent frequency for each plant species by dividing the number of occurrences of a plant species (the number of quadrats in which a plant species was observed) by the total number of quadrats sampled along the transect. Multiply the resulting value by 100. Record the percent frequency on the form (Illustration 10).

c Species Composition With this method, species composition is based on canopy cover of the various species. It is determined by dividing the percent canopy cover of each plant species by the total canopy cover of all plant species. Record the percent composition on the form (Illustration 10).

10. *Data Analysis*

Tests should be directed at detecting changes in cover of the species and/or in major ground cover classes. Tests for changes in minor species will have low power to detect change. If quadrats are spaced far enough apart on each transect so as to be considered independent, the quadrat can be analyzed as the sampling unit. Otherwise, the transects should be considered the sampling units. If the transects are treated as the sampling unit, and given that the transects are permanent, either the paired t-test or the nonparametric Wilcoxon signed rank test should be used to test for change between two years. Repeated measures ANOVA can be used to test for differences between 3 or more years. If the quadrats are treated as the sampling units, care must be taken to ensure they are positioned the same along each transect in each year of measurement. A paired t-test, Wilcoxon signed rank test, or ANOVA is then used as described above for transects.

11. *References*

Daubenmire, Rexford. 1959. A Canopy-coverage method of vegetational analysis. Northwest Science 33:43-64.

——— 1968. Plant communities: a textbook of plant synecology. Harper and Row, New York. 300 p.

USDI, Bureau of Land Management. 1985. Rangeland monitoring - Trend Studies TR4400-4.

Daubenmire

Page ____ of _____

Study Number	Date	Examiner	Allotment Name & Number	Pasture

Transect Number and Location	Number of Quadrats

Plant Species	Quadrat																								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25

Plant Species	Quadrat																								
	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50

Illustration 9

Daubenmire

Page 1 of 1

Study Number 035-27W-08-02 | Date 7/24/95 | Examiner Chuck Wagon | Allotment Name & Number Quaking Aspen -10373 | Pasture Sheep Creek

Transect Number and Location 3 miles north of Eagle Creek on the west side of the road | Number of Quadrats 50

Plant Species	Quadrat 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
AGSP	2		1		2				1				2			3		4					3	1	
PONE	1					2	3												4		1			2	
ORHY		3																							
STTH2				1	1					3													1		
SIHY								1																	
BRTE										1		1								1				1	
PHHO														2								1	2		
CRAC 2												1									1	1			
ASTER												2													
ARTR 2														3	3			4				4			
CHVI 8													4											3	

Plant Species	Quadrat 26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
AGSP			1							1	2				1			2	1		1	1	1		
PONE								2			1			1	3					1					
ORHY						1																		1	
STTH2					3																2				
SIHY					1																				
BRTE												1	2										1		
PHHO							1									1							1		
ASTER							1	1			2									1					
ARTR 2		4							4		4	4			1				2			2			
CHVI 8				3	3			5						2		2			4						

Illustration 9

Daubenmire Summary

Page ____ of _____

Study Number	Date	Examiner	Allotment Name & Number	Pasture

Study Location	Number of Quadrats

Cover Class	Mid-Point	Species		Species		Species		Species		Species		Species		Species		Species		Species		Species		Species	
		Number	Product	Number	Product	Number	Product	Number	Product	Number	Product	Number	Product	Number	Product	Number	Product	Number	Product	Number	Product	Number	Product
1 1-5%	2.5																						
2 5-25%	15																						
3 26-50%	37.5																						
4 51-75%	62.5																						
5 76-95%	85																						
6 96-100%	97.5																						
Total canopy																							
Number of Samples																							
% canopy cover																							
Species composition																							
Frequency																							

Illustration 10

Daubenmire Summary

Page 1 of 1

Study Number 035-27W-08-02 | Date 7/24/95 | Examiner Chuck Wagon | Allotment Name & Number Quaking Aspen 11037 | Pasture Sheep Creek

Study Location Three miles north of Eagle Tank on the west side of road. | Number of Quadrats 50

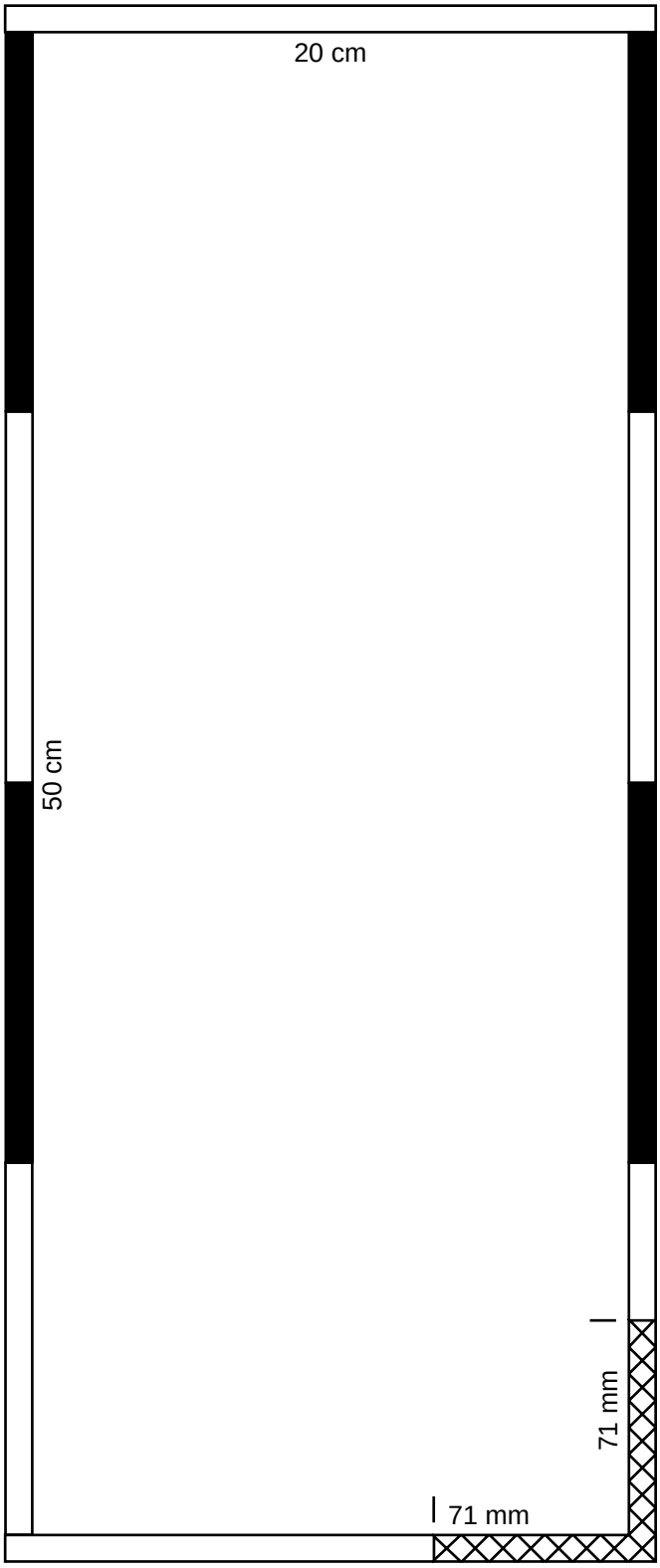
Cover Class	Mid-Point	Species AGSP		Species PONE		Species ORHY		Species STTH2		Species SIHY		Species BRTE		Species PHHO		Species CRAC2		Species Aster		Species ARTR2		Species CHIV8	
		Number	Product	Number	Product	Number	Product	Number	Product	Number	Product	Number	Product	Number	Product	Number	Product	Number	Product	Number	Product	Number	Product
1 1-5%	2.5	10	25	5	12.5	2	5	3	7.5	2	5	6	15	4	10	3	7.5	3	7.5	1	2.5		
2 5-25%	15	5	75	3	45			1	15			1	15	2	30			2	30	2	30	2	30
3 26-50%	37.5	2	75	2	75	1	37.5	2	75											2	75	3	112.5
4 51-75%	62.5	1	62.5	1	62.5															6	375	2	125
5 76-95%	85																					1	85
6 96-100%	97.5																						
Total canopy			237.5		195		42.5		97.5		5		30		40		7.5		37.5		482.5		352.5
Number of Samples			50		50		50		50		50		50		50		50		50		50		50
% canopy cover			5		4		1		2		—		1		1		—		1		10		7
Species composition			16		13		3		6		—		3		3		—		3		31		22
Frequency			36		22		6		12		4		14		12		6		10		22		16

Illustration 10

Rangeland Monitoring

Daubenmire Frame

Six Cover Class Frame



The frame is made of 3/8-inch iron rod. The inside dimensions of the frame are 20 x 50 centimeters. The frame should have sharpened legs 3 centimenters long welded to each corner to help hold the frame in place.

The six cover class frame is divided into fourths by painting alternate sections of the frame different colors as illustrated. Use orange and white or red and white paint.

In one corner of the frame, delineate two sides of an area 71 millimeters square as illustrated. This area represents 5% of the quadrat area.

The painted design provides visual reference areas equal to 5, 25, 50, 75, 95, and 100% of the plot area.

Illustration 11

E. Line Intercept Method

1. *General Description* The Line Intercept method consists of horizontal, linear measurements of plant intercepts along the course of a line (tape). It is designed for measuring grass or grass-like plants, forbs, shrubs, and trees. The following vegetation attributes are monitored with this method:

   - Foliar and basal cover
   - Composition (by cover)

   It is important to establish a photo plot (see Section V.A) and take both close-up and general view photographs. This allows the portrayal of resource values and conditions and furnishes visual evidence of vegetation and soil changes over time.

