Habitat Restoration Plan & Non-Native Plant Removal Guidelines

Otay Valley Regional Park

County of San Diego, City of San Diego, & City of Chula Vista, California

Prepared For:

County of San Diego
Department of Parks and Recreation

5201 Ruffin Road, Suite P
San Diego, CA 92123

July 2006

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5201 Ruffin Road, Suite P
San Diego, CA 92123

Prepared by

HDR Engineering, Inc.
8690 Balboa Avenue, Suite 200
San Diego, CA 92123

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EXECUTIVE SUMMARY

The County of San Diego Department of Parks and Recreation (DPR) in coordination with the Cities of Chula Vista and San Diego have prepared the Habitat Restoration Plan & Non-native Plant Removal Guidelines (Plan). The goals of the plan are to 1) remove populations of non-native vegetation and 2) to manage and minimize the expansion of non-native species with in the Otay Valley Regional Park (OVRP).

The OVRP is an 11-mile long Park of over 8,500 acres, located in southern San Diego County. The Park extends from the southeastern end of the salt ponds at the mouth of the Otay River, through the Otay River Valley to the land surrounding both the Upper and Lower Otay Reservoirs. Since the OVRP is located in the jurisdiction of the County of San Diego, the City of San Diego, and the City of Chula Vista, those jurisdictions have entered into a Joint Exercise of Powers Agreement (JEPA) to plan and manage the OVRP.

This Plan is subject to the California Environmental Quality Act and a Mitigated Negative Declaration (MND) shall be prepared for implementation of the Plan. In addition, the projects implemented under this plan could require additional environmental compliance measures as described herein.

The Plan was written to conform to the Otay River Watershed Management Plan, local NCCP plans, and other planning and regulatory documents. The Plan includes guidelines on control and management strategies for the removal of non-native species. These are only guidelines and are subject to change as the technology improves.

The implementation of the plan is expected to be undertaken by all three jurisdictions. The plan is written with the flexibility to allow each of the jurisdictions to use their regulatory authority to approve projects undertaken within their jurisdiction. The document describes the basic requirements for any proposed project then splits the projects into one of two categories: 1) Projects less than five acres and 2) Projects of five acres or greater. There needs to be some basic requirements for restoration projects. There are 6 basic requirements for any proposed project:

- Designated Project Manager or Project Point-of-Contact
- Project Biologist
- Cultural Resource Specialist *
- Qualified Herbicide/Pesticide Applicator **
- Verification of Jurisdictional Compliance
- Verification of Resource Agency Notification***

These requirements are needed to ensure the project proponent (regardless of their intent) does not have an impact on the environment and to project the jurisdiction with the land use authority to oversee and approve the project. The document leaves the process open so that as long as the jurisdiction and Resource Agencies responsible for the project approval determine these requirements have been met, the jurisdiction with land use authority can approve the project.

* A Cultural Resource Specialist would be a requirement if 1) the project proposed ground disturbing activities and/or 2) the project was located within or adjacent to a recorded site.

** A qualified herbicide/pesticide applicator would be required only if the project proposed the use of herbicides or pesticides.

*** Resource Agency Notification is only required if the project proposes impacts to jurisdictional wetlands or non-wetland waters.

1.0 INTRODUCTION AND BACKGROUND

This section provides an introduction to the project as well as background information on the Otay Valley Regional Park (OVRP).

1.1 INTRODUCTION

The purpose of the OVRP - Habitat Restoration Plan and Non-Native Plant Removal Guidelines (Plan) is to provide a universal set of guidelines for habitat restoration and/or enhancement for each of the jurisdictions (County of San Diego, City of San Diego, and City of Chula Vista) that are party to the Joint Exercise of Powers Agreement (JEPA) for the OVRP. This Plan is not expected to replace, or supersede, any local regulations but to act as a set of overall guidelines for proposed habitat restoration and/or enhancement activities within the OVRP boundaries. The types of restoration or enhancement activities anticipated with this Plan include mitigation and non-mitigation for: wetland restoration; non-native plant removal; and upland restoration; complying with the rules and regulations governing cultural resources and surrounding land uses.

This Plan will be subject to the California Environmental Quality Act (CEQA) process. The parties of the JEPA will determine who will be the lead agency. At the time of report preparation, it is anticipated that a Mitigated Negative Declaration (MND) will be prepared for the implementation of this plan as a project under CEQA. However, if unmitigable significant impacts are identified during the Initial Study process, an Environmental Impact Report (EIR) will be prepared.

Goals

The main goals of this Plan are to remove populations of non-native vegetation and to manage and minimize the expansion of non-native vegetation within the OVRP. To meet these goals the following elements will be accomplished by this Plan:

- **Goal 1: Remove Populations of Non-native Vegetation**

Map Non-Native Species and Vegetation Communities Within the OVRP

HDR prepared vegetation maps in April 2005 concurrent with the preparation of this Plan to guide non-native vegetation removal and habitat restoration activities. These maps extend from the western end of the OVRP, and cover the entire OVRP including the areas surrounding the Otay Lakes. The maps show the locations and areas of non-native vegetation as well as the native habitats within the OVRP.

- **Goal 2: Manage and Minimize the Expansion of Non-Native Species**

Produce a Plan for the Non-native Plant Removal and Habitat Restoration Within the OVRP

This Plan will serve as a tool for future management of non-native plant species within the OVRP. This Plan will supply a set of guidelines, consistent with other local planning documents, for the removal of non-native plants and the restoration/enhancement of native vegetation within the OVRP. This Plan will describe: a strategy for prioritizing individual project areas; methodologies for specific species removal; plant palettes for replanting; and long term maintenance of native plant species and restored habitats within the OVRP.

1.2 BACKGROUND

Park Administration

The OVRP is an 11-mile long Park of over 8,500 acres, located in southern San Diego County. The Park extends from the southeastern end of the salt ponds at the mouth of the Otay River, through the Otay River Valley, to the land surrounding both Lower and Upper Otay Reservoirs (Figure 1-1). The OVRP encompasses three jurisdictions: the County of San Diego, the City of San Diego, and the City of Chula

Vista. Land ownership within the Park is a mixture of private, semi-private and public, and the current land use is primarily open space within the OVRP boundaries.

Since the OVRP is a multi-jurisdictional effort by the County of San Diego, City of San Diego, and the City of Chula Vista, there needed to be a formal agreement between the jurisdictions regarding park management and operations. In 1990, the jurisdictions entered into the first Joint Exercise of Powers Agreement (JEPA) to coordinate planning, acquisition, and design for the OVRP. This agreement established a three-member Policy Committee (PC) of elected officials and a 30-member Citizens Advisory Committee (CAC). The CAC also advices the policy committee on land use matters within the Park area. CAC membership traditionally represents community organizations, property owners, developers, businesses, residents, and recreation and environmental interest groups.

In 2005, the original JEPA documents were rescinded and a new set of governing documents were presented and approved by each jurisdiction, or JEPA party. The original framework of the PC and CAC all stay in place as originally intended.

Additionally, staff from each jurisdiction continues to work together on the Park planning efforts. This joint effort provides technical Park planning support and administrative assistance to the PC as well as the CAC. The County of San Diego has the lead for administrative responsibilities and maintains the records for the JEPA. Currently, each local jurisdiction is responsible for maintaining their respective active recreation areas, and the City of San Diego has the responsibility of maintaining the open space areas within Western OVRP.

Setting

The OVRP is approximately 8,500 acres of the overall 92,920 acres of the Otay River watershed. The watershed is situated between the Sweetwater River watershed to the north and the Tijuana River watershed to the south. The Otay River watershed is characterized by a low-elevation coastal plain that rises gradually to steep mountainous areas inland. Elevations within the watershed range from sea level at its western extent to approximately 3,740 feet at Lyons Peak in the northeast corner of the watershed. The uplands to the east are cut by southwesterly trending canyons that open onto an alluvial plain. Located along the drainages on the alluvial plain are a series of fluvial terraces composed of coarse channel deposits. The alluvial plain thins to the west as marine deposits that are partially covered by younger alluvial fan deposits appear.

The OVRP boundaries are from the eastern edge of the salt ponds at the coast to the areas surrounding the Otay Lakes. The OVRP can be characterized by three distinct areas. These areas are: from the edge of the salt ponds at the shoreline to Heritage Road (Area 1); east of Heritage Road to Otay Lakes (Area 2); and the area surrounding Otay Lakes (Area 3) (Figure 1-2). Area 1 is characterized by commercial, industrial, and residential development. Area 2 is characterized by open space and agricultural areas, and spreads out to incorporate habitat in tributary finger canyons as well as areas designated as part of the Otay Ranch Preserve. Area 3 is characterized as the areas around both the upper and lower Otay Lakes.

Climate

The regional climate in the Otay River area is classified as Mediterranean, with warm, dry summers and mild, wet winters. Precipitation averages range from approximately 10 inches (in) along the coast to approximately 18 in. in the eastern mountains with low to high intensity storms occurring mostly in the winter and spring. Frosts are light and infrequent, with the growing season ranging from 345 to 360 days, depending on distance from the ocean. The average annual temperature is about 63 ºF (17.2 ºC), with an average daily high of 71ºF (21.7ºC) and an average daily low of 53ºF (11.7ºC).

Figure 1-1 Regional Vicinity Map

Figure 1-2 OVRP Project Phases

The major influences on the regional climate are the Eastern Pacific High, a strong persistent anticyclone, and the moderating effects of the cool Pacific Ocean (U.S. Army Corps of Engineers 1998). During the summer, the Eastern Pacific High dominates the Eastern Pacific Ocean, creating fair weather and producing a temperature inversion. Thermal low-pressure systems that typically develop over the inland deserts draw cool marine air onto the land, moderating the daytime temperatures. This marine air frequently condenses into fog and stratus clouds below the inversion layer during the evening but dissipates during the following day as the land mass warms. Summer precipitation associated with tropical air masses is generally infrequent and light.

During winter and spring, polar storm systems pass through the region as the Eastern Pacific High weakens and shifts south. Most regional precipitation occurs during this period. Excessive rainfall can occur when the jet stream maintains a position over southern California and carries multiple storms across the region. Moderate to major flooding events for this region typically occur December to March and have been documented for the following years during the 20th century: 1906, 1916, 1921, 1927, 1937, 1938, 1969, 1978, 1980, 1983, 1993, 1995, 1998, and 2005. The worst flooding observed in the Otay River watershed occurred in 1916, when catastrophic flooding beyond the level of a 100-year flood burst the Otay Reservoir Dam, destroying all structures and killing several people in the valley below.

A strong east to northeastern wind, known as the "Santa Ana Winds," begins throughout southern California in the fall and can occur at any time throughout the winter months. These "Santa Ana Winds" carry warm dry air from the deserts to the coast, dramatically increasing temperatures and decreasing relative humidity levels.

History

The Otay River Valley contains a rich history of human occupation and resource use. The watershed is located in the southwestern portion of San Diego County within the historical territory of the Kumeyaay. Prior to European contact, Kumeyaay territory may have extended as far north as the San Luis Rey River. To the north of the Kumeyaay lived the Takic-speaking Luiseño and Cahuilla, and to the east and south were other inhabitants who spoke a variety of distinct languages belonging to the Yuman language family (Loumala 1978).

The Kumeyaay have been known by and referred to as the Diegueño. The standard practice during the Spanish colonial era in California was to name all native people within the sphere of influences of a particular mission district after that mission; hence, the native people living around the mission of San Diego de Alcalá came to be known as the Diegueño (Loumala 1978).

The Kumeyaay were organized into autonomous bands. Each band usually occupied a main village and several smaller inhabitations. One of the main villages occupied by the Kumeyaay was the village of Otay, located on the north and adjacent to the Otay River. However, these settlements were temporary, as the community would disband seasonally into smaller groups, which would allow them to establish camps to gather, process, and cache seasonally available resources. Each territorial group, with a population of between 200 and 1,000 persons, controlled approximately 20 miles of river drainage (depending upon the width and richness of the valley) from their winter home.

European Period

The historical period began in the San Diego area with the voyage of Juan Rodríguez Cabrillo, who landed near Point Loma in September 1542. At this time, contact and interaction between the Kumeyaay and the Europeans was initiated; however, it was not until the founding of Mission San Diego Alcalá in 1769 that the cultural interaction developed. After 1542, several expeditions were sent to explore the Alta California, but for nearly two centuries following Cabrillo's voyage, the Spanish showed little interest in the region, focusing instead on the Mexican mainland and on Baja California (Loumala 1978).

The secularization of the California missions in 1832 followed the Mexican independence from Spain in 1821. Between the time period of 1833 and 1845, the newly formed Mexican government began to divide the large church holdings into land grants, forming ranches. By 1840, ranches and farms were being established throughout the El Cajon Valley, along the Sweetwater River and nearby areas. The Estudillo family, who initiated the Euro-American settlement in the Otay River Valley, received a property title to the Janal grant (Janal Ranch) and the Rancho Otay. Both ranches consisted of 11,093 acres, and were collectively referred to as Otay Ranch. Over time, the ranches changed hands and expanded in size to roughly 22,000 acres (Gallegos 2000). The Janal Ranch would later become the site for both the Upper and Lower Otay Reservoirs, built in the early 1900s for the Southern California Water Company.

American Period

When Mexico relinquished California to the U.S. with the Treaty of Guadalupe Hidalgo in 1848, growth in the region came rapidly as a result of subsequent gold rushes, land booms, and transportation development. San Diego County was created in 1850, the same year that the City of San Diego was incorporated (with a population of 650). Over the next 20 years, the County's population increased by six-fold, and the City population more than tripled (San Diego Historical Society 2004).

Most of the mountain Kumeyaay, especially those along the emigrant trails, were seriously affected by the entrance of American settlers. By the time gold was discovered, shortly after the Civil War, the Spanish, Mexican, and American governments and settlers had significantly changed the Kumeyaay's way of life. In 1875, the inland Kumeyaay were expelled from their ancestral homes and their land was expropriated. Their plight was ignored until publicity generated by the Indian Rights Association and the Sequoia League forced the Bureau of Indian Affairs (BIA) to set aside lands of the Cuyamaca, La Posta, Manzanita, and Laguna Mountains earlier in the 20th century. The Kumeyaay population finally began to revive after 1910. Currently, there are about 20,000 Kumeyaay descendants in San Diego County, about 10 percent of whom live on its 18 reservations, more than in any other county in the United States (Royo 1999).