2. *Areas of Use* This method is ideally suited for semiarid bunchgrass-shrub vegetation types.

3. *Advantages and Limitations* The Line Intercept method is best suited where the boundaries of plant growth are relatively easy to determine. It can be adapted to sampling varying densities and types of vegetation. It is not well adapted, however, for estimating cover on single-stemmed species, dense grassland situations, litter, or gravel less than 1/2 inch in diameter. It is best suited to estimating cover on shrubs.

4. *Equipment* The following equipment is needed (see also the equipment listed in Section V.A, page 31, for the establishment of the photo plot):

   - Study Location and Documentation Data form (see Appendix A)
   - Line Intercept form (see Illustration 12)
   - Hammer
   - Permanent yellow or orange spray paint
   - Two stakes: 3/4 - or 1-inch angle iron not less than 16 inches long.
   - Two tapes: 100- or 200-foot, delineated in tenths and hundredths, or a metric tape of the desired length
   - Compass
   - Steel post and driver

5. *Training* A minimum of training is needed to make sure the examiners understand how to lay out baselines and transects and how to make the measurements. The examiner must also be able to identify the plant species.

6. *Establishing Studies* Careful establishment of studies is a critical element in obtaining meaningful data (see Section III).

   a **Site Selection** The most important factor in obtaining usable data is selecting representative areas (critical or key areas) in which to run the study (see Section II.D). Study sites should be located within a single plant community within a single ecological site. Transects and sampling points need to be randomly located within the critical or key areas (see Section III).

b **Pilot Studies** Collect data on several pilot studies to determine the number of samples (transects or observation points) and the number and size of quadrats needed to collect a statistically valid sample (see Section III.B.8).

c **Number of Transects** Establish the minimum number of transects to achieve the desired level of precision for the key species in each study site (see Section III.B).

d **Length of Transect** The length of a transect is based on the density and homogeneity of the vegetation. If the vegetation is sparse, a longer transect is needed. Transects may be any length (eg. 100 feet, 200 feet, or even longer).

e **Study Layout** Line Intercept data can be collected using either the baseline or linear study design described in Section III.A.2 beginning on page 8. The baseline technique is the recommended study design.

(1) The study location stake is placed at the beginning of the baseline. After determining the bearing of the study, a stake is placed at the end of the baseline. Transects are run perpendicular to and at random distances along the baseline. Transect location stakes are placed at the beginning and end of each transect. The distance between the stakes dependents on the length of the transect. The height of the stakes depends on the height of the vegetation. (Directions for randomly selecting the location of transects to be run off of a baseline using random number tables are given in Appendix D).

Transect location stakes may be left in place as permanent markers or removed at the conclusion of the study. Permanently marking transects will result in greater power to detect change.

(2) Stretch the transect tapes between stakes as close to the ground as possible, with the zero point of the tape aligned on the baseline (the beginning point of the transect). Do not allow vegetation to deflect the alignment of the tape.

f **Reference Post or Point** Permanently mark the location of each study with a reference post and a study location stake (see beginning of Section III).

g **Study Identification** Number studies for proper identification to ensure that the data collected can be positively associated with specific sites on the ground. (see Appendix B).

h **Study Documentation** Document pertinent information concerning the study on the Study Location and Documentation Data form (see beginning of Section III and Appendix A).

7. *Taking Photographs* The directions for establishing photo plots and for taking close-up and general view photographs are given in Section V.A.

8. *Sampling Process* In addition to collecting the specific studies data, general observations should be made of the study sites (see Section II.F).

Proceed down the tape stretched along the transect line and measure the horizontal linear length of each plant that intercepts the line. Measure grasses and grass-like

plants, along with rosette-forming plants, at ground level. For forbs, shrubs, and trees, measure the vertical projection of the foliar cover intercepting one side of the tape. Be sure not to inadvertently move the tape to include or exclude certain plants. If the measurements are made in 10ths and 100ths of feet, the totals are easily converted to percentages. The measurements are recorded by species on the Line Intercept form (Illustration 12).

9. *Calculations* Make the calculations and record the results on the Line Intercept form (see Illustration 12).

a Cover

(1) Calculate the percent cover of each plant species by totaling the intercept measurements for all individuals of that species along the transect line and convert this total to a percent.

(2) Where the measurements are made in 10ths and 100ths of feet along a 100-foot transect, the totals for each species are the cover percentages.

(3) Calculate the total cover measured on the transect by adding the cover percentages for all the species. This total could exceed 100% if the intercepts of overlapping canopies are recorded.

b Composition With this method, species composition is based on the percent cover of each species. Calculate percent composition by dividing the percent cover for each plant species by the total cover for all plant species.

10. *Data Analysis* It is important to realize that each transect is a single sampling unit. For trend analysis permanent sampling units are suggested. If permanent transects are monitored, use the appropriate paired analysis technique. Use either a paired t-test or the nonparametric Wilcoxon signed rank test when testing for change between years. When comparing more than two sampling periods, use repeated measures ANOVA. If the transects are not permanently marked, use the appropriate nonpaired test.

11. *References*

Brun, Jorge M. and Thadis W. Box. 1963. Comparison of line intercepts and random point frames for sampling desert shrub vegetation. J. Range Manage. 16:21-25.

Buckner, D.L. 1985. Point-Intercept Sampling in Revegetation Studies: Maximizing Objectivity and Repeatability. Paper presented at American Society for Surface Mining and Reclamation Meeting, Denver, CO. 1985.

Canfield, R.H. 1941. Application of the line interception method in sampling range vegetation. J. Forestry 39:388-394.

Canfield, R.H. 1944. Measurement of grazing use by the line intercept Method. Jour. For. 42(3):192-194

Hanley, Thomas A. 1978. A comparison of the line-interception and quadrat estimation methods of determining shrub canopy coverage. J. Range Manage. 31:60-62.

Kinsinger, Floyd E., Richard E. Eckert, and Pat 0. Currie. 1960. A comparison of the line-interception, variable-plot, and loop methods as used to measure shrub-crown cover. J. Range Manage. 13:17-21.

USDI, Bureau of Land Management. 1985. Rangeland monitoring - Trend studies TR4400-4.

Line Intercept

Page ____ of _____

Study Number	Date	Examiner	Allotment Name & Number	Pasture

Line Length	Transect Location

NOTES (Use other side or another page, if necessary)	Grass Species							Forb Species						Shrub Species					NOTES
																			Totals
Totals																			
% Cover																			
% Comp																			100%

Illustration 12

Line Intercept

Page 1 of 1

Study Number 12N-37W-19-03	Date 10/3/95	Examiner Jack Straw	Allotment Name & Number Cow Gulch 20111	Pasture

Line Length 100 feet

Transect Location 3 miles east of Potter's Corral on north side of road.

NOTES (Use other side or another page, if necessary)	Grass Species							Forb Species						Shrub Species					NOTES
	BOCU	BOGR2	BOHI2	KOCR	SIHY			HYRI	PSORA	COWR2				CEGR	JUNIP				
100 ft. tape	.42	.10	.32	.11	.06			.52	2.04	.55				3.40	.06				
	.20	.02	.25	.02	.02			.46	1.32	.22				.13	2.13				
	.26	.03	.05	.12	.02			1.47	.59					4.90	.07				
	.03	.01		.08	.04			.28	3.30					.72	.02				
	.17	.10			.05			.80	.07					.14					
	.26	.29			.26			.05						1.02					
	.22	.24			.04														
	.22	.14			.03														
	.34	.10			.01														
	.32	.17			.19														
	.02	.12			.02														
	.02	.18			.35														
	.10	.13																	
	.02	.14																	
	.16	.04																	
	.18	.16																	
	.10	.05																	
	.14	.27																	
	.06	.03																	
	.03	.46																	
	.04	.07																	
	.10	.38																	
	.02	.12																	
	.03	.10																	
	.02	.11																	
	.16	.03																	
		.36																	
		.68																	
																			Totals
Totals	3.64	4.63	.62	.33	1.09			3.58	7.32	.77				10.31	2.28				
% Cover	4	5	1	0	1			4	7	1				10	2				
% Comp	11	14	3	—	3			11	20	3				29	6				100%

F. Step-Point Method

1. *General Description* The Step-Point Method involves making observations along a transect at specified intervals, using a pin to record cover "hits." It measures cover for individual species, total cover, and species composition by cover.

   It is important to establish a photo plot (see Section V.A) and take both close-up and general view photographs. This allows the portrayal of resource values and conditions and furnishes visual evidence of vegetation and soil changes over time.

2. *Areas of Use* This method is best suited for use with grasses and forbs, as well as low shrubs. The greater the structure to the community, the more difficult it becomes to determine "hits" due to parallax, observer bias, wind, etc. This method is good for an initial overview of an area not yet subjected to intensive monitoring.

3. *Advantages and Limitations* This method is relatively simple and easy to use as long as careful consideration is given to the vegetation type to which it is applied. It is suitable for measuring major characteristics of the ground and vegetation cover of an area. Large areas can easily be sampled, particularly if the cover is reasonably uniform. It is possible to collect a fairly large number of samples within a relatively short time.

   A limitation of this method is that there can be extreme variation in the data collected among examiners when sample sizes are small. Tall or armored vegetation reduces the ability to pace in a straight line, and the offset for obstructions described in the procedures adds bias to the data collection by avoiding certain components of the community. Another limitation is that less predominant plant species may not be hit on the transects and therefore do not show up in the study records. The literature contains numerous studies utilizing point intercept procedures that required point densities ranging from 300 to 39,000 in order to adequately sample for minor species. One major consideration in the use of this method is to assure that a sharpened pin is used and that only the point is used to record "hits." Pins have finite diameters and therefore overestimate cover (Goodall 1952). Another limitation of this method is that statistical analysis of the data is suspect unless two and preferably more transects are run per site (see Section III - Study Design and Analysis).

4. *Equipment* The following equipment is needed (see also the equipment listed in Section V.A, page 31, for the establishment of the photo plot):

   - Study Location and Documentation Data form (see Appendix A)
   - Cover Data form (see Illustration 13)
   - Permanent yellow or orange spray paint
   - Tally counter (optional)
   - One stake: 3/4- or 1-inch angle iron not less than 16 inches long
   - 3-foot long, 3/16th-inch diameter sharpened pin
   - Compass
   - Steel post and driver

5. *Training* A minimum amount of training is needed for this method. Examiners must be able to identify the plant species, be familiar with the ground-level cover

categories, know how to collect canopy or foliar cover data, and know how to collect cover data using a pin and notch in the boot.

6. *Establishing Studies* Careful establishment of studies is a critical element in obtaining meaningful data.

   a **Site Selection** The most important factor in obtaining usable data is selecting representative areas (critical or key areas) in which to run the study (see Section II.D). Study sites should be located within a single plant community within a single ecological site. Transects and sampling points need to be randomly located within the critical or key areas. (see Section III).

   b **Pilot Studies** Collect data on several pilot studies to determine the number of samples (transects or observation points) and the number and size of quadrats needed to collect a statistically valid sample (see Section III.B.8).

   c **Number of Transects** Establish the minimum number of transects to achieve the desired level of precision (see Section III.B).

   d **Study Layout** Data can be collected using either the baseline or linear study designs described in Section III.A.2 beginning on page 8. The linear technique is the one most often used.

   e **Reference Post or Point** Permanently mark the location of each study with a reference post and a study location stake (see beginning of Section III).

   f **Study Identification** Number studies for proper identification to ensure that the data collected can be positively associated with specific sites on the ground (see Appendix B).

   g **Study Documentation** Document pertinent information concerning the study on the Study Location and Documentation Data form (see beginning of Section III and Appendix A).

7. *Taking Photographs* The directions for establishing photo plots and for taking close-up and general view photographs are given in Section V.A.

8. *Sampling Process* In addition to collecting the specific studies data, general observations should be made of the study sites (see Section II.F).

   a **Running a Transect** Determine the transect bearing and select a prominent distant landmark such as a peak, rocky point, etc., that can be used as the transect bearing point.

      (1) Start a transect by randomly selecting a point along the transect bearing and reading the first hit (observation point).

      (2) Read hits at specified intervals by placing the heel of the boot on the ground with the sole of the boot at a 30-degree angle to the ground. Place the pin into the 3/16th inch wide by 1/8th inch deep notch in the toe of

the boot and vertically lower the pin until it either intersects an herbaceous plant or the ground for the specified number of hits. It is recommended that the interval be a minimum of 5 paces. To lengthen the transect, increase the distance between hits (10 paces, 20 paces, etc.).

(3) When obstructions such as juniper trees, cholla cactus, or ledge rock, etc., are encountered, sidestep at 90° from the transect line and continue pacing parallel to the transect to avoid the obstructions. Return to the original transect line as soon as possible by sidestepping at 90° in the opposite direction. Continue pacing along the transect bearing. If the obstruction (juniper tree, cholla cactus, or ledge rock) is determined to be a highly important component of the community, this information can be recorded qualitatively on the back of the form.

(4) In most cases, do not count hits along portions of a transect that have been unnaturally disturbed, such as roads or trails. When such areas are encountered, proceed three paces past the disturbance before resuming the reading of hits along the transect line.

b Collecting Cover Data At each observation point, identify the ground level or basal hit with the point of the pin and record the data by dot count tally by category and/or plant species code in the appropriate section of the Cover Data form (see Illustrations 13 and 14). If there is a vegetation canopy layer, lower the pin through the vegetation until a basal or ground level hit is determined. Record the basal or ground level hit and any subsequent vegetation layers that intersect the pin. For vegetation structure above 3-feet (length of pin), a visual observation of plant intercepts above the notch in the boot can be made and recorded as additional canopy or foliar level hits on the data form.

(1) ***Ground-level or basal hits***

(a) Ground-level hits (excluding basal vegetation hits) will fall into four cover categories. They can be redefined and/or additional categories added, depending on the data needed. The four categories are:

L - Litter

B - Bare ground

G - Gravel (particle sizes between 1/12 inch and 10 inches)

S - Stone (greater than 10 inches)

(b) Record the ground-level hits by dot count tally by ground-level cover category in the Ground-Level Cover section of the form, except where there are ground-level and, basal or canopy cover hit combinations. In this situation, use the Basal and Canopy/Foliar Cover section of the form.

(c) Basal hits on live vegetation are identified by species (includes mosses and lichens more than 1/16 inch thick). To count as a basal hit on live vegetation, the plant crown at or below a l-inch height above the ground MUST be intercepted by the pin.

(d) Enter the appropriate plant species code in the Basal or Ground-Level Column in the Basal and Canopy/Foliar Cover section of the form.

(e) Enter a dot count tally for each basal hit on a species in the Dot Count Column in the Basal and Canopy/Foliar Cover section of the form when the plant species code is first entered on the form. Enter an additional dot count tally each time there is a basal hit on that species on the transect, except where there are basal and canopy/foliar cover hit combinations.

(2) ***Ground-level or basal and canopy/foliar cover hit combinations***

(a) Identify the ground-level or basal hit, as well as any canopy cover hit(s) below 3 feet in height, intercepted at each point by the pin. For canopy cover above 3 feet, use line-of-sight observations directly perpendicular to the notch in the boot.

(b) Enter the appropriate ground-level cover category code and/or plant species code for each level of hit (up to four levels) in the appropriate columns in the Basal and Canopy/Foliar Cover section of the form (see Illustration 13).

(c) Enter a dot count tally for each ground-level or basal and canopy/foliar cover hit combination when it is first entered on the form and each time this same combination is encountered on the transect.

(d) Enclose plant species codes for vegetation cover hits more than 20 feet above ground level in brackets [ ].

9. *Calculations* Calculate the percent cover for each cover category by dividing the number of hits for each category by the total number of hits for all categories, including hits on vegetation.

a Ground Cover Ground cover is determined by dividing the total number of hits for all categories except bare ground by the total number of hits (including bare ground).

b Canopy/Foliar Cover Canopy/Foliar cover is determined by dividing the total number of hits on vegetation (includes all basal and canopy/foliar hits) by the total number of hits.

c Basal Cover Basal cover is determined by dividing the number of basal hits by the total number of hits.

10. *Data Analysis*

a When transects are the sampling units: For trend analysis, permanent sampling units are suggested. If permanent transects are monitored, use the appropriate paired analysis technique to compare change in average cover by species and cover class. When comparing more than two sampling periods, use repeated

measures ANOVA. If the transects are not permanently marked, use the appropriate nonpaired test.

b When points are the sampling units: To determine if the change between sampling periods is significant, use Chi Square analysis of variance for cover data.

11. References

Bonham, C.D. 1989. Measurements for Terrestrial Vegetation, John Wiley and Sons, New York, NY. 338 p.

Evans, Raymond A. and R. Merton Love. 1957. The step-point method of sampling—a practical tool in range research. J. Range Manage. 10:208-212.

Goodall, D.W. 1952. Some considerations in the use of point quadrats for the analysis of vegetation. Aust. J. Sci. Res., Series B 5:1-41

Mueller-Dombois, Dieter and Heinz Ellenberg. 1974. Aims and methods of vegetation ecology. John Wiley & Sons, New York, NY. 547 p.

USDI, Bureau of Land Management. 1985. Rangeland monitoring - Trend studies TR4400-4.

Page ____ of ____

Cover Data

Study Number	Date	Examiner	Pasture

Allotment Name & Number	Study Location	Number of Points

Ground-Level Cover

Category	**B** Bare Ground	**L** Litter	**G** Gravel (2mm-10")	**S** Stone (>10")	Vegetation	Total
Dot Count						
Total Hits						
% Cover						

Basal and Canopy/Foliar Cover

Bsl or Grnd-Lev	Level 1	Level 2	Level 3	Dot Count	Total Hits
				Total	

Notes (use other side or another page)

Cover Data

Study Number	Date	Examiner	Pasture
Red Feather #2	9/28/95	Josh Gibson	1

Allotment Name & Number	Study Location	Number of Points
Red Feather 11473	Two miles south of Headquarters Well on west side of road.	100

Ground-Level Cover

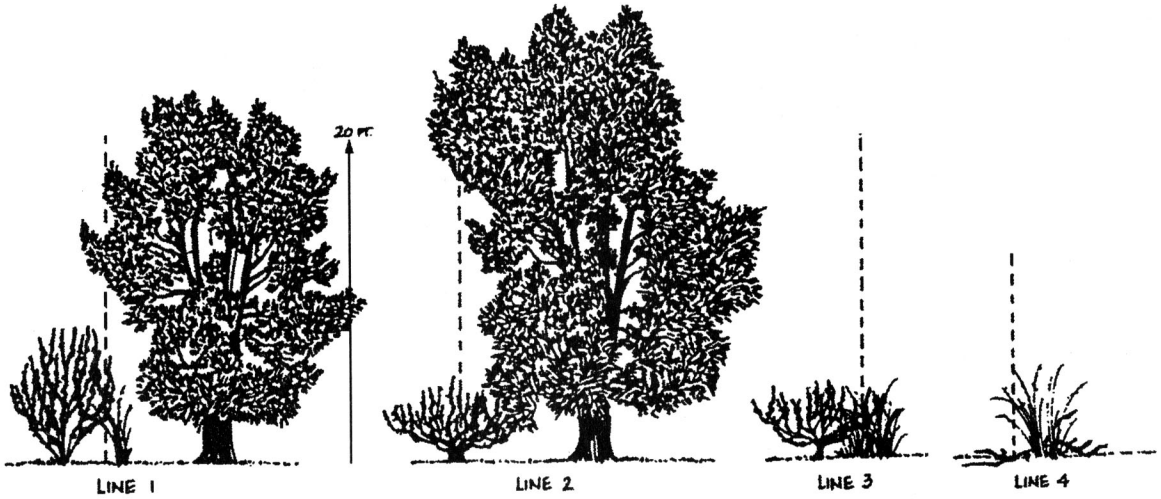
Category	B Bare Ground	L Litter	G Gravel (2mm-10")	S Stone (>10")	Vegetation	Total
Dot Count						39
Total Hits	9	12	16	2	61	100
% Cover	9	12	16	2	61	100