The first European settlers to arrive in the region were primarily farming families. As the farming communities began to develop, the need for water became increasingly apparent. Between 1895 and 1922, San Diego's water system transitioned from being privately owned, to a system owned by the City of San Diego. After building the Upper and Lower Otay Reservoirs in the late 1800s, E.S. Babcock merged interests with John Spreckles, to combine the water rights of the Tecarte Mountain Water Company and the Otay Water Company. The merger formed the Southern California Mountain Water Company, which was ultimately sold to the City of San Diego. The City eventually bought the entire water system from Morena to Otay (Eastlake 2004).

1.3 BIOLOGICAL RESOURCES

The Otay River Valley once supported abundant vegetation that served as a focal point for life in the south bay. But, over time, the quality and integrity of biological resources in the valley have fragmented and disturbed by a variety of human activities. Salt mining, sand and gravel extraction operations, agriculture, extensive cattle grazing, urban development and damming of the river at the Lower Otay Lake have contributed to the current conditions of the biological resources of the river valley.

There does, however, continue to be areas within the valley that support high quality biological communities. These communities are supported by a combination of topography, soils, and climate. Generally, in the area, from sea level to 5,000 feet, woody shrubs in stands usually become very dense and form various chaparral community types. Starting at approximately 800 feet in elevation the Coastal Plains, Foothills, and lower montane landscape are dominated by chaparral and coastal scrub, but are also interspersed with oak woodlands and riparian forest.

The following vegetation communities may be found within the area:

Foothill Woodlands

Foothill Woodlands tend to occur as close-canopy stands in canyons or along streams and as open savannas in broad valleys and rolling hills. Closed-canopy stands typically have a dense overstory with little space between crowns, dominated primarily by coast live oak or Engelmann oak. Sycamore and sycamore-alder woodlands tend to be open to moderately closed riparian and streamside woodlands dominated by sycamores (*Platanus racemosa*) and also alder (*Alnus rhombifolia*). The following woodland vegetation series may be found within the area:

- Coast live oak woodland
- Southern sycamore-alder riparian woodland
- Sycamore alluvial woodland

Coastal Scrub and Chaparral

Coastal scrub and chaparral are the dominant vegetation communities on the coastal side of the mountains, up to 5,000 feet. Coastal sage scrub (CSS) consists of drought-deciduous, soft-leaved shrubs often dominated by California sagebrush (*Artemisia californica*), buckwheat (*Eriogonum* spp.), and several sage species (*Salvia* spp). This vegetation type supports several sensitive species including the federally-listed threatened coastal California gnatcatcher. Chaparral stands typically consist of evergreen and woody shrubs including chamise (*Adenostema* spp.), manzanita (*Arctostaphylos* spp.), and California lilac (*Ceanothus* spp.). Prior to development within the County, CSS communities dominated the region's coastal terraces, particularly on south- and west- facing slopes.

Sage scrub communities occur on higher, steeper slopes in more inland locales and tend to be dominated by black or white sages. Chaparral communities tend to replace CSS communities on even higher and more inland sites, particularly on mesic (moist) north-facing slopes. The following coastal scrub and chaparral series may be found within the area:

- Chamise chaparral
- Coastal sage-chaparral scrub
- Diegan coastal sage scrub
- Gabbroic chaparral
- Maritime succulent scrub
- Southern mixed chaparral

Grasslands

Grasslands are scattered throughout the County with the largest stands in north San Diego County, and somewhat lesser stands in southern San Diego County. Annual grasses primarily dominate the grassland habitats, although scattered areas of native perennial grassland may remain, often as small inclusions within scrub habitats. The annual grass species are dominated by non-native species, including wild oats (*Avena fatua*), ripgut grass (*Bromus diandrus*), red brome (*Bromus madritensis ssp. rubens*), tocolote (*Centaurea melitensis*), and summer mustard (*Hirschfeldia incana*). The following grassland community series may occur in the area:

- Needlegrass grassland
- Non-native grassland

Riparian

Riparian vegetation is highly varied and reflects the amount of seasonal water, flow rates, disturbance history, and type of streambed substrate. Riparian forests, woodlands, and scrub communities occur along drainages with significant stands associated with the major rivers and streams throughout the County. Smaller intermittent streams generally support willow scrub, dominated by arroyo willow (*Salix lasiolepis*). Larger streams support more diverse riparian communities in terms of species and structure; i.e., multiple canopy layers. However, channelization and flood control facilities have resulted in the loss of habitat or diversity of these riparian communities as linear strips of willow scrub habitat replace riparian forest.

Relatively undisturbed portions of larger streams, such as the Otay River, support arroyo willow riparian forest. Fremont cottonwood (*Populus fremontii*) may also occur, forming patches of willow-cottonwood riparian forest. Coast live oak riparian forest is typically open to locally dense evergreen riparian woodlands dominated by coast live oak (*Quercus agrifolia*) and appears to be richer in herbs and poorer in understory shrubs than other riparian communities. The following riparian community series can be found in the area.

- Mule fat scrub
- Southern coast live oak riparian forest
- Southern cottonwood-willow riparian forest
- Southern willow scrub
- Sensitive plant community

(*Source: Final EIR, Otay Water District, May 8, 1996*)

Marsh and Wetland Communities

The County supports a variety of marsh and other wetland vegetation communities, including open water, beaches and dunes. Coastal lagoons support a mixture of salt marsh and freshwater marsh habitats. Estuaries occur where saltwater and fresh water meet and typically occur within bays, lagoons, or sloughs. Vernal pools are a unique and scarce wetland type occurring only where certain soil conditions exist. Two types of vernal pools (San Diego mesa claypan and San Diego mesa hardpan) have also been identified as endemic to the County. The San Diego mesa claypan type is concentrated in the Otay Mesa and Jamul areas with a few other more northerly county occurrences. Surrounding vegetation is typically chamise chaparral, but occasionally annual grassland or CSS. These pools are small, often clustered in complexes, and may occur in hummocky terrain (mima mound topography) and support a variety of specialized and sensitive species. The following wetland community series may be found in the area.

- Coastal freshwater marsh
- San Diego mesa claypan vernal pool

It should be noted here, that this Plan will not discuss, or provide guidelines, for any work within vernal pool areas. These habitats are extremely sensitive and work near or in them will be governed by the local jurisdictions and regulatory agencies only.

Non-Native Vegetation and Developed Areas

Non-native vegetation typically consists of landscaping with non-native and native species within the metropolitan and suburban areas. Stands of eucalyptus may occur and are often associated with agricultural/former agricultural areas. In addition, a number of highly disturbed areas are located within the Park boundaries. These disturbed areas are dominated by giant reed (*Arundo donax*), tamarisk

(*Tamarix ramosissima*). Previously graded, grazed, or plowed areas are dominated by ruderal non-native vegetation or bare ground, and sand mining operations.

Developed areas are urbanized locales containing structures, roads and infrastructure facilities.

Sensitive Vegetation Communities

Sensitive vegetation communities are those that are considered rare in the region, support sensitive species of plants and animals, and/or which are subject to regulatory protection through federal, state, or local policies, ordinances, and regulations. Wetland and non-wetland waters are regulated under the federal Clean Water Act (CWA) to regulate certain activities that will impact areas under federal jurisdiction. Similarly, Section 1600 *et seq.* of the California Fish and Game Code and the California Coastal Act grant authority to the California Department of Fish and Game (CDFG) and the California Coastal Commission (CCC) to regulate actions occurring in their jurisdictions within wetlands or other waters.

The following vegetation community series are considered sensitive and may occur in the area.

- Coast live oak woodland
- Southern sycamore-alder riparian woodland
- Sycamore alluvial woodland
- Gabbroic chaparral

The above described vegetation communities, as well as some subsets of these vegetation communities, are classified by what is known as the Holland code. The Holland code is used locally to provide a universal nomenclature for describing various vegetation communities. Within the OVRP there are 12 native and non-native vegetation communities as generally described by Holland. These vegetation communities include: Diegan Coastal Sage Scrub; Maritime Succulent Scrub; Southern Cottonwood Willow Riparian Forest; Mule Fat Scrub; Southern Coastal and Valley Freshwater Marsh; Coastal Salt Marsh; Alkali Marsh; San Diego Mesa Claypan Vernal Pool; Open Water/Seasonal Ponds; Non-native Grasslands; Eucalyptus Woodland; and Tamarisk Riparian Scrub.

2.0 PLANS, REGULATORY REQUIREMENTS, AND PERMITS

It is anticipated that all of the JEPA party's will review and provide final endorsement of the provisions of this Plan. However, it should be understood that this Plan does not replace the current regulatory framework within the individual jurisdictions of each JEPA party. Therefore, this chapter provides an overview of the planning documents, as the potential regulatory requirements and permits that may be required depending on the type of project, or the location of the project, proposed for implementation.

2.1 REGULATORY PLANS, PROGRAMS AND PERMITS

The primary controls of development in this watershed are the General Plans adopted by each of the responsible jurisdictions (i.e., County of San Diego, City of Chula Vista, City of San Diego). These plans guide the physical development of their respective jurisdictions by striking a balance among the multitude of uses and resources. With the rapid development of the region during the last several decades that is expected to continue, these plans have focused on providing the housing, infrastructure, facilities, and services necessary to support the growing population, and maintaining economic stability. Pressures that this urbanization has brought to habitat and species regionwide prompted the development of natural resource conservation programs such as the Multiple Species Conservation Program (MSCP).

In the Otay River watershed, the MSCP conserves large blocks of habitat and species in balance with planned urban development (e.g., Otay Ranch). The County of San Diego, City of San Diego, and City of Chula Vista, all have prepared and implemented individual MSCP Subarea Plans and entered into Implementing Agreements with the U.S. Fish and Wildlife Service and California Department of Fish and Game to obtain permits under the Federal and State Endangered Species Acts. The City of Chula Vista's MSCP Subarea Plan also includes a Wetlands Protection Program, focused on conserving wetlands and requiring mitigation for any wetland impacts to ensure no net loss of wetland quantity or quality.

Similarly, through the regulation of non-point source pollution, the Municipal Permit focuses on protecting and enhancing the variety of beneficial uses in the regional watersheds. Pursuant to this permit, each co-permittee is required to prepare a Jurisdictional Urban Runoff Management Program (JURMP) and Standard Urban Storm Water Mitigation Plan (SUSMP), and to work collaboratively with the other co-permittees on Watershed Urban Runoff Management Programs (WURMPs). These documents not only provide background information but serve to coordinate land use planning efforts at the project, jurisdictional, and watershed levels that are necessary to protect and enhance beneficial uses.

Recognizing the changing conditions and needs, the County of San Diego, City of San Diego, the City of Chula Vista, are currently completing updates to their General Plans. The local jurisdictions have already modified their stormwater and grading ordinances to implement the requirements of the Municipal Permit (e.g., the County's Watershed Protection Ordinance, City of Chula Vista's Storm Water Management and Discharge Control Ordinance), which if properly adhered to and enforced, should protect and could benefit the quality of water in this watershed and the adjoining San Diego Bay from stormwater pollutants. In addition, the City of San Diego has prepared the Source Water Protection Guidelines for New Development, 2004, to address pollutants of concern for drinking water sources, as discussed above.

The jurisdictions in this watershed also have other resource-oriented policies and ordinances. For example, the County of San Diego has a Resource Protection Ordinance that protects floodplains, wetlands, vernal pools, and steep slopes and requires no net loss of wetland functions and values. Moreover, the County's Biological Mitigation Ordinance implements the MSCP on unincorporated County lands within the Metro-Lakeside-Jamul segment of the South County MSCP Subarea. Similarly, the City of Chula Vista has adopted a Habitat Loss and Incidental Take (HLIT) ordinance, which is intended to implement the City of Chula Vista's MSCP Subarea Plan and to protect both upland and aquatic resources.

The Otay Ranch General Development Plan (GDP)/Subregional Plan (SRP) and Resource Management Plan (RMP) are the comprehensive plans controlling development and preservation within the approximately 23,000-acre Otay Ranch area (east of Heritage Road), located primarily in this watershed and under the joint purview of the County of San Diego and the City of Chula Vista. The RMP includes policies and guidelines focused on natural and cultural resource protection, enhancement, and management, including the protection of the Preserve from adjacent land uses.

Watershed Management Plan

The Otay River Watershed Management Plan (OWRMP) involves characterizing the Otay River watershed's various resources and land uses; identifying goals and objectives for watershed enhancement; assessing and prioritizing threats to existing beneficial uses and natural resources; identifying implementation strategies for the protection, enhancement, and restoration of beneficial uses and natural resources, including a water quality monitoring program to monitor, maintain, and enhance water quality. The OWRMP is intended to be consistent with the local General Plans, and local resource plans and programs.

Special Area Management Plan

The Special Area Management Plan (SAMP) provides a comprehensive review of aquatic resources in the entire watershed. This watershed approach enables the regulatory agencies, particularly the USACE, to evaluate projects on a watershed basis instead of the typical project-by-project basis. This approach allows for a more through evaluation of the potential for cumulative impacts to aquatic resources within the entire watershed. Once the SAMP is complete the USACE will likely issue a General Permit for potential impacts to aquatic resources. The provisions outlined within this Permit should be reviewed prior to proposing any restoration or enhancement project within the OVRP. It should also be noted that the issuance of the General Permit for the SAMP does not exempt future projects from permitting under the USACE nationwide permit program, or individual permit requirements.

Western Otay Valley Regional Park - Natural Resources Management Plan

The Western Otay Valley Regional Park (WOVRP) includes the area from Heritage Road to the west only. The Natural Resources Management Plan (NRMP) for this area establishes guidelines for present and future use and maintenance of the Park while protecting natural resources. Guidelines within the management plan provide for maintenance, usage, and development of the WOVRP include the following practices: requiring prior maintenance crew "natural resource awareness" of the WOVRP training; requiring all maintenance vehicles and personnel to stay within existing access roads and right-of-way; minimizing erosion by using appropriate measures and best management practices; providing cultural resource protection and awareness; scheduling maintenance and development activities to avoid nesting/breeding seasons; constraining domestic animals; keeping park users on designated areas and trails only; inspecting trails regularly to identify areas requiring erosion control, maintenance, closure, and/or revegetation; providing buffer zones around sensitive areas; keeping all maintenance roads, trails, and minor parking areas unpaved; and limiting water quality and erosion impacts from new development.

Table 2-1 provides a list of existing and planned regulatory plans, programs and permits.