Basal and Canopy/Foliar Cover

Bsl or Grnd-Lev	Level 1	Level 2	Level 3	Dot Count	Total Hits
L	BOCU				12
G	BOGR 2	D	[JUNIP]		1
BOGR 2	Junip				20
G	BOCU				4
SIHY					2
L	ERIOG				2
G	SIHY	RHTR			2
B	VIGUI				2
G	L	VIGUI			4
B	BOCU				2
B	BOHI 2				3
L	BOGR 2	BOCU			2
BOCU	L				2
OPUNT					1
BOGR 2	BOCU				2
				Total	61

Notes (use other side or another page)

Diagrammatic Sketches of Sample Units (Hits) and Recording Procedures



The data from the above illustrated sample units (hits) are recorded on the Cover Data Form as follows:

	BASAL and FOLIAR			
	BSL or grnd-lev	Foliar-level 1	Foliar-level 2	Foliar-level 3
Line 1 —	B	AGSP	PUTR 2	PIED
Line 2 —	ARTR 2	[PIED]		
Line 3 —	AGSP	CHNA 2		
Line 4 —	L	AGSP		

Note — To count as a basal hit on live vegetation, the plant crown at or below a 1-inch height above the ground must be intercepted by the pin.

— Dead vegetation in the canopy is counted as litter.

— Enclose plant species codes for vegetation cover hits more than 20 feet above ground level in brackets [ ].

Illustration 14

Attachment D.
Willow Road Extension Habitat Mitigation and Monitoring Plan

Habitat Mitigation and Monitoring Plan for the Willow Road Extension/U.S. 101 Interchange, Nipomo, San Luis Obispo County, California

Prepared for:

County of San Luis Obispo
Department of Public Works

Prepared by:

SWCA Environmental Consultants

March 2010

HABITAT MITIGATION AND MONITORING PLAN
FOR
WILLOW ROAD EXTENSION/U.S. 101 INTERCHANGE

Prepared for:

COUNTY OF SAN LUIS OBISPO
DEPARTMENT OF PUBLIC WORKS
County Government Center, Room 207
San Luis Obispo, CA 93408
Contact: John Farhar

Prepared by:

SWCA Environmental Consultants
1422 Monterey Street, Suite C200
San Luis Obispo, CA 93401
Contact: Travis Belt

March 2010

SWCA Project Number: 15114.04

TABLE OF CONTENTS

1. INTRODUCTION 1
2. PROJECT AND SITE DESCRIPTION 1
2.1 Responsible Parties and Financial Assurances 1
2.2 Location of Project 1
2.3 Brief Summary of Project 1
2.4 Jurisdictional Areas to be Impacted by Habitat Type 5
2.4.1 Ruderal 5
2.4.2 Freshwater Marsh 5
2.4.3 Willow Riparian 6
3. GOALS OF THE COMPENSATORY MITIGATION PROJECT 6
3.1 Temporary Impact Restoration 6
3.2 Permanent Impact Mitigation 6
3.3 Target Improvements 6
3.4 Time Lapse Between Jurisdictional Impacts and Expected Compensatory Mitigation Success 6
4. MITIGATION AND RESTORATION IMPLEMENTATION PLAN 8
4.1 Plant Salvage 8
4.2 Site Preparation 9
4.3 Planting Plan 9
4.3.1 Zone 1 Seasonal Freshwater Marsh 9
4.3.2 Zone 2 Transitional Riparian 9
4.3.3 Zone 3 Upland 10
4.4 Irrigation Plan 13
4.5 As-Built Conditions 13
5. MAINTENANCE PLAN 13
5.1 Watering 13
5.2 Weed Control and Herbicide Use 14
5.3 Debris Removal and vandalism 14
5.4 Replanting 14
6. MONITORING PLAN 14
6.1 Monitoring Schedule 14
6.2 Annual Performance Standards and Success Criteria 15
6.3 Biological Monitoring Program 16
6.3.1 Plant Vigor and Survival 16
6.3.2 Percent Cover 16
6.3.3 Other Attributes to Monitor 17
6.4 Reporting Requirements 17
6.4.1 United States Army Corps of Engineers 17
6.4.2 California Department of Fish and Game 17
6.4.3 Regional Water Quality Control Board 17
7. COMPLETION OF COMPENSATORY MITIGATION 18
7.1 Notification of Completion 18
8. CONTINGENCY MEASURES 18
9. REFERENCES 19

TABLES

Table 1. Impact and Mitigation Summary 5
Table 2. Estimated Mitigation and Monitoring Schedule 7
Table 3. Zone 1 Plant List 9
Table 4. Zone 2 Plant List 10
Table 5. Zone 3 Plant List 10
Table 6. Annual Performance Standards 15

FIGURES

Figure 1. Project Vicinity Map 2
Figure 2. Project Location Map 3
Figure 3. Project Site Map 11

ATTACHMENTS

Attachment A. Photo Documentation
Attachment B. Monitoring Report Guidelines

1. INTRODUCTION

This Habitat Mitigation and Monitoring Plan (HMMP) has been prepared to mitigate project impacts within U.S. Army Corps of Engineers (USACE), Regional Water Quality Control Board (RWQCB), and California Department of Fish and Game (CDFG) jurisdiction that will result from the Willow Road Extension/U.S. 101 Interchange Project (project). The HMMP structure follows guidelines presented in the *Checklist for Compensatory Mitigation Proposals*, dated June 10, 2008, and the *Final Rule for Compensatory Mitigation for Losses of Aquatic Resources*, dated April 10, 2008.

2. PROJECT AND SITE DESCRIPTION

2.1 RESPONSIBLE PARTIES AND FINANCIAL ASSURANCES

As the project applicant, the party responsible for meeting the mitigation obligation pursuant to the special conditions of the Clean Water Act permitting is:

County of San Luis Obispo
Department of Public Works
County Government Center, Room 207
San Luis Obispo, CA 93408

The County of San Luis Obispo Department of Public Works (County) has the financial and technical means to implement this HMMP and any required contingency actions. The need to establish a performance bond for the actions outlined in this HMMP or any subsequent contingency measure is not anticipated at this time. The site is located within a County-owned right-of-way; therefore, a third-party conservation easement or other site protection measures are not necessary.

2.2 LOCATION OF PROJECT

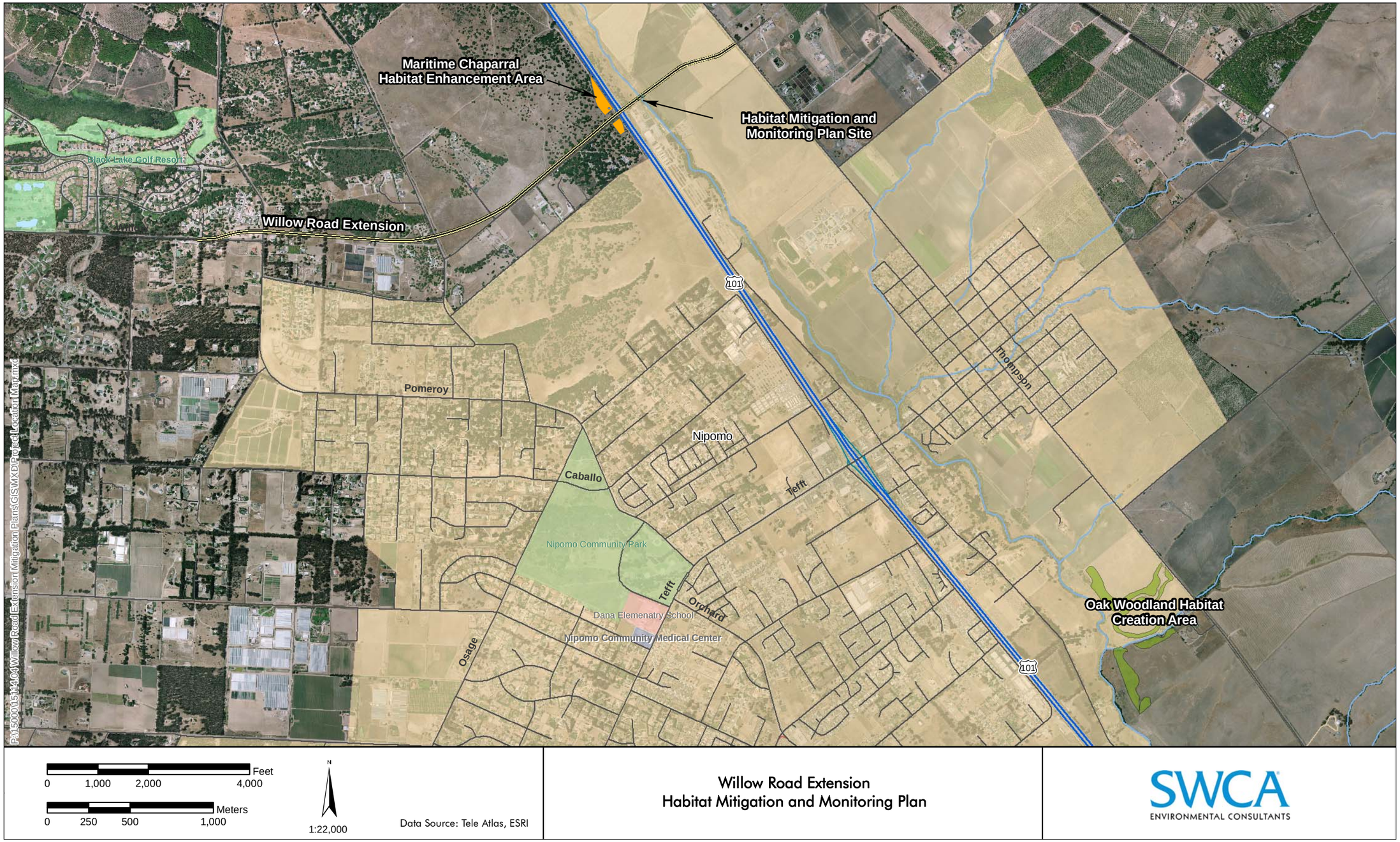
The project is located in Nipomo, southern San Luis Obispo County, California (refer to Figure 1). The overall project will extend Willow Road from its existing terminus (approximately 1,000 feet west of Pomeroy Road) to Thompson Avenue (approximately 2,000 feet east of U.S. 10l). Impacts to jurisdictional waters and subsequent mitigation will be located at the eastern end of the project corridor between U.S. 101 and Thompson Avenue (refer to Figures 2 and 3).

2.3 BRIEF SUMMARY OF PROJECT

The project will extend Willow Road from its existing terminus to Thompson Avenue. This will include construction of a frontage road between Willow Road and Sandydale Drive and construction of a new Willow Road/U.S. 10l interchange. The project will be constructed in two phases. Phase one will not impact jurisdictional waters; phase two will impact waters of the U.S. and State. Phase two is expected to start in 2011 and will require approximately 24 months to complete. This phase involves constructing the new interchange and a new bridge over Nipomo Creek to convey traffic between U.S. 101 and Thompson Avenue (LSA 2005 and 2006). Please refer to the attached Habitat Creation, Conservation, and Enhancement Plan (HCCEP) for a more detailed project description (SWCA 2010).

Figure 1. Project Vicinity Map

Figure 2. Project Location Map



This page intentionally left blank.

2.4 JURISDICTIONAL AREAS TO BE IMPACTED BY HABITAT TYPE

LSA Associates prepared a Jurisdictional Delineation Report for the project (LSA 2007). According to the LSA report, the jurisdictional areas to be impacted largely consist of ruderal vegetation, but also include areas supporting freshwater marsh and willow riparian habitats. As proposed, the project would result in 0.0993 acre of impacts (temporary and permanent) to waters of the U.S. and the State. Discussions of the existing habitats observed on-site are included below. Table 1 provides a summary of impacts and proposed mitigation.

Table 1. Impact and Mitigation Summary

Jurisdiction	Permanent Impacts (acres)	Temporary Impacts (acres)	Proposed Mitigation
USACE Wetland (includes CDFG jurisdiction)	0.016	0.041	Restore 0.041 acre and enhance 0.032 acre with native wetland species.
USACE Other Waters (includes CDFG jurisdiction)	0.0003	0.042	Restore 0.042 acre and enhance 0.0006 acre with native riparian species.
Total (acre)	**0.0163**	**0.083**	**0.1156**

2.4.1 Ruderal

Ruderal vegetation is usually found in areas that are altered by construction, landscaping, agriculture, or other land-clearing activities. Ruderal habitats often occur along roadsides and fence-lines, near developments, and other disturbed areas. Plants found within this habitat are typically introduced Mediterranean species. The Nipomo Creek bed and surrounding flood prone areas in the project site largely consist of ruderal vegetation. Species observed in this habitat include bristly ox-tongue (*Picris echiodes*), Italian thistle (*Carduus pycnocephalus*), black mustard (*Brassica nigra*), and sweet fennel (*Foeniculum vulgare*).

2.4.2 Freshwater Marsh

Freshwater marsh communities usually occur in nutrient-rich mineral soils that are saturated or inundated on a seasonal or permanent basis. These communities can occur in areas of slow-moving or stagnant shallow water along streams and drainages, or in areas where the low-permeability of soils results in the prolonged presence of surface water or saturated soils (Holland 1986). Freshwater marsh is often indicative of waters of the U.S. and/or State jurisdictional wetland habitat, both within USACE and CDFG jurisdiction. The freshwater marsh habitat within the project site consist of seasonally wet areas that support yellow umbrella sedge (*Cyperus esculentus*), iris-leaved rush (*Juncus xiphioides*), and narrow-leaved cat-tail (*Typha angustifolia*).

2.4.3 Willow Riparian

Willow riparian scrub consists of scrubby streamside thickets dominated by any of several willow species. Willow riparian scrub occurs on relatively fine-grained sand and gravel bars that are close to groundwater, and at or near the mouths of most perennial and many intermittent streams of the South Coast Ranges (Holland 1986). Willow scrub communities provide habitat for numerous common and rare bird species including fly-catchers, vireos, wrens, and raptors. A small patch of willow riparian habitat is located within the project area. This thicket supports arroyo willow (*Salix lasiolepis*), yellow umbrella sedge, and iris-leaved rush.

3. GOALS OF THE COMPENSATORY MITIGATION PROJECT

The goal of this mitigation project is to ensure that no net loss of wetlands will result from project implementation and to offset anticipated impacts to waters of the U.S and State. This HMMP provides for on-site and in-kind mitigation for temporary impacts at a 1:1 ratio and a 2:1 ratio for permanent impacts. Restoration of temporarily impacted areas will focus on restoring disturbed areas with the appropriate vegetation. Mitigation for permanently impacted jurisdictional areas will be conducted by expanding/enhancing freshwater marsh, willow riparian, and upland vegetation.

3.1 TEMPORARY IMPACT RESTORATION

Temporary impacts to 0.083 acre will result from construction access, staging, and contouring. Such activities will disturb ruderal, freshwater marsh, and riparian scrub habitats. All temporarily impacted areas will be restored by installing freshwater marsh, riparian, and upland species, and removing exotic species to the extent feasible.

3.2 PERMANENT IMPACT MITIGATION

Permanent impacts to 0.0163 acre of jurisdictional areas will result from placement of the new bridge abutments and piers. Permanent impacts will be mitigated by expanding and enhancing 0.0326 acre of freshwater marsh, riparian, and upland vegetation in areas currently dominated by exotic species. The mitigation area will be located directly adjacent to the northwest edge of the new bridge and extend to the County right-of-way. This area will receive mitigation plantings and undergo exotic species removal.

3.3 TARGET IMPROVEMENTS

The goal of this HMMP is to restore and enhance the vegetative structure found within the project area. Due to the small size of the project area, a significant change in functions and values is not anticipated. However, the enhanced vegetative structure will help improve the ability of the site to filter storm water and provide greater wildlife cover and forage areas.

3.4 TIME LAPSE BETWEEN JURISDICTIONAL IMPACTS AND EXPECTED COMPENSATORY MITIGATION SUCCESS

Project construction is proposed to begin in the summer of 2011 and is expected to be completed within two years. Implementation of this HMMP will begin upon completion of all grading within the mitigation and restoration areas. Revegetation is anticipated to occur in the fall and early winter of 2013. The mitigation project is expected to attain the described success criteria within five years of project completion. Table 2 provides the projected schedule for project activities.

Table 2. Estimated Mitigation and Monitoring Schedule

IMPLEMENTATION TASKS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Prepare Planting Areas										X		
Install and Water Plantings										X	X	X
Construction Completion Report												X
FIRST YEAR TASKS	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**
Weeding/Maintenance/Watering		X		X		X		X		X		X
General Site Monitoring	X		X		X		X		X		X	
Biological Monitoring Data Collection												X
Annual Report												X
SECOND YEAR TASKS	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**
Weeding/Maintenance/Watering		X		X		X		X		X		X
General Site Monitoring			X			X			X			X
Biological Monitoring Data Collection												X
Annual Report												X
THIRD YEAR TASKS	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**
Weeding/Maintenance/Watering		X		X		X		X		X		X
General Site Monitoring			X			X			X			X
Biological Monitoring Data Collection												X
Annual Report												X
FOURTH YEAR TASKS	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**
General Site Monitoring			X			X			X			X
Biological Monitoring Data Collection												X
Annual Report												X
FIFTH YEAR TASKS	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**
Site Monitoring				X								X
Biological Monitoring Data Collection												X
Mitigation Completion Report												X

4. MITIGATION AND RESTORATION IMPLEMENTATION PLAN

Implementation of the restoration and mitigation activities will be conducted or overseen by a County restoration specialist. The County's restoration specialist will utilize the project site plan (refer to Figure 3) and appropriate project grading plans when staking the revegetation areas and detailing plant locations. The restoration specialist will oversee all site preparation, plant salvage, and plant installation, and will ensure conformity with this HMMP.

4.1 PLANT SALVAGE

The freshwater marsh species to be used for the restoration project currently occupy the site and are locally adapted to the site conditions. To the extent feasible, these plant materials will be salvaged from the anticipated impact areas prior to initial disturbances.