Table 2-1. Existing Local and Regional Regulatory Plans, Programs, Permits

Jurisdiction	Existing Regulatory Plans, Programs, Permits
San Diego County	• San Diego County General Plan • County of San Diego MSCP Subarea Plan • County of San Diego JURMP • County of San Diego SUSMP • Special Area Management Plan (SAMP)
City of San Diego	• City of San Diego Progress Guide and General Plan • City of San Diego MSCP Subarea Plan • City of San Diego JURMP • City of San Diego SUSMP • Special Area Management Plan (SAMP)
City of Chula Vista	• City of Chula Vista General Plan • Otay Ranch GDP/SRP and RMP • City of Chula Vista MSCP Subarea Plan • City of Chula Vista JURMP • City of Chula Vista SUSMP • Special Area Management Plan (SAMP)
Regional (U.S. Fish and Wildlife Service and California Department of Fish and Game with Regional Jurisdictions in Southwestern San Diego County)	• MSCP Subregional Plan • Clean Water Act Section 404 permits • Section 1600 Requirements
Regional (San Diego Regional Water Quality Control Board and Regional Co-permittees)	• Municipal Stormwater Permit
Regional (San Diego Regional Water Quality Control Board and Regional Jurisdictions)	• Basin Plan • Porter Cologne Water Quality Act , "water quality certification"
Regional (Jurisdictions in watersheds flowing into San Diego Bay)	• San Diego Bay WURMP

California Environmental Quality Act (CEQA)

CEQA encourages the protection of all aspects of the environment by requiring state and local agencies to prepare multidisciplinary environmental impact analyses and make decisions based on those studies' findings regarding the environmental effects of the proposed action. CEQA applies to all discretionary activities proposed to be carried out or approved by California public agencies, including state, regional, county, and local agencies. CEQA also applies to private activities that require discretionary government approvals.

The fundamental premise of CEQA is that environmental protection can be achieved through compliance with rigorous, action-forcing, procedures. These procedural requirements are linked with specific timing requirements that must be met in order for an agency to have complied with CEQA. Each of the JEPA parties has jurisdiction-specific CEQA requirements that will guide and direct the CEQA analysis required for evaluation of each project proposed.

CEQA also allows for Categorical Exemptions, which is an exemption from CEQA for a class of projects that the Secretary of Resources determines generally will not have a significant impact on the environment. Currently the Resources Agency has established 32 classes of categorical exemptions. This does, however, require each public agency to establish its own list of specific activities falling within each class. Therefore, when a specific project is proposed, there should be consultation with the appropriate

jurisdiction in which the project is proposed, to determine if there is an appropriate Categorical Exemption for the project.

For proposed projects that may impact wetlands or riparian areas, there are specific permit requirements that will need to be met before a project may proceed. These permits are issued by the U.S. Army Corps of Engineers (USACE), California Department of Fish and Game (CDFG), and the Regional Water Quality Control Board (RWQCB). An overview of these permits is included below.

U.S. Army Corps of Engineers (USACE)

Section 404 of the Clean Water Act (CWA) requires that private, state, and federal entities obtain a permit from USACE before discharging dredged or fill materials into waters of the United States, which may include wetlands.

The USACE has various types of permits, and the appropriate type of permit depends on the scope and type of project. The types of permits include; individual permits, general permits, and nationwide permits. It is anticipated that the size, and type of projects associated with this Plan will qualify for a nationwide permit. There are nationwide permits allowed for various activities but it should be noted that these permits can change. The current set of nationwide permits went into effect on March 18, 2002, and will expire on March 18, 2007.

California Department of Fish and Game (CDFG)

The California Department of Fish and Game has jurisdictional authority over resources, including wetlands associated with rivers, streams, and lakes under the California Department Fish and Game Code, sections 1600 – 1616, which is referred to the "streambed alteration program". Under this statute the CDFG has the authority to regulate work that will substantially divert or obstruct the natural flow of, or substantially change or use any material from the bed, channel, or bank of, any river, stream or lake.

Prior to construction, a project proponent must submit a notification of streambed alteration to the local CDFG office responsible for the project area. In addition to the formal application materials and fee, the proponent must also submit the appropriate CEQA document (or categorical exemption). After reviewing the application materials, the CDFG enters into a streambed alteration agreement with the applicant and imposes conditions on the agreement to ensure no net loss of wetlands values or acreage results from project construction. The CDFG does not consider this streambed alteration agreement a permit, but rather an agreement between the CDFG and the project proponent.

Regional Water Quality Control Board (RWQCB)

The RWQCB is the U.S. Environmental Protection Agency representative in California for matters concerning water quality. Section 401 of the CWA and the Section 404(b)(1) Guidelines require that the discharge of dredged or fill material into water of the United States not violate state water quality standards; Section 401 requires proof of that through a certification issued by the RWQCB (in California). In California the requirements are specified by the Porter-Cologne Water Quality Act, which contains the California specific water quality regulations.

An additional component of the CWA requires the preparation of site specific Stormwater Pollution Prevention Plans (SWPPPs) for construction sites that impact one acre or more. These SWPPPs outline the best management practices (BMPs) that will be implemented during the ground disturbing activities. Prior to completing a site specific SWPPP, verify with the appropriate jurisdiction that there are not additional requirements based on the Municipal Stormwater Permit that may impact the contents of the SWPPP.

California Coastal Commission

The California Coastal Commission, in partnership with coastal cities and counties, plans and regulates the use of land and water in the coastal zone. The Commission enforces the California Coastal Act enacted by the State Legislature in 1976 to provide long-term protection of California's 1,100-mile coastline for the benefit of current and future generations. Development activities, which are broadly defined by the Coastal Act to include construction of buildings, division of land, and activities that change the intensity of use of land or public access to coastal waters, generally require a coastal permit from either the Coastal Commission or the local government. Local governments are required by the Commission to establish planning goals for their political jurisdiction, including long range plans called Local Coastal Programs.

Prior to development in the coastal zone, a project proponent must consult with the appropriate Commission office (i.e., San Diego Coast Area Office) to determine whether a coastal permit is required. The project proponent must determine, with assistance from the appropriate Commission office, which jurisdiction the project is located in and acquire the appropriate coastal development permit. The County of San Diego and the Cities of Chula Vista and San Diego each have a Local Coastal Program and issue their own coastal development permits. In addition to the formal permit application materials and fee, the proponent must also submit the appropriate CEQA document (or categorical exemption). After reviewing the application materials, the County or City makes a determination on the requested permit and notices the California Coastal Commission. If the Coastal Commission does not conclude that a substantial issue exists and the project is in conformance with the Coastal Act, the determination made by the County or City is upheld and the determination on the permit is final.

Right-of Entry Permits

If private parties wish to conduct restoration activities on public properties within the OVRP, right-of-entry permits will be required from the appropriate JEPA party. Additionally, for potential projects on private property a right-of-entry permit will be required.

3.0 ANTICIPATED IMPACTS AND IMPROVEMENTS

The implementation of this plan as a project or multiple projects is expected to be a net benefit to the Otay River Valley. However, during non-native species removal there will be limited temporary impacts. Listed below are anticipated impacts resulting from non-native species removal. Additionally, there is a discussion of the designated beneficial uses as outlined the Water Quality Control Plan (Basin Plan).

3.1 VEGETATION COMMUNITIES

3.1.1 Wetland and Riparian

Impacts to wetlands will be avoided to the maximum extent practicable. However, due to the nature of removal of some non-native species, impacts may be unavoidable. If necessary, mitigation for wetland impacts will be conducted. Potential impacts could occur to establishing proper ecological planting grades on disturbed sites, to gain site access, and due to the removal of non-native vegetation from wetland areas.

Mitigation ratios along with mitigation plans (if necessary) will be prepared during the CEQA process or prior to implementation of specific projects.

Grading activities will be limited to areas occupied by non-native species targeted for removal, or access to a specific site. Access routes to reach the restoration areas will require identification during the preparation of any habitat restoration plans. These access routes should meet the following conditions to minimize temporary wetland impacts relating to revegetation installation:

1. Access routes which do not involve impacts to native habitat will always be preferred to those that do.
2. Routes will be minimized to the maximum extent practicable.
3. Wetland impacts due to temporary access routes will be restored with a native habitat plant mix at the same time as areas of non-native plant removal.

3.1.2 Uplands

Impacts related to non-native plant removal in uplands are anticipated to be relatively small. These impacts will not require permits by the USACE, CDFG, or RWQCB but the appropriate JEPA party will still require approval of the proposed plan. Upland restoration is very seasonally dependant and will likely require irrigation. It is extremely important that the irrigation regime be monitored and adjusted to ensure that there is no water runoff from the restoration site.

3.2 WATER QUALITY

This section focuses on the various “beneficial uses” for the OVRP as defined by the California Regional Water Quality Control Board (RWQCB) Region 9 Water Quality Control Plan (RWQCB 1994). The OVRP falls within the Lower Otay River watershed (Otay Hydrologic Unit-910.00). It encompasses the Otay Valley (910.20) and the Savage (910.31) and Proctor (910.32) Hydrologic Subareas in the Dulzura (910.30) Hydrologic Area. Beneficial uses designated for the reservoir area which do not apply to the lower watershed include: Municipal and Industrial water use, ground water recharge, and cold water wildlife habitat. These beneficial uses are reviewed below along with any anticipated project impacts to these uses. All water quality issues will be addressed in accordance with local, state, and federal requirements.

3.2.1 Municipal Water Supply (only above Otay Reservoir Dam)

There will be no interruption to any municipal use of water due to project implementation since the only areas proposed for exotic plant removal will be around the edges of the Otay Reservoir and any herbicides

used for such control efforts will be approved for aquatic use. The use of herbicides, pesticides, and fertilizers on, or adjacent to (within 1,000 feet of the high water mark), the Otay Reservoirs (lower and upper) may only be implemented following consultation on an Application Plan with the City of San Diego Water Department. The Water Department will then have to receive plan approval from the State of California Department of Health Services. The use of herbicides, pesticides, and fertilizers adjacent (within 1,000 feet) to any stream tributary to the reservoirs will require the same level of consultation with the Water Department and the Department of Health Services. Recycled water cannot be used for irrigation purposes adjacent to (within 1,000 feet of the high water mark) the lake.

3.2.2 Agricultural Supply

There will be no anticipated interruptions to any agricultural uses of water due to project implementation. The only uses of this kind occur in a few areas below the Otay Reservoir Dam. It is not known whether these uses include the need for irrigation from wells; but, if there were any effect to well levels through the removal of non-native exotic plant cover it is expected to be positive since both giant reed and tamarisk have been shown to transpire larger amounts of soil moisture than native vegetation. Removal of the exotic plants will be expected to result in an increase in water migrating into the groundwater table keeping it at higher levels during the summer growth months.

3.2.3 Industrial Process (above Otay Reservoir Dam) and/or Service Supply (Potential Use Below Dam)

Industrial service supply is the use of water by industrial facilities where water quality is not important (e.g., mining, gravel washing, fire protection, pavement washing, etc.). Industrial process supply applies to uses where water quality does matter. There will be no interruption to any industrial process, or service, use of water due to project implementation since none of the activities proposed for habitat restoration will negatively affect either water supply or quality. Similar to the agricultural supply, the amount of water available for pumping from wells along the lower drainage may increase.

3.2.4 Groundwater Recharge (only above Otay Reservoir Dam)

There will be no interruption to any groundwater recharge due to project implementation. Groundwater recharge will probably be increased below the Otay Reservoir Dam after exotic plant removal and habitat restoration.

3.2.5 Contact Water Recreation (Potential Use)

Contact water recreation is limited in the project area since there are few pools deep enough to swim and the river is broken into segments which make boating for any distance difficult. There is also heavy vegetation along much of the waters edge with some riprap present in localized areas further limiting open water access. On Otay Reservoir only boating and shore fishing uses are permitted. Exotic plant removal and habitat restoration activities are not anticipated to have a negative impact on any current water contact uses since the removal and restoration actions will only affect areas of the OVRP not currently used for such purposes.

3.2.6 Non-contact Water Recreation

Non-contact recreation uses such as hiking, wildlife watching, and fishing may be affected in a minor and temporary way due to project implementation. However, the goal of this Plan is to restore disturbed wetlands, thus, encouraging higher levels of wildlife use. The OVRP Concept Plan Goal to eventually establish a recreational trail system through the OVRP should greatly enhance this beneficial use.

3.2.7 Warm Freshwater Habitat

Although warm water habitat is found mainly in the shallow channel areas west, downstream, of Otay Reservoir Dam, the edges of Upper and Lower Otay Reservoir also offer such use. Exotic plant removal and habitat restoration efforts are not anticipated to directly affect these areas. Although during initial stages of habitat restoration there may be minor erosion runoff during the restoration process, this runoff will be expected to occur only during flood season when the river water is normally turbulent and loaded with sediments from many sources. Only herbicides approved as non-detrimental to aquatic animal species will be used to control exotic plant growth in or near warm freshwater habitat during their restoration period. Therefore, no significant adverse effect due to project implementation is anticipated on warm freshwater habitat. The use of herbicides, pesticides, and fertilizers on, or adjacent to (within 1,000 feet of the high water mark), the Otay Reservoirs (lower and upper) may only be implemented following consultation on an Application Plan with the City of San Diego Water Department. The Water Department will then have to receive plan approval from the State of California Department of Health Services. The use of herbicides, pesticides, and fertilizers adjacent (within 1,000 feet) to any stream tributary to the reservoirs will require the same level of consultation with the Water Department and the Department of Health Services. Recycled water cannot be used for irrigation purposes adjacent to (within 1,000 feet of the high water mark) the lake.

3.2.8 Cold Freshwater Habitat (Only Above Otay Reservoir Dam)

The only cold freshwater habitat use identified in the OVRP is in the deep water areas of Upper and Lower Otay Reservoir. Exotic plant removal and habitat restoration efforts will not directly affect this habitat. In addition, only herbicides approved as non-detrimental to aquatic animal species will be used to control exotic plant growth around the reservoirs. The use of herbicides, pesticides, and fertilizers on, or adjacent to (within 1,000 feet of the high water mark), the Otay Reservoirs (lower and upper) may only be implemented following consultation on an Application Plan with the City of San Diego Water Department. The Water Department will then have to receive plan approval from the State of California Department of Health Services. The use of herbicides, pesticides, and fertilizers adjacent (within 1,000 feet) to any stream tributary to the reservoirs will require the same level of consultation with the Water Department and the Department of Health Services. Recycled water cannot be used for irrigation purposes adjacent to (within 1,000 feet of the high water mark) the lake. Therefore, no significant adverse effect is anticipated for cold freshwater habitat due to project implementation.