Prior to site grading or bridge demolition activities, the restoration biologist will salvage the iris-leaved rush and other Juncus species located in the impact area. These species respond well when divided and can be grown in containers. The species' favorable response to division and local adaptations will help provide for an increased success rate among the restoration plantings. The salvaged plant materials will be placed in pots immediately after removing them from the ground, transferred to a holding area, and maintained until they are ready for reintroduction into the restoration areas. Juncus salvage activities will be conducted pursuant to the following guidelines:

- Available Juncus materials, including cuttings, divisions, and plugs, may be collected from adjacent drainage and wetland areas within the County right-of-way.
- Collection will occur from healthy populations, and no more than 20 percent of individual plants will be removed from any area located outside of the impact area.
- Material should be excavated by hand.
- All implementation of planting/collecting efforts will be overseen in the field by the restoration specialist.

The restoration specialist will attempt to salvage and divide enough plantings to implement the restoration program; however, salvaging enough Juncus to fulfill all planting requirements may be difficult. If salvaging and dividing enough materials is not feasible, the County may purchase additional materials from reputable nursery.

In addition to Juncus species, the restoration specialist will obtain willow stakes from the adjacent willow thicket for inclusion into the restoration areas. Willow cuttings will be installed immediately following their collection. All willow collection activities will be conducted pursuant to the following guidelines:

- Willow stakes will be installed within 24 hours of collection. Cuts will be made with sharp, clean tools. Willow stakes will be reasonably straight, 18 to 36 inches in length, and not less than 5/8 inches in diameter at the base of the cutting.
- The top of each willow cutting will be cut square above a leaf bud, and the base of each willow cutting will be cut below a leaf bud at an approximately 45 degree angle.
- Willow cuttings will have all leaves and branches trimmed off flush with the stem.

4.2 SITE PREPARATION

Site preparation for the proposed mitigation project will consist of a mixed effort that utilizes both on-site construction equipment and small hand tools. Areas that are physically impacted by bridge construction activities will be mechanically shaped by construction equipment to achieve the desired topography. After the desired topography is achieved, small hand tools will be used to facilitate the installation of the restoration plantings. Areas that are not physically impacted by construction activities will be cleared of non-native vegetation prior to planting.

Areas that are comprised of erodible substrates will be top-dressed prior to planting. Prior to planting and seed application, the soil surface will be track-walked and covered with an appropriate erosion control blanket. The erosion control blanket must be constructed of biodegradable materials and must not include monofilament netting or other non-biodegradable fibers.

4.3 PLANTING PLAN

This planting plan will enhance and restore native freshwater marsh, willow riparian and upland habitats. A planting detail is included in Figure 3. The planting plan divides these habitats into the following three planting zones, based on the hydrologic characteristics of the site: Zone 1 will include seasonal freshwater marsh species, Zone 2 will include transitional riparian species, and Zone 3 will include upland species.

4.3.1 Zone 1 Seasonal Freshwater Marsh

Zone 1 will be located within and directly adjacent to the flow line of the creek and will be planted with obligate and facultative wet species. This area conveys seasonal flows and maintains moist soils into the summer months, but appears to dry out later in the season. These conditions will support hardy perennial species such as iris-leaved rush, common rush (*Juncus effusus*), and California dock (*Rumex salicifolius*). As discussed in Section 4.1, the Juncus species currently occupy the site and will be salvaged from the impact area to the extent feasible.

Table 3. Zone 1 Plant List

Common Name	*Scientific Name*	Comment
common rush	*Juncus effusus*	Plant spacing will depend on the size of the container stock used; however, should be approximately two feet on-center.
California dock	*Rumex salicifolius*	
iris-leaved rush	*Juncus xiphioides*	

4.3.2 Zone 2 Transitional Riparian

Zone 2 will include facultative and riparian species including arroyo willow, creeping wild-rye (*Leymus triticoides*), and giant wild rye (*Leymus condensatus*). These species will be planted at the toe of the bank slope and the flood prone areas located on the northern and southern sides of the creek channel. The soil in these areas are moist or saturated in the winter and spring months and dry in the summer and fall. The species chosen for this zone are adapted to the fluctuating soil moisture content.

Table 4. Zone 2 Plant List

Common Name	*Scientific Name*	Material	Comment
arroyo willow	*Salix lasiolepis*	Stakes	Willow stakes will be placed at 20 feet on-center directly adjacent to the creek bed. Creeping wild-rye will be massed and placed four feet on center. Giant wild-rye will be sporadically distributed through the zone.
creeping wild-rye	*Leymus triticoides*	Container	
giant wild rye	*Leymus condensatus*	Container	

4.3.3 Zone 3 Upland

Coast live oak (*Quercus agrifolia*), Nipomo Mesa ceanothus (*Ceanothus impressus* var. *nipomoensis*), and California coffeeberry (*Rhamnus californica*) will be planted in Zone 3. These upland species are suitable for dry soil conditions located on the southern bank of the creek. All of the Zone 3 plant materials will be grown from seeds collected in and adjacent to the project area. Coast live oak and California coffeeberry seeds can be collected from the project impact area. Nipomo Mesa ceanothus seed may need to be collected from the maritime chaparral areas located near the new U.S. 101 interchange impact area. The new U.S. 101 interchange area supports Nipomo Mesa ceanothus that can be used as a seed source.

Table 5. Zone 3 Plant List

Common Name	*Scientific Name*	Material	Comment
California coffeeberry	*Rhamnus californica*	10 feet on-center	Planted in random distribution (not rows). Spacing is provided to assist in developing a materials inventory. These species should be distributed in a patchy mosaic that emulates natural distribution.
coast live oak	*Quercus agrifolia*	20 feet on-center	
Nipomo Mesa ceanothus	*Ceanothus impressus* var. *nipomoensis*	5 feet on-center	

Figure 3. Project Site Map

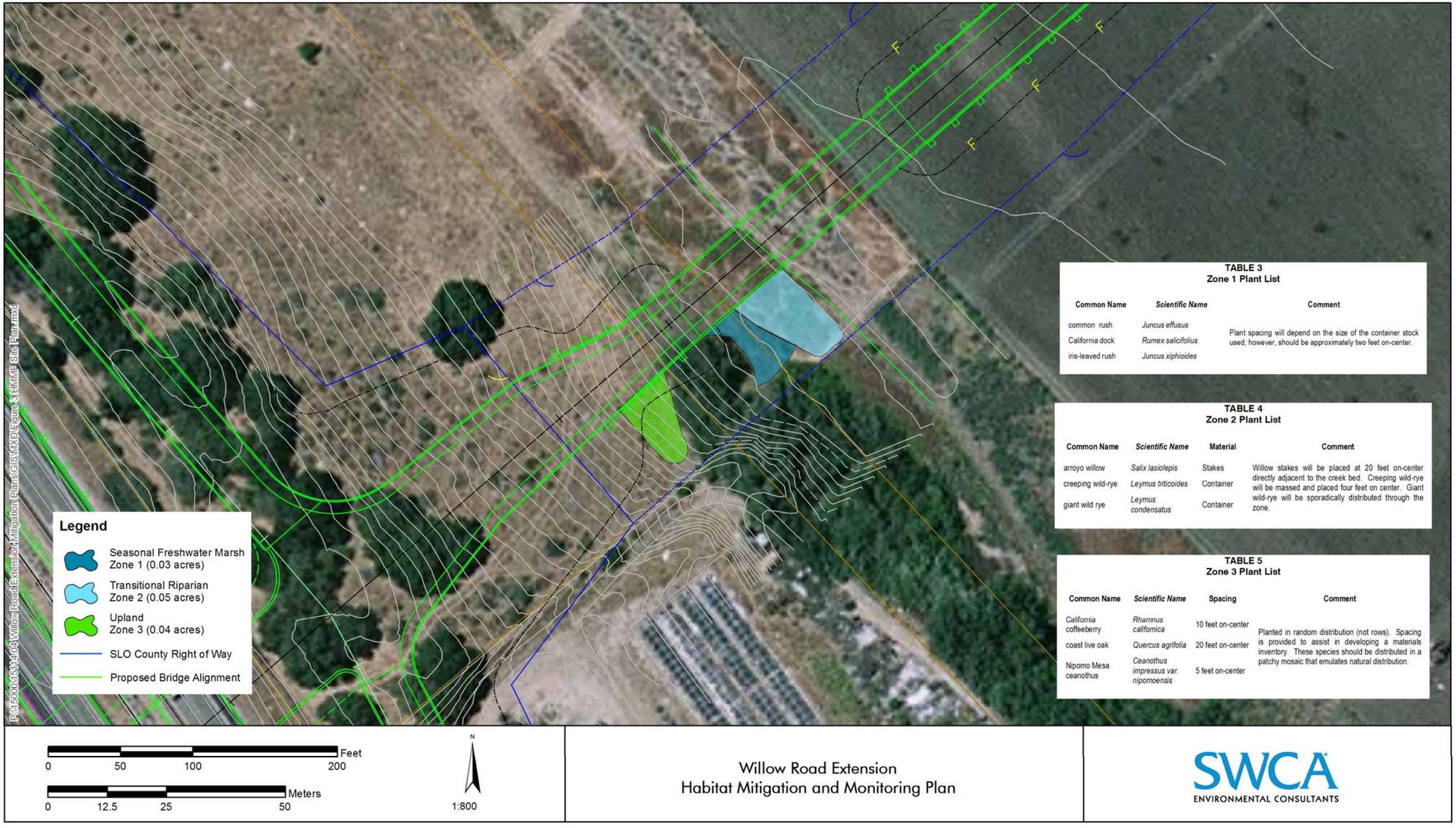


TABLE 3
Zone 1 Plant List

Common Name	*Scientific Name*	Comment
common rush	*Juncus effusus*	Plant spacing will depend on the size of the container stock used; however, should be approximately two feet on-center.
California dock	*Rumex salicifolius*	
iris-leaved rush	*Juncus xiphioides*	

TABLE 4
Zone 2 Plant List

Common Name	*Scientific Name*	Material	Comment
arroyo willow	*Salix lasiolepis*	Stakes	Willow stakes will be placed at 20 feet on-center directly adjacent to the creek bed. Creeping wild-rye will be massed and placed four feet on center. Giant wild-rye will be sporadically distributed through the zone.
creeping wild-rye	*Leymus triticoides*	Container	
giant wild rye	*Leymus condensatus*	Container	

TABLE 5
Zone 3 Plant List

Common Name	*Scientific Name*	Spacing	Comment
California coffeeberry	*Rhamnus californica*	10 feet on-center	Planted in random distribution (not rows). Spacing is provided to assist in developing a materials inventory. These species should be distributed in a patchy mosaic that emulates natural distribution.
coast live oak	*Quercus agrifolia*	20 feet on-center	
Nipomo Mesa ceanothus	*Ceanothus impressus var. nipomoensis*	5 feet on-center	

This page intentionally left blank.

Upland areas that are temporarily disturbed by project activities will be hydro-seeded with a native seed mix. The seed will be applied following completion of finish grading and immediately prior to the first rain of the season. The seed mix should be purchased from a reputable distributor and is provided below.

- California sagebrush (*Artemisia californica*)
- golden yarrow (*Eriophyllum confertiflorum*)
- black sage (*Salvia mellifera*)
- sticky monkey flower (*Mimulus aurantiacus*)
- deerweed (*Lotus scoparius*)
- California buckwheat (*Eriogonum fasciculatum*)
- meadow barley (*Hordeum brachyantherum*)
- purple needlegrass (*Nassela pulchra*)
- California fescue (*Vulpia microstachys*)
- California poppy (Eschscholzia californica)

4.4 IRRIGATION PLAN

The natural water source for the project site is Nipomo Creek. Supplemental water will be supplied to planted materials during the three-year maintenance period via drip irrigation. The drip irrigation system will be installed as part of the bridge project. Water supply for the irrigation system will be delivered by water truck. The County restoration specialist will connect the County-owned water truck to the irrigation system and the truck will pump the water to the plantings. The need for supplemental water applications will be determined by the restoration specialist based on weather patterns and soil moisture.

4.5 AS-BUILT CONDITIONS

Within 45 days of HMMP implementation, an as-built planting plan will be prepared and submitted to the USACE. The plan will illustrate the final construction of the restoration areas, showing planting locations and any modifications to this HMMP. Other than remedial plantings, there will be no deviation from the as-built planting plan without written USACE approval.

5. MAINTENANCE PLAN

Maintenance during plant establishment is necessary to ensure success of the mitigation effort. The maintenance period will begin immediately upon completion of the mitigation planting and will continue through the first three years of the program (refer to Table 2). Maintenance activities should be conducted every other month, or on an as needed basis directed by the restoration specialist. At the end of three years, the restoration specialist will evaluate the site conditions and determine if the maintenance period is complete or needs to be extended.

The maintenance program will ensure that watering of installed plants, weed control, debris removal, vandalism control, replanting, plant and site protection are performed adequately. The County will be responsible for site maintenance during the three-year maintenance period.

5.1 WATERING

Supplemental water will be supplied on an as needed basis until the restoration specialist determines that the plantings are self sustaining. Supplemental water will be supplied by drip irrigation. All

supplemental watering will be performed in a manner that ensures deep penetration of water to the soil around the plant roots.

5.2 WEED CONTROL AND HERBICIDE USE

Weed control will be conducted to minimize competition from exotic plants. Exotic species will be removed during grading activities; however, additional weed abatement will be required during the maintenance period. Weeds will be removed by hand or herbicide applications. If herbicide applications are necessary, they will be conducted by an individual holding a valid Qualified Applicators License. The Qualified Applicator must use herbicides that are approved for use in and adjacent to aquatic areas (i.e. Rodeo or similar). Exotic plant species to be targeted for removal include, but are not limited to, veldt grass (*Ehrharta calycina*), bristly ox-tongue (*Picris echiodes*), Italian thistle (*Carduus pycnocephalus*), and sweet fennel (*Foeniculum vulgare*).

5.3 DEBRIS REMOVAL AND VANDALISM

Removal of trash and litter will occur on a regular basis during the maintenance period. Non-fruiting organic debris created from hand removal of weeds may be left on-site if it will not significantly impact the establishment of the plantings. However, noxious weed debris will be disposed of off-site to avoid further invasions of the exotic species.

Due to the sites proximity to U.S. 101, vandalism may be a problem. If vandalism occurs and plants are removed or trampled, the project applicant will replace the vandalized plants and take appropriate actions to prohibit further vandalism. As such, incidents shall be recorded and reported to regulatory agencies within the annual reports to be produced per this HMMP.

5.4 REPLANTING

The County's restoration specialist will adjust specific replanting requirements if needed, including species, quantities, and schedules. Species selection will be consistent with those currently occupying the immediate area and at the direction of the restoration specialist. Any replanted vegetation will be monitored until the restoration specialist determines that the plantings are self-sustaining.

6. MONITORING PLAN

In order to accomplish project goals, a monitoring program will provide both quantitative and qualitative data to be used to determine the success of the mitigation project. The restoration biologist will collect and evaluate data indicating the relationship between actual site conditions and established performance criteria. The data will be presented in annual reports that include photo-documentation and evaluate whether or not the annual performance goals for the year were met. All monitoring shall be conducted by a restoration specialist with documented experience preparing mitigation restoration monitoring reports.

6.1 MONITORING SCHEDULE

The five-year monitoring program will consist of general monitoring visits and annual biological data collection visits. The County's restoration specialist will perform general monitoring site visits every other month during the first year of the program; quarterly for the second, third, and fourth years of the program; and semi-annually in the fifth year (refer to Table 2). General monitoring visits can be conducted concurrently with maintenance visits. The focus of general monitoring visits is to assess the plantings need for water, or other maintenance related issues. General monitoring visits should be conducted directly following storm events to determine if the plantings were damaged by the event.

The restoration specialist will perform biological monitoring data collection annually throughout the five-year monitoring program. The focus of the biological monitoring visits is to collect quantitative data that will provide an assessment of the site's vegetative cover, success rates, and overall vigor.

6.2 ANNUAL PERFORMANCE STANDARDS AND SUCCESS CRITERIA

According to the USACE *Final Rule for Compensatory Mitigation for Losses of Aquatic Resources* (April 10, 2008), HMMPs must include ecologically based success criteria. This HMMP includes annual performance standards to ensure a successful mitigation effort (refer to Table 6). The performance standards are based on the vegetative structure found on-site prior to construction related disturbances. Since the site is dominated by non-native species and surrounded by non-native species, the final success criteria will be based on the existing conditions of undisturbed areas located directly adjacent to the restoration areas.

The mitigation areas will be monitored for five years or longer, as necessary, until the final success criteria are met. It is anticipated that by the fifth year, the site will be self-sustaining for the long-term. At the end of the five-year monitoring period, the site will be evaluated to determine if the success criteria have been met. If the program is determined to be unsuccessful, the restoration specialist will recommend appropriate contingency measures. The mitigation site will not be considered successful until USACE has provided written verification that the final success criteria have been met.

Table 6. Annual Performance Standards

Performance Standards	Year 1	Year 2	Year 3	Year 4	Year 5
*Total Percent of Native Cover (no less than what is observed adjacent to the site)	30%	40%	50%	55%	60%
Average Vigor Rating (refer to Section 6.3.1)	1,2	1,2	1,2	1,2	1,2
**Percent of Non-Native Cover (excluding annual grasses; no greater than what is observed adjacent to the site)	<60%	<60%	<45%	<35%	<35%
Plant Survival	90%	85%	80%	80%	80%

Notes:

- The mitigation site must be self-sustaining (i.e., no maintenance or artificial irrigation) for a minimum of two years to be considered successful.
- Nursery stock plant survivorship may include original plantings, remedial plantings, or volunteers.
- Any remedial plantings will be monitored until the restoration specialist determines that they are self sustaining.

*The final goal for percent cover of native vegetation is 60%. If 60% cover of native vegetation can not be achieved, the restoration specialist can adjust the final success criteria to be at least equal to the percent cover of native vegetation found in areas adjacent to the site.

**Percent non-native cover calculations exclude non-native annual grasses; however, includes non-native perennial grasses. The final goal for percent non-native cover is less than 35% (excluding annual grasses). If achieving 35% non-native cover in the restoration areas is not feasible, the restoration specialist can adjust the final success criteria to be no greater than the non-native vegetation percent cover found in areas adjacent to the site.

6.3 BIOLOGICAL MONITORING PROGRAM

Biological attributes of the mitigation and restoration areas will be monitored annually for five years following plant installation or until the USACE agree that mitigation is complete. Annual monitoring visits will be conducted in the late fall or winter of each year. The objective of the monitoring program is to ensure that the mitigation efforts achieve the established performance standards. In order to achieve this evaluation, the mitigation area will be assessed for plant survivorship, vigor, and percent cover.

6.3.1 Plant Vigor and Survival

Plant vigor and survival will be monitored annually for five years following plant installation. Plant vigor will be measured as follows:

- 1 = excellent – vigorous healthy plant (no necrotic or chlorotic leaves)
- 2 = good – plant healthy with limited signs of vigorous growth
- 3 = adequate – plant healthy with no signs of vigorous growth and some necrosis or other damage present
- 4 = poor – low vitality, or main stem dead but basal sprouts emerging
- 5 = dead – no evidence of recovery

Plant survival calculations will be based on the number of individual plants installed. Percent survival will be obtained by counting the number of surviving plants and dividing the result by the number of plants installed (initial and remedial installations). Volunteer plants will be counted if they are the same species as the planted vegetation. Consequently, this calculation method can result in a survival rate greater than 100 percent. A plant is considered "surviving" if at least half of the foliage (or stem if deciduous) is green and flexible (vigor of 1 through 4). Since many of the species to be installed are rhizomatous, there is a potential that survivability counts will not be feasible after the plantings begin to trail. In this situation, percent cover calculations will supersede the survival rate.