3.3 WILDLIFE

The Otay River corridor through the OVRP and several of the tributary canyons constitutes significant habitat for many riparian and upland animal species and is a major regional wildlife corridor. However, the non-native plant populations which are the target of this project are considered detrimental to most wildlife uses of the area. These non-native plant species come from outside California but the animal species which use them as habitat generally have not been imported with them. While some of the non-native tree species do provide nesting or feeding habitat for local bird species, this use is not specific to these plant species. Dense populations of giant reed hamper wildlife corridor access and use, while decreasing nesting and foraging habitat for some of the less well distributed animal species. Proposed habitat restoration palettes are designed to develop native riparian bird species habitat especially that for the endangered least Bell's vireo (Baird 1989). For these reasons, this Plan is anticipated to have a net positive effect on wildlife habitat values in the OVRP.

3.4 SENSITIVE SPECIES

The project area is known to support several rare, threatened, or endangered plant and animal species. The MSCP has identified the following species to be found in the OVRP:

- Palmer's goldenbush (*Ericameria palmeri* ssp. *palmeri*)
  Federal: Species of Concern; CNPS List 2
- Orcutt's bird's beak (*Cordylanthus orcuttianus*)
  State: Species of Concern CNPS List 2
- Otay tarplant (*Deinandra conjugens*)
  Federal: Threatened; CNPS List 1B
- Variegated dudleya (*Dudleya variegata*)
  State: Species of Concern; CNPS List 1B
- San Diego Barrel Cactus (*Ferocactus viridescens*)
  State: Species of Concern; CNPS List 2
- San Diego Goldenstar (*Muilla clevelandii*)
  State: Species of Concern; CNPS List 1B
- Snake Cholla (*Cylindropuntia californica var. californica*)
  State: Species of Concern; CNPS List 1B
- Tecate Cypress (*Cupressus Forbesii*)
  State: Species of Concern; CNPS List 1B

The following animal species are known to occur in the OVRP:

- Quino Checkerspot Butterfly (*Euphydryas editha quino)*
  Federal: Endangered, State: None
- Spreading navarretia (*Navarretia fossalis*)
  Federal: Threatened
- Jepson's button-celery (*Eryngium aristulatium*)
  Federal: Endangered
- San Diego Fairy Shrimp (*Branchinecta sandiegonensis*)
  Federal: Endangered
- Riverside Fairy Shrimp (*Streptocephus wootoni*)
  Federal: Endangered
- Western pond turtle (*Emmys marmorata*)
  State: Species of Special Concern
- Orangethroat whiptail lizard (*Cnemidophorus hyperythrus beldingi*)
  State: Species of Special Concern
- San Diego horned lizard (*Phrynosoma coronatum blainvillei*)
  State: Species of Special Concern
- White-faced ibis (*Plegadis chelhi*)
  State: Species of Special Concern
- Northern harrier (*Circus cyaeus hudsonius*)
  State: Species of Special Concern
- Coopers' hawk (*Accipiter cooperii*)
  State: Species of Special Concern

- Swainson's hawk (*Buteo swainsoni*)
  State: Threatened
- Golden eagle (*Aquila chrysaetos*)
  State: Species of Special Concern; fully protected
- Burrowing owl (*Athene cuniculara hypugaea*)
  State: Species of Special Concern
- Southwestern willow flycatcher (*Empidonax estrimus traillii*)
  State: Endangered; Federal: Endangered
- Least Bell's vireo (*Vireo bellii pusillus*)
  State: Endangered; Federal: Endangered
- Coastal cactus wren (*Campylorhynchus brunneicapillus cousei*)
  State: Species of Special Concern
- California gnatcatcher (*Polioptila californica californica*)
  State: Species of Special Concern; Federal: Endangered
- Southern California rufus-crowned sparrow (*Aimophila ruficeps canescens*)
  State: Species of Special Concern
- Tricolored blackbird (*Agelaius tricolor*)
  State: Species of Special Concern
- Clapper Rail (*Rallus longirostris)*
  State: Endangered; Federal; Endangered
- American badger (*Taxideatexus*)
  State: Species of Special Concern

Overall, it is anticipated that non-native species removal and restoration will provide an overall benefit to native species and habitats. However, it is critical that the conditions outlined in the specific jurisdiction MSCP are followed. This is particularly critical for what the MSCP calls "narrow endemic" species. The MSCP identifies known populations of these narrow endemic species, such as the Orcutt's bird beak. These areas of known narrow endemic populations require complete avoidance from all activities outlined in this Plan.

3.5 ARCHEOLOGICAL RESOURCES

Known and suspected archaeological sites are distributed throughout the OVRP. The majority of habitat restoration activities should not affect these sites, because generally, there will be no need for ground disturbing activities. However, there may be a need to remove giant reed rhizomes, roots of exotic trees, or tamarisk root crowns. Root crowns can be buried up to one foot below the ground surface and giant reed rhizomes can be buried up to 4 feet below the ground surface by alluvium (typically 1–3 feet). In addition, container planting will require the excavation of planting holes up to one foot deep. The trunks of exotic trees should not be removed but left to stand on-site after cutting and being treated with herbicide in order to avoid potential excavation impacts to archaeological/historical resources. In some instances, temporary roads may need to be constructed to gain access to the restoration site. This too could require ground disturbing activities.

To address the potential for archaeological/historical impacts, the following standards will apply to all restoration projects within the OVRP:

1. Prior to the implementation of any restoration project which requires ground disturbing activities or is located in or near a known cultural resource, a cultural resource specialist shall conduct a thorough review of existing cultural resource maps to determine the presence of known cultural resources. Any area not surveyed within the past 5 years should be resurveyed, and/or monitored during ground disturbing activities. If surveys conducted as part of the implementation of the Plan they should conform to the City of San Diego's Historical Guidelines (adopted September 28, 1979, amended June 6, 2000).
2. When ground disturbing activities occur, an archaeological monitor should be present. For any project where cultural resource sites exist, cultural resource avoidance will be the preferred alternative. If avoidance is not feasible, then mitigation measures recommended by a qualified archaeologist will be implemented to assure proper mitigation of these resources during restoration project installation.
3. Any archaeological/historical mitigation measures recommended for a project should be incorporated into the final project plans.

4.0 MAPPING VEGETATION COMMUNITIES

The following section provides an overview of the methods used to conduct the mapping of vegetation communities, and identifies the resulting acreages of each native and non-native vegetation type.

4.1 NATIVE VEGETATION

One of the stated goals of the Plan was to map non-native vegetation within the OVRP. Additionally, native vegetation was mapped to provide assistance in evaluating areas for restoration. In order to complete this task, a modified Holland vegetation classification system was used to identify vegetation communities, and some individual species of non-native vegetation was mapped as individual species. This technique allowed for mapping individual non-native species within overall habitat types. Additionally, the Holland classification system was modified slightly to allow for classifications of developed and ruderal areas. Ruderal is defined as areas consisting of mixed, disturbed, and unclassifiable weed vegetation. Listed below are the habitats mapped within the OVRP (Table 4-1).

Table 4-1. Habitat Communities Mapped

HABITAT COMMUNITIES	
Community	Holland Code
Chamise Chaparral	37200
Developed	12000
Diegan Coastal Sage Scrub	32500
Maritime Succulent Scrub	32400
Mulefat Scrub	63310
Non-Native Grasslands	42200
Fresh Water Marsh	52400
Open Water	13140
Ruderal	no code
Southern Mixed Chaparral	37120
Southern Willow Scrub	63320
Sycamore Woodland	62400
Vernal Pools	44000

4.2 NON-NATIVE VEGETATION

Based on their effects on habitat degradation within the OVRP and the tendency to be highly successful in invading and out competing native species, the following list of non-native species was selected for individual species mapping (Table 4-2).

4.3 VEGETATION COMMUNITIES AND NON-NATIVE SPECIES MAPPING

4.3.1 Methodology

The vegetation communities and non-native species mapping was completed using a combination of aerial photography analysis followed by field ground-truthing. Low-level aerials were flown by Lenska Aerial Surveys in April 2004, to obtain aerial photography of the OVRP. From this photography, scanned negatives provided six-inch pixel imagery which were used to develop base maps of the river valley. These photographs were geo-referenced to USGS 1:24000 Topographic Quadrangles and SanGIS assessors parcel data. The baseline level of accuracy for the project is established as being greater than or equal to the established accuracy for the land based parcels, which is approximately plus or minus 20 feet. These parcels also distinguished public/private property boundaries along the park corridor.

Table 4-2. Non-Native Species Mapped

NON-NATIVE SPECIES	
Common Name	Scientific Name
tamarisk	*Tamarix* species
giant reed	*Arundo donax*
pampas grass	*Cortaderia selloana*
castor bean	*Ricinis communis*
evergreen ash	*Fraxinus udhei*
pepper trees	Multiple species
eucalyptus	*Eucalyptus sp.*
palm trees	Multiple species
chrysanthemum	*Chrysanthemum sp.*
mustard	*Brassica sp.*
myoporum laetum	*Myoporum laetum*
silk tree	*Grevillea robusta*
tree tobacco	*Nicotiana glauca*
olive tree	*Olea europea*
non-native groundcover*	Multiple species
ornamental**	Multiple species

Notes:

* Several additional non-native groundcover species were also noted as occurring in limited populations which should be included in overall removal project design.

** Ornamental vegetation is identified as planted non-natives that have encroached on the park's boundaries and maintained a contiguous connection to the original landscaped property.

Vegetation communities were digitized using the six inch imagery to establish geographic positions for vegetation communities. Using image interpretation techniques and previously established databases, an initial vegetation classification was identified for each vegetation community. All trails and areas that were graded, paved, or cleared were classified as developed unless vegetation had been uniformly reestablished, in which case it was classified as the appropriate vegetation community with a secondary classification of disturbed. If the successional vegetation was dominated by an unclassifiable mix of weedy plants the area was classified as ruderal. The digitized vegetation data sets were then loaded on to a ruggedized tablet computer enabled with a sub-meter global positioning unit for on the ground verification of the vegetation community classifications.

Biological field teams surveyed the vegetation data for the entire OVRP, field verifying and correcting vegetation communities as identified in the aerial imagery interpretation. Field studies were characterized by intermittent periods of heavy rain that made access extremely difficult until water levels subsided. Non-native vegetation surveys were completed over a four month period between October 2004 and February 2005. The polygon boundaries were adjusted to reflect field conditions. On the final maps each vegetation polygon is identified by species or habitat community. Acreages are contained within the mapping volumes and available to use them to facilitate future exotic plant removal projects.

All completed vegetation surveys were cataloged in a Geographic Information System (GIS) utilizing Environmental Systems Research Institute's (ESRI) personal geodatabase format for ArcGIS 9.X. All GIS data, with associated metadata, is held by the County Department of Parks and Recreation.

4.4 RESULTS

4.4.1 Total Acreage of Non-Native Vegetation Mapped

OVRP is generally classified by a mix of vegetation communities that are distributed geographically east to west as well as distributed within the flood plain versus upland environments. Communities of annual grassland, chaparral and coastal sage scrub dominate OVRP. Approximately seven percent of the Park is dominated by non-native species. This percentage is skewed downward by the large areas of annual grasslands and relatively undisturbed chaparral and coastal sage scrub in the upland areas. The percentage of non-native plant cover is much higher in the riparian zones and flood ways. Non-native plant cover consists primarily of tamarisk, Arundo, and mixed non-native groundcovers (Table 4-3). The non-native vegetation in the western section of the park are primarily dominated by Arundo and pepper trees while the central and eastern portions of the park transition to large sections dominated by tamarisk. The invasive tree species are distributed across the project area with palm, pepper, myoporum, and eucalyptus the most prevalent species with scattered areas of higher concentrations.

4.4.2 Acreage of Non-Native Vegetation Mapped By Area

Distributions of non-native vegetation vary greatly by area, particularly in respect to the distribution of individual species. The acreages of non-native vegetation mapped by Area (Figure 1-2) presents a clearer summarization of the distinct areas within OVRP (Table 4-4).

Area I

The overall vegetation communities in Area 1 of OVRP are characterized by extensive and dense communities of southern willow scrub, chamise chaparral, and coastal sage scrub with some species such as hymenoclea occurring in almost pure stands (Table 4-4). To a lesser extent other native and riparian areas are present within the Area I. All native communities have some degree of non-native invasion and the density of non-native species varies widely depending on the area. Overall, the distribution of non-native vegetation covers roughly 8 percent of the Area 1 area. The majority of the exotic acreage is made up of non-native groundcover species. The areas with extensive non-native populations are primarily contained to the Otay Valley floodplain. Upland areas are relatively free of extensive communities of non-natives. The invasive tree species are distributed regularly across the project area with palm, pepper, myoporum, and eucalyptus particularly significant species with the higher concentrations and occurrences. The *Arundo* (giant reed), tamarisk and groundcover species (mustard, chrysanthemum, etc.) have dense and wide spread populations in the Area 1 as well.

Area 2

The Area 2 vegetation of OVRP is characterized by extensive annual grassland and coastal sage scrub communities (Table 4-4). To a lesser extent other native and riparian areas are present within the Area 2 OVRP boundary. All native communities have some degree of non-native invasion and the prevalence of exotic species varies widely depending on the area. Overall the distribution of non-native species is substantial and covers roughly 10 percent of the Area 2 area. Tamarisk, with a southern willow scrub over-story, makes up the vast majority of the exotic acreage. Upland areas are primarily free of extensive communities of invasive non-natives.

Area 3

The overall vegetation communities in Area 3 of OVRP are characterized by extensive annual grassland communities surrounding the Otay Lake Reservoirs (Table 4-4). To a lesser extent other native and riparian areas are present within the Area 3 OVRP boundary. Most native communities have minimal non-native invasion and the density of non-native species varies widely depending on the specific area. Overall, the distribution of non-native species is minor and covers roughly 1 percent of the Area 3 with eucalyptus and tamarisk making up the majority of the non-native acreage. Upland areas are primarily free of extensive communities of non-natives.