6.3.2 Percent Cover

Percent cover of native and non-native species will be obtained annually throughout the five year monitoring program. Percent cover calculations must be determined by a documented vegetation monitoring method such as Daubenmire, Braun-Blanquet, line-intercept, or similar. The percent cover calculations will be utilized to determine the success of the restoration project.

For the project to be considered successful, at the end of five years, native plant species should provide at least 60% cover; and the percent cover of non-native species (excluding annual grasses) should not exceed 35%. Areas directly adjacent to the proposed restoration area are dominated by non-native species. These areas are a source of non-native seed dispersal that will likely be deposited in the restoration area. If at the end of the five year program, it is evident that the non-native cover can not be kept below 35% or the native cover at 60%, the success criteria can be adjusted to commensurate with the percent cover found in areas directly adjacent to restoration area. For example, if the percent cover of non-native vegetation adjacent to the restoration area is 50% (excluding annual grasses) then the final success criteria for the restoration areas can be adjusted to be less than 50%. The restoration program will not be considered successful if the non-native percent cover in the restoration area exceeds that of the adjacent areas. Likewise, the restoration program will not be considered successful if native vegetation in the restoration area provides less coverage than native vegetation in the adjacent areas.

6.3.3 Other Attributes to Monitor

Another important monitoring activity is to detect the presence and advance of invasive plant species, such as introduced pioneer species commonly found on disturbed seasonally-wet areas. Monitoring activities will determine the presence of such species and if action is required to control their advance.

All wildlife observed in and around the mitigation areas will be documented as to species, number, and functional use of habitat (e.g., feeding, nesting, roosting, etc.). Observations of the general habitat quality will be documented in the annual report.

Permanent photo points will be established throughout the mitigation site to assist in tracking the success of the mitigation program. Permanent photo points will be established during the preparation of the as-built planting plan, and ground view photos will be taken during each monitoring year from the same vantage point.

6.4 REPORTING REQUIREMENTS

The various regulatory agencies having discretionary approval over the bridge project have different reporting requirements for the revegetation efforts. The County will ensure that the appropriate agencies receive the required reports on a timely basis. Although permits have yet to be obtained for the project, the following reporting requirements are anticipated.

6.4.1 United States Army Corps of Engineers

Monitoring reports will be prepared annually during the five-year monitoring period. The County will be responsible for ensuring that monitoring reports are submitted to the USACE on the required basis. Annual reports must be prepared by the restoration specialist, and be submitted to the USACE by December 31st of each year. The annual reports shall be written pursuant to the USACE Mitigation Monitoring Guidelines requirements (refer to Attachment B).

6.4.2 California Department of Fish and Game

The County is responsible for preparing and submitting annual reports to CDFG within 30 days of the end of each calendar year for five years. The reports must include photo documentation and detail the progression of the revegetation efforts.

6.4.3 Regional Water Quality Control Board

Typically, RWQCB water quality certifications require submittal of three reports pertaining to a project. The first report would document the completion of the construction efforts including revegetation activities. This report must be submitted within 30 days of project completion and include a summary of daily activities, monitoring observations, problems incurred, and actions taken. The second and third reports must be submitted annually by December 31st of the second and third monitoring years. The annual reports must quantify growth and progress of the restoration plantings to determine if the performance criteria have been met. All three of the required reports must include photographs that document the revegetation progress over time.

7. COMPLETION OF COMPENSATORY MITIGATION

7.1 NOTIFICATION OF COMPLETION

The County will notify the USACE, CDFG, and RWQCB in writing upon completion of the monitoring period and attainment of the success criteria. At the end of the five-year monitoring period, the restoration specialist will submit a final monitoring report requesting agency verification that the final success criteria have been met. Following receipt of the final monitoring report, the County understands that the agencies may request a site visit to confirm the completion of the compensatory mitigation effort. The compensatory mitigation will not be considered complete without an on-site inspection by an agency representative or written confirmation that approved success criteria have been achieved.

8. CONTINGENCY MEASURES

If it becomes apparent that the on-site mitigation will not attain the final success criteria within the five-year time frame, the County will begin an assessment of reasons for failure, and will work with the USACE to determine an acceptable solution. If the site trends indicate that the success criteria will eventually be met in a longer timeframe than anticipated, maintenance and monitoring will continue until the criteria have been satisfied. If replanting is determined to be necessary, the replanted areas will be monitored and maintained for a period of five years from the date of planting, or for a period agreeable to the USACE. Any species substitutions proposed for contingency planting due to low survival of originally planted species must be approved in writing by the USACE. The mitigation site should be self-sustaining (i.e., no maintenance or artificial irrigation) for a period of two years to be considered successful. If a total site failure is evident, the USACE will determine what alternative compensatory mitigation will be required. Should this occur, identification of an alternative mitigation site may be necessary. No alternative locations for contingency compensatory mitigation are identified at this time. If a total site failure is evident, the County will consult with USACE to locate an alternative location for contingency mitigation activities.

9. REFERENCES

Emery, Dara (Emery, 1988). Seed Propagation of Native California Plants. Santa Barbara Botanic Garden.

Hickman, J. Ed. 1993. The Jepson Manual: Higher Plants of California. University of California Press. Berkeley, California.

Holland, Robert F. 1986. Preliminary Descriptions of the Terrestrial Natural Communities of California. California Department of Fish and Game. Sacramento, California.

Hoover, Robert F. 1970. The Vascular Plants of San Luis Obispo County, California. University of California Press. Berkeley, California.

LSA Associates June 2005. (LSA, 2005). Biological Assessment Willow Road/US 101 Interchange in the Community of Nipomo, San Luis Obispo California.

LSA Associates, April 2006 (LSA, 2006). Final Supplemental Environmental Impact Report Willow Road Extension/US 101 Interchange.

LSA Associates, May 2007 (LSA, 2007). Delineation of Wetlands and Jurisdictional Waters Subject to U.S Army Corps of Engineers and California Department of Fish and Game Regulatory Authority.

SWCA Environmental Consultants (SWCA, 2009). Draft Willow Road/U.S. 101 Interchange Habitat Creation, Conservation, and Enhancement Plan.

U.S. Department of Agriculture (NRCS 1996). Sampling Vegetation Attributes an interagency technical reference; published in 1996 by the Cooperative Extension Service, U.S. Department of Agriculture, Natural Resource Conservation Service, Grazing Land Technology Institute, and U.S. Department of the Interior

This page intentionally left blank.

Attachment A.
Photo Documentation

PHOTO 1:

Representative view of the existing conditions in the seasonal freshwater marsh and riparian planting areas.

Photo taken May 20, 2009.

PHOTO 2:

Representative view of existing conditions within the riparian planting areas.

Photo taken May 20, 2009.

PHOTO 3:

View looking across the riparian planting area towards the upland planting area.

Photo taken May 20, 2009.

PHOTO DOCUMENTATION

PHOTO DOCUMENTATION

Attachment B. Monitoring Report Guidelines

U.S. Army Corps of Engineers
Mitigation and Monitoring Requirements

The required compensatory mitigation monitoring reports shall be a minimum of six pages and a maximum of eight pages. The following information shall be included within the report of the specific pages described below:

Pages 1-2:

A. Project Information
   1. Project Name.
   2. Applicant name, address, and phone number.
   3. Consultant name, address, and phone number (for permit application, if necessary).
   4. Corps permit file number.
   5. Acres of impact and type(s) of habitat impacted (or proposed for impact)
   6. Date project construction commenced (or proposed to begin).
   7. Location of the project and directions to site (including latitude/longitude or UTM coordinates).
   8. Date of the report and the corresponding permit conditions pertaining to the compensatory mitigation.
   9. Amount and information on any required performance bond or surety.

B. Compensatory Mitigation Site Information
   1. Location and directions to the site (including latitude/longitude or UTM coordinates).
   2. Size and type(s) of habitat existing at the site and proposed for restoration, enhancement, and/or creation.
   3. Stated purpose/goals for the compensatory mitigation site.
   4. Date site construction and planting completed.
   5. dates of previous maintenance and monitoring visits.
   6. Name, address, and contact number of responsible agent for the site.
   7. Name, address, and contact number for designer.

C. Brief Summary of Remedial Actions(s) and Maintenance of the Compensatory Mitigation Site

Page 2 or 3:

A. Map of the compensatory mitigation site
   1. 8 ½ Diagram of the site including:
      a. Habitat types (as constructed).
      b. Locations of photographic record stations.
      c. Landmarks
      d. Inset defining location of the site.

Page 3 or 4:

A. List of Corps-approved success criteria.

B. Table of results from the monitoring visits versus performance standards for specified target dates.

Page 4, 5, and/or 6:

A. Photographic record of the site during most recent monitoring visit at record stations (at least four photos on at least one page, no more than two pages).

Page 5, 6, or 7:

A. Summary of field data taken to determine compliance with performance criteria. At least one page, no more than two pages.

Page 6, 7, 8 (if needed):

A. Summary of any significant events that occurred on the site that may affect ultimate compensatory mitigation success.

The completed monitoring reports shall be submitted unbound to the Corps for inclusion into the official case file. Electronic copies of these reports can be submitted in lieu of written reports and may be required in the future.