Table 4-3. Total Acreages of Habitat and Exotic Plant Dominated Vegetation

Vegetation Classification	# of Occurrences*	Acres
Habitat Community		
Annual Grassland	222	2,448.82
Chamise Chaparral	23	189.84
Developed	206	951.61
Diegan Coastal Sage Scrub	265	1,501.91
Fresh Water Marsh	108	119.16
Maritime Succulent Scrub	1	9.35
Mulefat Scrub	35	72.72
Open Water	90	918.21
Ruderal	197	519.24
Southern Mixed Chaparral	84	598.36
Southern Willow Scrub	82	250.36
Sycamore Woodland	1	0.03
Vernal Pools / Mima Mounds	34	464.10
Subtotal	*1348*	*8,043.71*
Non-Native Species		
Arundo (giant reed)	141	14.29
Castor bean	5	0.22
Chrysanthemum	6	9.00
Evergreen Ash	2	0.04
Eucalyptus	455	51.35
Mustard & Non-native Groundcover	21	99.64
Myoporum Laetum	61	0.77
Olive Tree	10	0.16
Ornamental	24	14.58
Palm	70	0.70
Pampas Grass	92	2.18
Pepper	354	8.71
Silk Tree	1	0.21
Tamarisk	262	399.63
Tree Tobacco	6	0.70
Yucca	6	1.53
Subtotal	*1516*	*603.71*
TOTAL	2864	8,647.42

Notes:
* Occurrences represent the number of communities or mapping polygons present within the park and not the individual plants of the species.

Table 4-4. Acreages of Mapped Habitat and Non-Native Plants

Vegetation Classification	Area 1 (Acres)	Area 2 (Acres)	Area 3 (Acres)
Habitat Community			
Annual Grassland	76.65	1546.44	2,480.66
Chamise Chaparral	31.52	--	158.33
Developed	421.46	270.35	159.68
Diegan Coastal Sage Scrub	193.40	1009.08	473.08
Fresh Water Marsh	72.71	1.60	90.28
Maritime Succulent Scrub	9.35	--	--
Mulefat Scrub	7.26	17.49	97.33
Open Water	12.36	8.38	897.49
Ruderal	260.05	78.66	181.64
Southern Mixed Chaparral	401.79	113.47	184.63
Southern Willow Scrub	503.30	5.99	1.85
Sycamore Woodland	0.03	--	--
Vernal Pools Mima Mounds	0.24	251.135	212.73
Subtotal	*1,990.11*	*3,302.62*	*4,937.68*
Non-Native Species			
Arundo (giant reed)	13.85	0.14	0.29
Castor bean	0.11	--	0.11
Chrysanthemum	9.00	--	--
Eucalyptus	13.42	9.50	34.20
Evergreen Ash	0.04	--	--
Mustard & Non-native Groundcover	25.57	73.9	0.16
Myoporum Laetum	0.77	--	--
Olive Tree	0.10	0.049	0.02
Ornamental	7.52	7.06	0.01
Palm	0.33	0.23	0.18
Pampas Grass	2.18	0.01	0.01
Pepper	4.08	2.84	2.15
Silk Tree	0.21	--	--
Tamarisk	91.63	275.34	32.75
Tree Tobacco	0.70	--	--
Yucca	1.53	--	--
Subtotal	*171.04*	*369.07*	*69.88*
TOTAL	2,161.16	3,671.69	5,007.56

4.4.3 Acreage of Non-Native Vegetation by Property Ownership

Non-native vegetation distribution varies by property owner. The estimated acreage of non-native ownership/jurisdiction includes the two cities, county, state, and private ownership (Table 4-5).

Table 4-5. Ownership Acreages of Habitat and Exotic Plant Dominated Vegetation

Exotic	City of Chula Vista	County of San Diego	Private	State of California	City of San Diego	Otay Water District	Unknown	San Diego County Water Authority
Arundo (giant reed)	2.54	0.03	4.79	--	6.30	--	0.63	--
Castor Bean	--	--	--	--	0.22	--	--	--
Chrysanthemum	2.80	--	5.40	--	0.62	--	0.18	--
Eucalyptus	2.79	8.96	11.75	0.01	27.04	0.11	0.65	0.05
Evergreen Ash	0.04	--	--	--	--	--	--	--
Mustard & Non-Native Groundcover	6.57	--	73.98	--	17.51	--	0.90	--
Myoporum Laetum	0.21	--	0.11	--	0.31	--	0.13	--
Olive Tree	0.04	--	0.10	--	0.03	--	--	--
Ornamental	0.52	0.01	8.12	--	--	--	5.91	--
Palm	0.09	0.08	0.15	0.00	0.34	--	0.02	--
Pampas Grass	0.85	--	0.02	--	1.27	--	0.04	--
Pepper	1.05	0.03	4.31	--	2.51	--	0.80	--
Silk Tree	0.21	--	--	--	--	--	--	--
Tamarisk	13.91	2.13	329.48	3.53	33.01	0.04	17.53	--
Tree Tobacco	--	--	0.00	--	0.70	--	--	--
Yucca	1.48	--	0.04	--	0.02	--	--	--
Total	33.1	11.24	438.25	3.54	89.88	0.15	26.79	0.05

5.0 CONTROL AND MANAGEMENT STRATEGIES

This section reviews current, appropriate, non-native plant control and management methodologies for non-native species covered by this Plan. It should be noted that the following described control methods are the current accepted strategies for non-native species. Before specific project implementation the proposed control and management methods should be reviewed and approved by the appropriate JEPA party. This section also includes a discussion of the use of seasonal flooding of reservoirs as a non-native plant control strategy.

5.1 SPECIES SPECIFIC INFORMATION AND REMOVAL METHODS

Tamarisk (*Tamarix sp.*)

Background

The plant genus Tamarix is comprised of about 54 species native to North Africa, the Mediterranean, and the Middle East. Most salt cedars, or tamarisks, are deciduous shrubs or small trees growing to 12-15 feet in height and forming dense thickets. Tamarisk is characterized by slender branches and gray-green foliage. The bark of young branches is smooth and reddish-brown. As the plants age, the bark becomes brownish-purple, ridged and furrowed. Leaves are scale-like, about 1/16 inch long and overlap each other along the stem. The leaves are often encrusted with salt secretions. From March to September, large numbers of pink to white flowers appear in dense masses on 2-inch long spikes at branch tips.

Tamarisk spreads vegetatively, by adventitious roots or submerged stems, and sexually. Each flower can produce thousands of tiny (1/25-inch diameter) seeds that are contained in a small capsule usually adorned with a tuft of hair that aids in wind dispersal. Seeds can also be dispersed by water. Seedlings require extended periods of soil saturation for establishment

Tamarisk is also a fire-adapted species and has long tap roots that allow them to intercept deep water tables and interfere with natural aquatic systems. Tamarisk disrupts the structure and stability of native plant communities and degrades native wildlife habitat by outcompeting and replacing native plant species, monopolizing limited sources of moisture, and increasing the frequency, intensity and effect of fires and floods. Although it provides some shelter, the foliage and flowers of tamarisk provide little food value for native wildlife species that depend on nutrient-rich native plant resources.

Control Methods

Seedlings can often be pulled out by hand; however, care needs to be taken to remove as many of the major underground roots as possible because the plant is capable of resprouting from roots even if the top parts and crown are removed. For this reason smaller trees should be herbicide treated not hand removed.

The preferred method of control for this species is to cut and remove all top growth down to approximately 6 inches above ground level and then to paint cut stumps immediately (within 5 minutes of cutting) with an appropriate herbicide. Care should be taken to wet the entire circumference of the exposed stump top cambium layer and at least six inches of outside bark layer with the herbicide. Isolated trees can also be girdled near their base, the cambium layer sprayed in the girdling area and the tree left to die in place. This approach can save significant removal costs. In instances where the species is dispersed through native cover, it is often better to cut back the trunk until it is about six inches above the level of adjacent native growth so that the treated trunk can be readily identified for retreatment if needed. The top six inches of trunk can then be sprayed with “Day-Glo” orange paint to make them easily identifiable in the field.

In order for herbicide treatments to be effective, follow up retreatments will be required. A flagging system needs to be used to mark the location of treated stumps of mature trees dispersed in existing native cover, so they can be relocated for retreatment. As mentioned above, leaving cut stumps protruding above

surrounding native groundcover and/or painting them with day glow paint is one effective marking method. Lath stakes or tying flagging tape to adjacent higher vegetation is also effective for such purposes.

There are glypsophosphate based herbicides that are effective for use in controlling tamarisk. Before using a specific brand of herbicide check to ensure the product is registered and the desired use area is appropriate. Non-registered herbicides that are not registered for aquatic use cannot be used within 1,000 feet of the ordinary high water mark of any open water bodies or within 1,000 feet of any drainage tributary to the Otay Reservoirs. Nevertheless, it appears many tamarisk stands found in the OVRP below Otay Reservoir Dam are located in dry enough areas to use this type of product especially during the summer dry season. Arsenic has also been shown to increase the effectiveness of glypsophosphate herbicides when used in combination with them. Any application of herbicides in the Otay Reservoir drainage basin will require notification to and consultation on an Application Plan with the City of San Diego Water Department.

If possible, plants should be killed before flower set (March to September) and flowering branches should be immediately removed from the site once cut. Herbicide treatments on cut stumps are quite effective and have often shown a 95 percent kill rate in the field. However, retreatments for resprouts and seedlings should be done within three to four months after initial treatment and at least every six months for a minimum of five years thereafter. The fact that the seed is short-lived (less than 45 days) (Neill 1996) and must reach highly saturated sites to germinate suggests that active removal of seedlings on an annual basis, especially during drought years can dramatically lower reoccurrence once initial removal takes place. However, since trees can reach seed bearing age within one year, follow-up maintenance must be thorough since only one missed tree can reseed an entire removal area.

There has been some recent success documented for biological controls on tamarisk. A species of leaf beetle (*Diorhabhda elongata deserticola*) has recently shown some promise on sites near Lovelock, Nevada (Carruthers, R. and DeLoach, J. 2004). But, at other sites further south, closer to the latitude of San Diego County, they have not proven effective. However, control from this arena may soon be forth coming.

For larger monotypic stands mechanical removal of plant tops and root crowns is often both economical and effective to clear a site for restoration; but, such approaches usually require herbicide follow-up to kill new seedlings and vegetative resprouts. Mechanical removals may also require archeological supervision if significant ground disturbance is anticipated.

Previous studies have documented numerous infestations of tamarisk in the Otay River Watershed outside the plan area (Merkel & Associates, Unpublished Data). However, the large majority (80 percent) of tamarisk occur in Areas 1 and 3 areas of the OVRP. For this reason, it should be possible to obtain good control of the species if a minimum five-year maintenance period and replanting with native species takes place after initial removal. This species seeds prolifically and repeatedly over the summer months (up to 250 million seeds per plant per year) and its seed are small and windborne. Buffer zones of at least 100 feet from other patches to be controlled later are recommended and are most effective when located down wind. Due to the extent of tamarisk dispersal throughout the OVRP, it may not be feasible to implement removals strictly in defensible sites.

Giant Reed (*Arrundo donax*)

Background

Arundo, also known as giant reed or wild cane, is a tall, perennial grass that can grow to over 20 feet in height. Its fleshy, creeping rootstocks form compact masses from which tough, fibrous roots emerge that penetrate deeply into the soil. Reproduction of giant reed is primarily vegetative, through rhizomes which

root and sprout readily. Leaves are elongate, 1-2 inches wide and a foot long. The flowers are borne in 2-foot-long, dense, plume-like panicles during August and September.

Giant reed chokes riversides and stream channels, crowds out native plants, interferes with flood control, increases fire potential, and reduces habitat for wildlife, including the Least Bell's vireo, a federally endangered bird. The long, fibrous, interconnecting root mats of giant reed form a framework for debris dams behind bridges, culverts, and other structures that lead to damage. It ignites easily and can create intense fires.

Giant reed can float miles downstream where root and stem fragments may take root and initiate new infestations. Due to its rapid growth rate and vegetative reproduction, it is able to quickly invade new areas and form pure stands at the expense of other species. Once established, giant reed has the ability to out compete and completely suppress native vegetation.

Control Methods

Giant reed is a species which depends on vegetative spread either through rhizome extension or through vegetative parts of the stem (rare) or rhizomes (most common), which break off from the parent plant, float downstream and then re-root at a new site. Plants have been known to set seed, but this is an infrequent occurrence and there is no evidence it is viable (Kelly 2002). Therefore, the primary means for giant reed suppression is through removal or killing of the rhizome parts of the plant. It is rare that these rhizomes can be killed with one treatment of any currently used method. In larger stands some parts of the rhizome always survive, re-sprout and require re-treatments. However, success of different removal methods has varied (Giessow et al. 2002). The Mission Resource Conservation District had success in removal of giant reed using this method (Judith Mitchell, pers. comm., March 2005).

Two general types of giant reed control are: Type I – smaller (0.25 acres or less) infestations with no revegetation and Type II – larger infestation (greater than 0.25 acres) requiring revegetation. The most appropriate method chosen will be dependent on site specific factors. These factors include the size of the infestation (isolated clumps or large monotypic stands), proximity to native vegetation, equipment access that doesn't cause significant damage to native vegetation (wetlands for example), biomass disposal sites (on-site mulching vs. off-site mulching or offsite land filling), season of the year, budget, and regulatory permitting issues. These different approaches are discussed in greater detail below:

1. Type I Giant Reed Control (Smaller Infestations and No Revegetation Planned)

    a. For smaller infestations not intermixed with native canopy. Giant reed stalks should be sprayed in the fall with the appropriate glyphosate formulation at a 5-7 percent dilution. This application has been shown to result in the best rhizome kill rate (95 percent), much higher than other methods (Giessow et al. 2002). Such stands can be retreated, again by spraying, as needed the following year. Dead stalks can then either be left to decompose (taking 2-3 years) or removed. Dead stalks, however, should not be cut until at least 6 months after spraying to permit the herbicide to translocate into the rhizomes. Premature cutting can stimulate a resprout response. Backpack sprayers or pressurized sprayers operated by licensed personnel, may need to use ladders to reach the top and center of such giant reed patches. Stalks too close to native vegetation are cut away to allow spraying without harming adjacent natives. This method is the least labor intensive and the most economical.

        Herbicide application must be done by licensed personnel following local municipal, County, and regulatory agency protocols. However, for the cutting and removal of stalks/rhizomes licensed personnel are not required.

        Small slash piles of cut stalks can be created on drier non-native exotic plant areas. Such slash piles rarely resprout (Santa Margarita and San Luis Rey and Mission Resource Conservation District web site: http://smslrwma.org).

b. For smaller infestations intermixed with native vegetation. The paint and cut method is the best control approach. Each stalk is cut as close to the ground as possible and then the stump is painted within 1 minute of cutting with the appropriate glyphosate formulation at 100 percent concentration. Resprouting stalks that are not killed by the first herbicide application will need to be resprayed at 1-3 month intervals using a 5-7 percent solution of the appropriate glyphosate or recut and repainted (with 100 percent glyphosate) to assure kill is complete. Such retreatments usually take several years to finally kill all of the rhizomes. Dead rhizomes and stalks can then be removed or left in place as mulch in the manner of option 1a.

2. Type II Giant Reed Control (Larger Infestations Requiring Subsequent Revegetation)

   Depending on site factors mentioned above, one or more of the following methods may be used.

   a. For monotypic stands not significantly intermixed with native canopy. Where time permits, spraying in the fall with the appropriate glyphosate formulation will continue to give the best overall control. Similarly, 6 (earliest) to 12 months (preferable) later, these stands can be cut down either by hand or by machine (where appropriate) and the biomass mulched and/or removed. Besides achieving a better kill of the rhizomes, this waiting period allows the plants to dry out, significantly reducing their weight, making for quicker cutting and mulching. Restoration plantings should not proceed until the revegetation biologist certifies giant reed removal is adequate. Respraying using a 5–7 percent solution of the appropriate glyphosate herbicide should take place when resprouts are approximately 36–60 inches in height during the active growing season. This is the recommended rate for deep-rooted perennials according to the label. Alternatively, resprouting stalks can be hand cut and painted as described above.

   b. Several types of heavier equipment can be used to cut down, mulch, and/or remove giant reed stalks and rhizomes, for monotypic stands not intermixed with native canopy where access permits use of machines. If rhizome removal is the goal, heavier equipment will almost always be necessary for larger areas of infestation. In areas of high soil moisture, such equipment can be mounted on swamp treads which spread the weight of the equipment such that its pressure in pounds per square inch (psi) on the ground surface is equivalent to or less than that of an adult walking on the site. Higher, drier, and sites less vulnerable to compaction from heavy equipment permit the use of standard construction equipment without swamp treads. This method is to be preferred for larger stands whenever possible, since it generally removes giant reed fastest and makes it much easier to install restoration plantings when the tough fibrous rhizome mat is removed. It should be noted here, that if heavy equipment is used a cultural resource monitor must be onsite during the field work.

      The different types of equipment used for giant reed removal and their methods include the following:

      - Excavator with grappling extension

        With this piece of equipment the giant reed is literally grabbed and pulled out of the ground in large chunks and deposited in a dump truck, then taken to a grinding site where it is mulched. A big advantage of this method is that much of the rhizomatious material is collected and removed off site. The remaining mulch can then be used on dry sites without significant resprouting (Tierra 2000). This method is much more economical than the hand removal of the same biomass of giant reed.

- Excavator with a mowing deck (flail or rotary)

  This type of equipment is used to cut down the giant reed stalks above ground. Pieces of the stalk which result from this mowing range from several inches to several feet in length. These fragments can either be removed from the site or left as mulch. Longer booms on such equipment are more efficient, since better results are obtained by being able to come down on the standing stalks (as much as 30 feet high) from above. The cut stalks can then be removed and mulched offsite. Alternatively, a smaller tractor with a power takeoff (PTO) driven flail deck can be used to mulch the cut stems further. A drawback to this method is that the resulting mulch cannot be efficiently removed from the site. This method only works well if the relatively large amount of mulch (which can range from six inches to two feet in depth after mulching) can be used on the site. For example, the mulch can be used to suppress exotic plant recruitment around container/cutting plantings. Another shortcoming of this method is that below ground rhizomes are neither killed nor removed; so, they have to be treated either before or after for removal.

- Bulldozers

  Bulldozers can be used to excavate the giant reed, rhizomes and all, and remove it to a mulching site. However, most such equipment does not come on swamp treads and is often not suitable for wetter sites because it will bog down and become stranded in the wetter soils.

- Tub Grinders

  On larger projects, tub grinders have been found to be more effective and efficient in mulching giant reed than most chippers/shredders. Even if machinery is used to remove rhizomes, there will be resprouts from pieces of rhizome left in the ground. These can be treated with the "cut and paint" or spray methods outlined above. A big advantage of removing most of the rhizome biomass is that the area that can be immediately planted is larger than with other methods, accelerating the restoration of native cover.

2c. For monotypic stands where machine access is not possible or desired, giant reed clones should be removed by first cutting and removing the stalks as close as possible to ground level and to the degree feasible (to be determined at the time of field implementation by project biologist) hand digging out the rhizomes and removing them from the site. All vegetative debris resulting from this process should be disposed of offsite so loose rhizomes are not carried by flooding to new locations. To kill the rhizomes which cannot be dug out, use the cut and paint method described above with subsequent follow-up at 1–3 month intervals (when resprouts are approximately 36–60 inches in height) until all rhizomes are killed.

No matter which type of control is used, follow-up spraying for resprouts should be done on an annual or biannual basis after the revegetation planting to minimize the reintroduction of this species. To the degree feasible, any remaining viable rhizomes should continue to be removed from the site as they are identified. In contiguous populations where only part of the population will be cleared, giant reed clones within 20 feet of the edges of all restoration sites should also be removed to assure sites are not reinvaded before riparian vegetation establishment.

In areas where giant reed rhizomes are not removed, they will likely cover the ground surface so thoroughly that nothing else will grow where they occur even if they are dead. These rhizome mats are very resistant to breakdown; so, unless they are mechanically or manually removed, nothing will grow where they persist. In areas where rhizome mats remain after the giant reed removal action, 12-inch

diameter planting holes will need to be augured through mats to a depth of 4 feet, rhizomes removed from the backfill, before container plants or cuttings can be successfully planted in the rhizome mats. The remaining rhizomes will then help prevent the germination of other non-desirable species near container plantings, prevent surface soil erosion, and help conserve soil moisture.

Palm and Non-native Broadleaf Tree

Background

The trees included in this section include non-native trees from a variety of species and don't necessarily have similar biology but have similar control strategies. It should be noted again, that any ground disturbing activities, including access routes, should be reviewed and approved by an archeologist prior to project implementation.

Control Methods

The primary means for palm and non-native broadleaf tree control will include felling trees and their surface branches, all possible seed, and surface leaf thatch will be removed from the site and disposed of in a legal manner. To the degree feasible, soil should be cleared to bare earth under the drip line of the tree. In order to remove all propagules from restoration sites and prepare an adequate seed bed for restoration, the existing native cover should be prepared. Tree stumps should be cut flush with ground level. Larger tree trunks and branches over 6-inches in diameter may be left on site so long as they do not interfere with restoration efforts. In areas where trees designated for removal are surrounded by native riparian woodland cover, removals will need to be conducted in a manner which avoids damage to this cover. Top growth will be removed from the site via pathways flagged by the revegetation biologist to create minimal damage to existing native cover. Mechanical equipment (e.g., trucks or cranes) will not be permitted if it will cause a loss of surrounding riparian cover. Trees will also be felled in a manner which limits damage to existing native cover to the greatest degree feasible. Removal methods will differ slightly for monocot and dicot species as follows:

1. Dicot trees stumps will be treated with an approved systemic herbicide to kill them in place unless it is considered feasible to mechanically remove them from a site. Repeat applications will be required to kill certain tough-to-kill species.
2. Monocots (palms) stumps will usually not receive herbicide treatment to kill them since this is unnecessary once they are cut off below their actively growing canopy. The exception to this rule is when the apical meristem is below the level at which the trunk can be cut off (e.g. small trees). In this case herbicide should be applied to the center of the cut trunk.

   In some situations where isolated trees exist or it is desirable to leave perching roosts for raptors, individual trees may be killed in place using a combination of girdling and herbicide injection into the cambium layer. In these cases, revegetation efforts will be implemented under the dead tree canopy.

When larger trees are removed all seedlings which are sprouting in the vicinity should be removed at the same time by either hand pulling or herbicide treatment. Herbicide spraying is more economical in killing seedlings where they are numerous. However, the preferred method of control for palm seedlings is hand pulling with care to remove the below ground seed nutlet.

Pampas Grass (*Cortaderia selloana*)

Background

Pampas grass is a perennial grass species imported originally from South America. It spreads quickly by means of wind blown seed which readily germinates on areas of bare ground. It does not spread vegetatively and seedlings are far more likely to be dispersed within and under existing native cover

rather than forming continuous colonies like giant reed. The species is particularly competitive on alkaline soil areas. Pampas grass occurs both inside and outside the OVRP. Therefore, its complete removal within the OVRP is unlikely. However, it can be removed and managed to low levels within the OVRP if proper management procedures are followed.

Control Methods

Control methods for pampas grass consist of the following:

1. Each clump should be sprayed with an appropriate formulation of glyphosate during the active growing season from March to August. Clumps may need to be resprayed a second or third time at 3-6 month intervals to assure kill is complete. Planting can either take place around dead plant crowns or crowns may be physically removed before planting. Generally the cutting of pampas grass tops before spraying is not cost effective; however, the physical removal of dead plant crowns may be necessary in areas of heavy infestation to revegetate a site.
2. Follow-up spraying for new seedlings should be performed on an annual basis. This is essential to remove newly germinating seedlings from seed blown into the site. If seedlings are small enough they can be hand pulled. Seed is short lived so only seed from the current season will likely germinate new seedlings. This is why it is also important to remove seed heads from plants before they set seed before when eventual removal is implemented.
3. In areas where pampas grass infestations are in direct contact with native cover, all plants will need to be hand cut or removed. If necessary after removal, herbicide spraying will be used to treat resprouting plant crowns of hand-cut removed plants; but only in situations where no herbicide will contact adjacent native cover.

Herbicide application must be done by licensed personnel; however mechanical and hand removal of plants or seed heads may be completed by unlicensed personnel.

Although it is desirable to remove the root crowns of pampas grass, as well as kill the clump, this is usually difficult to accomplish without using mechanical equipment which can damage adjacent native vegetation either during access or actual removal. However, to the degree feasible, the root crowns of this species should be removed to avoid re-sprouting.

Tree Tobacco (*Nicotiana glauca*)

Background

An open shrub or small tree with few branches, the yellow, trumpet-shaped flowers tending to spread or hang on slender branches. The flowers are long, slender, yellow tubes and many grow on the ends of stems. It is pollinated by long-tongued insects and hummingbirds.

Control Method

Tree tobacco shrubs can be controlled in a manner similar to palm and exotic trees by cutting them off at ground level and treating the stumps with a 25 percent formulation of glyphosate applied to the cut stumps. Seedlings can usually be hand pulled or large infestation removed with a 2 percent glyphosate spray application. In general only one herbicide treatment is required to kill larger plants in this manner. Smaller plants can often be hand pulled. However, because this species is primarily spread by light seed which is easily moved by wind and there are substantial occurrences of the species outside the OVRP, a thorough follow-up effort needs to be made annually to remove reoccurring seedlings. The species most easily establishes in bare disturbed sites with little vegetative cover, so an active revegetation program is essential after its removal to prevent reinvasion.

Castor Bean (*Ricinus communis*)

Background

Castor bean is native to warmer parts of Asia and Africa. Castor bean is a perennial shrub, sometimes tree-like, three to fifteen feet tall, with large, palmately lobed leaves and sharply toothed leaf margins. The leaves are usually deep green, but in some strains they have a reddish cast. The stems are smooth, round, and frequently red, with clear sap. The flowers are small and greenish, with both male and female flowers on the same plant. The fruit is a quarter-sized, round, spiny capsule, often reddish, containing up to three shiny, smooth, mottled seeds that resemble ticks. Castor bean is frequently found in riparian areas where it invades and displaces native vegetation.

Control Method

Castor bean shrubs can be controlled in a manner similar to exotic trees by cutting them off at ground level and treating their stumps with a 25 percent formulation of glyphosate applied to cut stumps. Seedlings can usually be hand pulled or large infestations removed with a 2 percent glyphosate spray application. In general only one herbicide treatment is required to kill larger plants in this manner; however, repeat sprayings are often required for tough-leaved young seedlings. Smaller plants can often be pulled out by hand. After treatment of larger plants, a thorough effort should be conducted to remove seedlings, mature seed pods, and seed dropped on the ground under larger plants during the removal process.

5.2 FLOODING AS A NON-NATIVE PLANT CONTROL STRATEGY

Temporary flooding around Upper and Lower Otay Reservoir could be used as a non-native plant removal strategy. It was observed that many eucalyptus and tamarisk seedlings have sprouted in recently lower bank areas around the lake. Raising water levels in the lake for at least 45 days to above the level these seedlings occur should kill them. Larger plants, which protrude above the high water levels of the lake, will be more assured of kill if they were cut back below high water levels before flooding. This strategy will probably work best in Upper Otay Reservoir because this is a secondary reservoir system that is routinely flooded by winter storm events. Holding water supplies in this region of the lake for longer periods after storm events could significantly decrease undesirable non-native plant infestations around Upper Otay Reservoir. Flooding for long periods of time may be more difficult to maintain for the Lower Otay Reservoir because it is a primary supply reservoir where levels more frequently vary.

5.3 SHORT AND LONG-TERM NON-NATIVE PLANT MANAGEMENT STRATEGIES

In the short-term, active replanting of native species is specified for most non-native plant removal areas to reduce the potential for non-natives to reinvade the larger sites. Specific planting, irrigation, and monitoring requirements will likely be specified within permit conditions or within the MSCP. What has become a relatively standard permit condition is to have a 5-year maintenance period for each restoration project implemented under the Plan. However, because many sources of invasive non-native plant propagules will remain both inside and outside the Plan area, an ongoing non-native plant maintenance program with a 3–5 year repeating cycle should be implemented after the initial 5-year post-removal maintenance period to minimize reestablishment of invasive exotic plants in restored areas.

For the long term management of non-native species, it is important to for City and County planners to condition all projects adjacent to the river corridor in such a was as to forbid the planting of such species near riparian corridors or open space. Within the City of San Diego, projects should be consistent with City of San Diego Landscape Guidelines. In addition, projects within the City of Chula Vista must be consistent with the requirements of the Chula Vista MSCP Subarea Plan and the Otay Ranch Resource Management Plan (RMP). If possible, the JEPA party's should consider creating financial and other incentives to convince property owners to remove existing invasive exotics from their property and to

replace them with non-invasive species. To the degree feasible, JEPA should initiate coordination efforts with other public agency and private ownerships within the OVRP for removal of targeted non-native plant species on their properties or easements. The JEPA members should also develop educational protocols to help the public, especially adjacent property owners, understand the need for non-native species control in order to create and maintain a healthy riparian ecosystem.

6.0 SITE PLANNING AND SELECTION GUIDELINES

This section will provide an outline for the site planning and the site selection process for restoration projects. These guidelines should be used for restoration projects and mitigation projects within the OVRP. However, any projects conducted for mitigation purposes may require additional CEQA review and permit conditions. CEQA includes an exemption for Small Habitat Restoration Projects (Section 15333). This Exemption only applies to projects that do not exceed five acres. Therefore, restoration is separated into two types of projects as described below, one for projects greater than or equal to five acres, and one for projects smaller than five acres. It will be the responsibility of the appropriate jurisdiction governing the land where the project is proposed to determine if the specific implementation conditions of the project.

6.1 BASIC REQUIREMENTS FOR ANY PROPOSED PROJECT

Below are the six basic requirements for all restoration projects in the OVRP:

- A Designated Project Manager or Project Point-of-Contact.
- Project Biologist
- Cultural Resource Specialist*
- Qualified Herbicide/Pesticide Applicator**
- Verification of Jurisdictional Compliance from the County of San Diego, City of San Diego, or City of Chula Vista
- Verification of Resource Agency Notification***

6.1.1 Responsibilities of the Designated Project Manager

The Project Manager is the main point of contact for specific project planning and implementation. The Project Manager will be responsible for jurisdictional and regulatory compliance, ensuring the qualifications of project personnel including the Project Biologist, Herbicide/Pesticide Applicator and Cultural Resources Specialist. In addition, the Project Manager is responsible for providing verification of agency notification and securing any necessary agency permits. The Project Manager shall provide copies of all agency notifications and/or permits to the appropriate jurisdiction, Installation Contractor and Project Biologist.

6.1.2 Responsibilities of the Designated Project Biologist

The Project Biologist is responsible for identifying and reporting on the existing site conditions to the Project Manager. The Project Biologist should develop a site-specific implementation plan in compliance with the requirements of the appropriate jurisdiction and/or agency and in compliance with this document. At the completion of the installation phase of the project, the Project Biologist should certify that any non-native plant removal, irrigation installation and planting have been done in accordance with the approved plans and specifications.

Qualifications for Project Biologist should include verified experience with at least two successful restoration projects.

6.1.3 Cultural Resources Specialist

The Cultural Resources Specialist is responsible for identifying and reporting cultural resources sites within the proposed project site. In addition, they are responsible for providing avoidance measures and/or mitigation measures. In addition, the Cultural Resources Specialist is required to be on site during

all ground disturbing activities, unless it is determined otherwise by the specialist working on a specific project.

Qualifications for Cultural Resources Specialist should include meeting the Secretary of the Interior Standards for cultural resources experts.

* A Cultural Resource Specialist would only be a requirement if 1) the project proposed ground disturbing activities and/or 2) the project was located within or adjacent to a recorded site.

6.1.4 Responsibilities and Qualifications of the Qualified Herbicide/Pesticide Applicator

The Herbicide/Pesticide Applicator is responsible for the safe and appropriate use of any herbicide/pesticides that utilized for restoration projects.

Qualifications for the Herbicide/Pesticide Applicator include certification as a California Pest Control Applicator and previous successful experience with at least two freshwater wetland and / or upland restoration project installations, as appropriate.

** A qualified herbicide/pesticide applicator would be required only if the project proposed the use of herbicides or pesticides.

6.1.5 Verification of Jurisdictional Compliance

The Project Manager shall work with the applicable jurisdiction (County of San Diego, City of San Diego, or City of Chula Vista) to ensure project compliance with any jurisdictional requirements and/or permit conditions.

6.1.6 Verification of Resource Agency Notification

The Project Manager shall notify resource agencies such as the California Department of Fish and Game, the Regional Water Quality Control Board, the U.S. Army Corps of Engineers and/or the Coastal Commission if impacts to resources under their respective jurisdictions will occur due to implementation of a project and obtain permits, if required.

*** Resource Agency Notification is only required if the project proposed impacts to jurisdictional wetlands or non-wetland waters.

6.2 PROJECTS LESS THAN FIVE ACRES

Restoration projects less than five acres must meet the above implementation requirements. At their discretion, the applicable jurisdiction and/or resource agencies may require additional project conditions.

6.3 PROJECTS OF FIVE ACRES OR GREATER

Restoration projects of five acres or greater must meet the requirements listed in Section 6.1. In addition, it is recommended that projects greater than 5 acres are implemented in compliance with the following guidelines:

6.3.1 Landscape Architect

A Landscape Architect, with technical input from the Project Biologist should prepare restoration construction documents to implement restoration projects within the Otay Valley Regional Park (OVRP) greater than five acres. The Landscape Architect should be responsible for obtaining any required approvals of these plans from the appropriate jurisdiction

Qualifications for the Landscape Architect shall include a valid licensed to practice in the State of California and at least 3 years of successful experience with the design and construction management of wetland/upland native plant restoration programs.

6.3.2 Installation Contractor

An Installation Contractor should be responsible for carrying out the removal of non-native plant materials and the installation of restoration landscaping in accordance with the landscape plans and specifications, as approved for the restoration project. Typical responsibilities of an Installation Contractor include site protection, site preparation, planting, seeding and installation of an irrigation system, as required on a project specific basis per the plans and specifications.

Qualifications for the Installation Contractor should include a valid "A" or C-27 General Contractor's license within the State of California, and previous successful installations of at least five freshwater wetland and/or upland restoration projects.

6.3.3 Maintenance Contractor

Upon completion of the plant establishment period, acceptance of the project by the appropriate jurisdiction and certification of the Project Biologist, the project may enter the plant maintenance phase.

Qualifications for the Maintenance Contractor should include a valid "A" or C-27 General Contractor's license within the State of California, and previous successful maintenance of at least five freshwater wetland and/or upland restoration projects.

6.4 PRECONSTRUCTION MEETING

A pre-construction meeting with the Project Manager, Project Biologist, Installation Contractor, Herbicide/Pesticide Application and any other pertinent parties shall take place before the start of any activity on site. All aspects of project implementation including, but not limited to required site inspections, approvals and certifications, site protection, permit requirements, landscaping procedures, plant establishment periods and guarantees should be discussed and clarified at the pre-construction meeting.

6.5 PROJECT SITE INSPECTIONS

The Project Manager, Project Biologist and Cultural Resource specialist should confirm the limits of work in the field with the Installation Contractor before the start of work.

The Cultural Resource Specialist is required to be on site during all ground disturbing activities. At a minimum, inspections should be conducted by the Project Manager and Project Biologist at the completion of non-native plant removal, the completion of site preparation and at the completion of installation of irrigation.

Upon completion of the irrigation system the Installation Contractor should perform an irrigation pressure test and coverage test. No planting or seeding should take place until verified completion of an irrigation pressure test and coverage test has occurred and been accepted by the Project Manger, in writing.

The Project Manager or Landscape Architect should inspect all plant materials upon delivery to the project site and should approve, in writing the health, species of the container materials and/or cuttings. The Installation Contractor should be required to provide to the Project Manager written verification ("trip ticket") from the driver of the hydroseed truck confirming seed mix and sourcing at the time of delivery.

All plant materials/seed should be planted in the correct ecological locations as indicated on the project drawings.

A site inspection by the Project Manager and Project Biologist should occur before the start of the plant establishment period, at established intervals during the plant establishment period and at the end of the

plant establishment period, prior to final written acceptance and certification of the installation phase of the project.

6.6 SITE ACCESS

Access routes to each restoration site should be clearly defined on the project construction plans. In determining appropriate access to the project site, the Project Biologist, Landscape Architect and Project Manager shall consider routes that allow for effective execution of all required non-native plant removal and access activities while limiting damage to desirable native vegetation and cultural resources. In addition, all proposed access route shall be approved by the appropriate jurisdiction. Due to the sensitive nature of restoration projects, the use of mechanized equipment utilized to create site access must provide for the minimum width possible, thus resulting in the lowest possible impact to the surrounding area.

6.7 SITE SELECTION GUIDELINES

Based on the considerations outlined, the following factors should be used in selecting restoration sites in the OVRP:

1. Ownership

   As previously stated there are a variety of public and private land owners within the OVRP. This Plan provides guidance for all parties restoring habitat inside the OVRP. Define Areas for Control Away From Other Non-Native Plant Populations

   To minimize reinvasion, sites adjacent to those where non-native plant control or habitat restoration has already occurred are preferred. Ideally all non-native plant control projects should occur in areas which are defensible against reinvasion from adjacent public and private properties. The edges of sites selected for non-native plant control should, to the degree feasible, be as great a distance as possible from sites with populations of non-native plant species. When selecting a site, the Landscape Architect or Project Biologist should take into account the non-native species reproduction ecology. For example, a 20-foot buffer is usually defensible for the vegetative spread of giant reed while a 200–300-foot buffer may be appropriate for wind disseminated species like tamarisk and pampas grass.

2. Eliminate Highly Invasive Non-Native Plants First

   Priority should be given to removing the most invasive non-native plant species. However, all non-native species should also be removed in conjunction with the dominant non-native species since less conspicuous species are likely to fill the ecological gaps.

3. Eliminate Small Populations of Species Which Have a High Potential for Spreading

   High priority should be given to eliminating species that currently have a very limited distribution within the OVRP, but a pose a high potential for future spreading.

4. Focus on Areas with the Highest Concentrations of Difficult to Control Species

   High priority should be given to eliminating the most extensive patches of giant reed and tamarisk.

5. Evaluate the Cost Benefits of Non-Native Plant Removal vs. Restoration

   Because the removal and active restoration of larger populations costs considerably more to implement than removal of smaller populations, when funds are greatly limited consider removal of small non-native plant populations surrounded by native plant species that are likely to reinvade the removal area. Because of the high likelihood that germination of volunteers from the surrounding native cover will be adequate to reestablish the population; small projects of this type

may not require the added costs of restoration. In addition, small areas of non-native plant control can often be implemented at minimal cost through the use of volunteer or regular maintenance staff efforts.

While non-native removal and habitation restoration of larger sites is most desirable, for projects with strict funding limitations, removal of small non-native plant populations surrounded by native plant species that are likely to reinvade the removal area can provide a valuable contribution to improving the habitat within OVRP, as well.

7. Consider Jurisdictional Controls and Resources

   Identify any specific jurisdictional authority for a given project area. Jurisdictions with streamlined processes can aid in moving a project forward in a timely manner. In addition, jurisdictions with technical experts on staff may be able to provide a higher level of project support.

8. Evaluate Publicly Supported Sites

   High priority should be given to sites with the highest level of public support. These are likely to be sites which have the least development along their edges and are covered with species the public does not perceive as desirable.

9. Consider the Cumulative Effects on Other Restoration Projects

   Site access planning should be implemented carefully so that restoration of easily accessible sites does not prevent access to other sites in the future.

10. Consider Availability of Water

    High priority should be given to large non-native plant removal sites which are easily accessible (i.e., within 200 feet of the site edge) to a municipal or well water supply. Implementation of non-native plant removal efforts in a manner which avoids reliance on water truck supplied irrigation systems is preferred, if feasible.

11. Consider the location of Archeological/Historically Sensitive Areas

    Select non-native plant removal sites that will have the least impacts to archeological/historical sites. While the Cultural Resource Specialist is required to be on site during all ground disturbing activities, projects taking place on sensitive sites that are known to be archeologically or historically significant will require a higher level of monitoring.

7.0 INSTALLATION AND MAINTENANCE GUIDELINES

Maintenance and installation requirements may vary on a project-by-project basis. Project sites that are less than 5 acres will need to comply with installation and maintenance conditions as set forth by the applicable jurisdiction and resource agencies. Project sites that are five acres are greater will usually require compliance with more formalized installation and maintenance requirements. This section outlines the optimal approach, and identifies necessary guidelines and conditions for restoration projects. It is expected that the appropriate jurisdiction will review the guidelines below on installation and maintenance and incorporate these guidelines into the project conditions.

Installation Methods for Projects Less Than Five Acres

While all projects are required to meet the conditions as set forth by the appropriate jurisdiction and agencies, the approach outlined in this section is generally applied to project sites that are less than five acres in size and are located in areas of non-native plant species infestation surrounded by native vegetation cover which is close (within 3-5 feet) to the water table. Under these conditions, the surrounding native vegetation can reasonably be expected to reinvade the site by root or stem sprouting, by seed, or by canopy expansion.

Such areas usually benefit from the clearing of ground to bare soil (where possible) in areas of non-native plant removal followed by hand seeding of appropriate understory species less likely to volunteer or invade the site. If it is not economical to irrigate these areas, then seeding should be done at times of the year when natural precipitation is likely to germinate seeds.

For sites that require grading to re-establish the appropriate topography, consideration should be given to active site restoration, including the use of container plants, seeding, and irrigation. Such sites are usually vulnerable to erosion and reinvasion of removed non-native plant species if they are not revegetated immediately. Container plantings, seed, and temporary spray irrigation (2-4 years) should be used on sites to reestablish native cover after non-native removal.

Installation Methods for Sites Five Acres or Greater

While all projects are required to meet the conditions as set forth by the appropriate jurisdiction and agencies, the approach outlined here is for generally applied to sites 5 acres or greater, which may be in riparian or upland areas. In many areas of the OVRP these sites are characterized by both a non-native groundcover as well as a non-native overstory of trees or large shrubs such as tamarisk.

It should be assumed that multiple cycles of non-native plant removal will be required before restoration can be attempted on such sites, since the annual non-native plant species which dominate these sites have a long seed life in the soil bank. When the site is ready for restoration, a mixture of seed and container plants should be used. The container plants should include a mixture of native species to ensure a diverse population within the restored area. In addition, it is expected that supplemental irrigation will be required in order for these types of restorations to meet success criteria within three to five years. The irrigation may include a spray system for the seed areas, but could include drip or bubbler irrigation for larger container plant. Where possible, irrigation lines should be laid on the surface to create the least disturbance to the seeded areas.

7.1 SITE PREPARATION AND GRUBBING

The following site preparation guidelines may be used for both small and large restoration sites. Temporary surface soil disturbances caused by non-native species removals (such as those required to remove giant reed rhizome mats) will be returned to their original contours after non-native plant removal is completed. No surface soil will be removed from restoration sites nor will any fill soils be brought in to any restoration sites unless approved by permit conditions. If recommended by the Project Biologist, and

to the extent feasible without damaging existing native cover, areas intended to be planted will receive surface scarification to a minimum depth of three inches prior to seeding to maximize the potential for successful seed germination.

7.1.1 Erosion Control

Erosion control for project sites greater than one acre will be specified within the project SWPPP and on the erosion control plans, however on smaller projects erosion control should also be used to prevent any sediment from leaving the project site. Prior to project implementation there should be verification with the local jurisdiction of any local erosion control requirements. These requirements may be related to how long bare soil may be allowed to stand without requiring a specific type of cover, or what specific types of erosion control best management practices may only be used under specific conditions.

7.1.2 Fencing and Signage

The Installation Contractor will assure that access to all restoration sites is protected. This protection may be necessary to prevent vandalism. Protection can be provided by temporary fencing to protect the restoration plantings from damage during installation and long-term maintenance. The Project Manager, the Project Biologist, or Landscape Architect will determine the need for fencing and when it could be removed.

Temporary signage approved by appropriate jurisdiction may also be recommended if needed to prevent damage to restoration plantings and irrigation systems. Signage should indicate the site is a restoration site and unauthorized personnel should not enter.

7.2 IRRIGATION

Temporary spray irrigation will be installed according to the construction documents at restoration sites to assure the survival and robust growth of restoration plantings. This system may be installed above or below grade as considered appropriate by the Project Biologist and Landscape Architect. The irrigation water supply may either be from water truck or connections to municipal sources. In limited areas, hand-watering may be approved by the Project Biologist. It is expected that if municipal water sources are used, an automatic controller or battery operated valve system will be part of the irrigation system.

7.2.1 System Operation

The Installation Contractor will ensure sufficient water is supplied to all plantings to establish and maintain them at a healthy rate of growth. If an irrigation controller is used, the Project Biologist will give recommendations on the cycle start and run times for all valves. Recommendations will be given, if necessary, by the Project Biologist to the Maintenance Contractor for adjustments to the watering frequency to assure restoration planting success.

Based on an analysis of annual growth data, the Project Biologist will make a recommendation as to when to terminate supplemental irrigation for restoration plantings. All plants must survive and grow for at least two years without supplemental water during the restoration phase of the project.

7.2.2 System Repair

The Contractor will be responsible for the regular maintenance and repair of all elements of the irrigation system. The Maintenance Contractor will make general system checks at least every month at the individual restoration sites from April to November and as needed at other times of the year to assure irrigation heads are operating properly and coverage is adequate. Checks are not necessary during periods when the system is not in operation per the recommendations of the Project Biologist.

7.2.3 System Removal

When irrigation is discontinued at each of the restoration sites, the Contractor will be responsible for removing all above-ground parts of the irrigation system.

7.3 TRASH AND DEBRIS REMOVAL

All trash and debris shall be removed by the Contractor from restoration sites at least once every three months throughout the potential five-year maintenance period. All dead limbs and/or fallen trees shall be left in the restoration areas unless they interfere with the growth of restoration plantings. All debris that is removed shall be disposed of outside of restoration areas at approved landfill facilities.

7.4 MOTORIZED VEHICULAR ACCESS

Most of the restoration sites will not be accessible by vehicle after restoration is complete. Maintenance access to the restoration sites shall be limited to the minimum necessary for non-native plant and trash removal. All other vehicles shall be parked outside the restoration sites at all times. The Project Biologist shall delineate service access routes, and the Contractor shall be expected to stay within their confines. No vehicular fluids will be changed, or added to maintenance vehicles while they are parked in restoration areas.

7.5 PLANTING SPECIFICATIONS

7.5.1 Contract Ordering

Contract arrangements for all container plant materials and seed required for restoration work should be made by the Installation Contractor at least four months before the expected planting date. The Contractor should provide the Project Biologist with written verification of this contract. All container plants will be grown in the sizes specified in the landscape documents. An additional five percent of the total number of each container species specified for planting will be grown as replacements for dead plants. Contract growing will be conducted by an experienced native plant nursery or seed company with a minimum of five years of native plant growing experience.

7.5.2 Sources of Plant Materials

It is preferable that the source of all propagules and seed used at a restoration site be secured from wild sources within San Diego County that are as close to the restoration site as possible. Plant and seed material used in project plantings should (when possible) be collected from plant parent material located with an approximately 30-mile radius of the project site in order to ensure genetic integrity and long-term planting success. Ideally, plant material should be collected from within the Park. Any deviations from such sources should have prior approval by the Project Biologist.

7.5.3 Substitutions

Substitutions may be allowed in the event that a specific plant species for an area my assist with the recovery of a sensitive species (i.e., Quino checkerspot butterfly). However, during installation no substitutions of any species, quantity, or container size specified in the final landscape construction documents will be allowed unless approved in advance by the Project Biologist. If the Installation Contractor is unable to obtain the specified container plants or seed at the time of planting, commencement of the guarantee period will be delayed until all plants specified are planted or substitution plants are approved by the Project Biologist.

7.6 DEAD PLANT REPLACEMENT

Dead plant replacement is commonly identified within specific regulatory permit conditions. However, if a specific project does not have dead plant replacement mentioned, the following may be used as a guideline for dead plant replacement. The Contractor shall be responsible for the replacement of all plant materials considered dead or diseased by the Project Biologist. Dead and diseased plants will be flagged in the field by the Project Biologist and a list provided to the Contractor for replacement. All dead plants will be replaced in kind (original size and species) unless otherwise approved by the Project Manager and the Project Biologist.

7.6.1 Container Planting Practices

All plant materials/seed should be planted in the correct ecological locations as indicated on the construction documents.

Container plants will be planted using standard horticultural practice, utilizing a hole twice the diameter of the rootball and leaving the plant crown two inches above grade after planting (except for willows whose crowns can be left at grade). All plants will be thoroughly watered in their pots before planting. Likewise, the soil in all planting holes will be wetted before planting.

The backfill mix will contain only native soil mixed with 7 lbs. per cubic yard of an approved slow release fertilizer (18-6-12). All rocks greater than two inches in diameter or any giant reed rhizomes will be removed from the backfill prior to planting.

For all plantings at elevations above normal flood flow (on banks or islands) a six-inch-high soil berm at a distance of one and a half feet from the plant crown will be installed and a three-foot diameter by four-inch deep layer of weed-free chipper mulch will be applied around each container planting to control non-native plant growth during the plant establishment period. Pin flags will be placed near each cutting after installation to be used for monitoring purposes.

No pruning or staking of container plant materials will be allowed unless specified by the Project Biologist. Staking will be removed as soon as trees can support themselves.

7.6.2 Cutting Planting Practices

Cuttings will be taken from dormant wood no larger than ¾-inch and no smaller than ¼-inch in diameter from which all leaves have been removed. Cuttings will be twelve to eighteen inches in length and will include at least five leaf nodes. The top of the cutting will be cut at a slant to stem growth while the bottom will be cut perpendicular to the stem. The cuts will be approximately 1-inch below (bottom) or above (top) a leaf node.

Cuttings will be forced or shovel planted into the soil surface to a depth of at least six inches and sufficient to cover at least two leaf nodes below the soil surface. A minimum of two leaf nodes will be left above the ground surface. No fertilizer will be used in the planting process. No planting basins will be constructed around cutting locations; however, pin flags used to mark initial plant locations will be left in place to monitor cutting success.

7.6.2.1 Overstory Planting

The following is an overview of potential overstory plant species used in restoration. The existing riparian overstory species currently found in the OVRP area will be used for wetland habitat overstory plantings. These species include arroyo willow (*Salix lasiolepis*), black willow (*Salix gooddingii*), red willow (*Salix laevigata*), lance-leaf willow (*Salix lucida sp. lasiandra*), sandbar willow (*Salix exigua*), mulefat (*Baccharis salicifolia*), Fremont cottonwood (*Populus fremontii*), western sycamore (*Platanus racemosa*) and coast live oak (*Quercus agrifolia*). The Fremont cottonwood will be used more commonly on sites

west of Otay Reservoir Dam while the western sycamore will be found more commonly in the upper river valley above the dam. In addition, several riparian corridor edge species including, leafy burrobush (*Hymenoclea monogyra*), toyon (*Heteromeles arbutifolia*), lemonadeberry (*Rhus integrifolia*), laurel sumac (*Malosma laurina*), California blackberry (*Rubus ursinus*), southwestern spiny rush (*Juncus acutus spp. leopoldii*), Brewer's saltbush (*Atriplex lentiformis ssp. brewerii*), desert grape (*Vitis girdiana*), California rose (*Rosa californica*), and Mexican elderberry (*Sambucus mexicana*) will be added to slightly higher and drier areas of the floodplain to add habitat diversity.

7.6.3 Seeding Specifications

Seeding of riparian understory species and upland coastal sage scrub species will be done after the completion of non-native plant removals for the smaller restoration sites and after container planting for the larger restoration sites. For smaller sites seed will be hand sown and then raked into the soil surface. For larger sites hydroseed will typically be used. Seeding will only take place in bare ground areas of the project where non-native plant control and ground scarification have been completed to the satisfaction of the Project Biologist.

Seed quality should be the best obtainable in the year of application for both purity and germination and will meet the pure live seed (PLS) requirements specified in the seed mix. No seed will be more than one year old when applied. Amount of seed purchased, source, germination, and purity of seed will be provided in writing to the Project Biologist by the Contractor.

7.6.3.1 Understory Planting

The recommended wetland revegetation seed mix for understory planting focuses on native species easily established from seed which are likely to be found in the OVRP. This mix should be expected to establish easily during the first year after sowing and prevent annual non-native plant invasion of the understory while the overstory canopy cover becomes established. Many of the species used are also clonal and therefore will naturally spread to fill in bare areas after establishment. In the long-term when canopy cover matures the understory cover will decrease as ground layer shading increases.

For upland sites where native cover is appropriate, it is recommended that an upland seed mix be used in combination with the container plantings of larger coastal sage scrub species such as laurel sumac and lemonadeberry. In addition, if regrading is not possible for previously disturbed areas of the floodplain, this mix will also be used to revegetate upland "hummocks". This seed mix contains upland coastal sage scrub species easily established from seed as well as Zorro fescue (*Vulpia myuros*) for initial erosion control. The larger evergreen shrubs which do not germinate easily from seed will be planted from containers. Most of these areas will be revegetated using a small site revegetation approach accompanied by supplemental irrigation to establish plantings. Unlike most wetland restoration sites, upland sites will require repeated irrigation periods before planting to germinate latent annual non-native plant seed and allow for removal of new non-native plant seedlings before planting took place.

7.6.4 120-Day Plant Establishment Period

Standard industry practice is to require that plants be monitored for 120 days by the Installation Contractor. During this 120 day Plant Establishment Period, at a minimum the Installation Contractor will be responsible for the regular maintenance of all installed plantings and seeding including irrigation, weed control, pest control, dead plant replacement, fencing, signage, and trash removal as required to assure the health and active growth of all restoration plantings. At a minimum, the Installation Contractor will make general irrigation system checks twice a week for the first month after installation to assure heads are operating properly and coverage of hydroseeded areas is adequate. Thereafter, the Installation Contractor will check system operation at least once a month, except when the system is not in operation at the direction of the Project Manager with the recommendation of the Project Biologist.

Control of all non-native species will continue at intervals of no more than ten days through the Plant Establishment Period including all species designated for initial removals and all non-native herbaceous weed covers. Additional contractual obligations may exist.

Prior to the end of the Plant Establishment Period, the Project Manager will prepare a punch list of items needed for completion and will identify in the field any dead or diseased plant materials requiring replacement. Upon completion of the punch list items and replacement of any identified plant materials, the Project Manager and Project Biologist will accept the project and certify installation as complete.

7.6.5 Container Plant Guarantees

All plants determined by the Project Manager or Project Biologist to be dead or diseased will be replaced before the end of the Plant Establishment Period by the Contractor. Unless substitutions are approved by the Project Manager and Project Biologist, replacement plants will be of the same size and species as originally planted.

7.7 SCHEDULING

7.7.1 No Impacts to Endangered or Threatened Species/Migrating Bird Species/Raptors

To ensure that there will be no impacts to sensitive species, the specifications of the appropriate jurisdiction (County of San Diego, City of San Diego, or City of Chula Vista) MSCP, and any other applicable local, State and regulations, should be followed.

7.7.2 Revegetation Scheduling

Seeding for all sites should ideally take place near the end or beginning of the rainy season when the potential for heavy rainfalls which might wash seed away is least likely; yet there is a good probability of smaller storms germinating seed. For similar reasons, when possible, container/cutting planting should also take place outside the heaviest rainfall months of January and February. No other seasonal restriction need apply to these projects. This installation schedule should also minimize erosion at the restoration sites.

7.8 FIVE-YEAR MAINTENANCE PROGRAM FOR RESTORATION AREAS

7.8.1 NON-NATIVE PLANT CONTROL

Non-native plant control is crucial to project restoration success. The success of the current restoration strategy proposed by this Plan depends upon the control of all non-native species within the restored areas. Because of the importance of non-native plant control to the overall success of this project a minimum of monthly maintenance visits will be made on large restoration sites the first two years after project planting and then a minimum of quarterly visits for the remainder of the maintenance period. No weed whipping will be permitted in the restoration sites unless approved in advance by the Project Biologist for use in limited areas. The Contractor is to be held responsible for reseeding or replanting if non-native plants are not removed on a timely basis, thus hampering or preventing the establishment of hand seeded species or container plants. A timely basis shall be understood to be within one week of written recommendation by the Project Biologist. More frequent non-native plant removal may be required as necessary, and recommended by the Project Biologist, to keep non-native plants at a manageable level.

7.8.2 Nesting Bird Avoidance for Follow-up Exotic Plant Control

During the avian nesting season from March 15 to September 15, a qualified biologist will survey any restoration sites where follow-up control is required no more than three days prior to implementation of control activities to verify nests or eggs are present in areas of control. If nests are present they shall be

flagged by the biologist and exotic plant control activities delayed within 100 feet of the nest (500 feet for raptors) until it is no longer in use.

7.8.3 Container Plant/Cutting Non-Native Plant Control

On larger restoration sites the most important area of non-native plant control will be around container plantings. The Contractor will continue to maintain a two-foot-diameter, weed-free area around each container planting for the first two years after planting. After the winter rainy season is over the contractor will replenish any chipper mulch applied at the time of original planting for two years after planting to aid in non-native plant control.

7.8.4 Invasive Non-Native Species Removal

The Contractor will continue to focus on removal of all highly invasive non-native plant species from the restoration areas. Species to be focused on for this control effort include all those originally specified for removal and control. Since the seedlings of many of these species are especially difficult to control, herbicide use will be necessary. Repeat herbicide applications may also be required on larger plants or tree stumps left in place. Juvenile plants of targeted non-native plant species are to be removed with their roots if feasible before herbicide use is attempted.

7.8.5 Annual Non-Native Plant Species Removal

During the maintenance period, the Contractor shall continue to treat all areas of heavy annual exotic plant infestation with herbicide applications for the first two years after planting at each restoration site. At other times, non-native plant growth will be kept at least six inches below the height of all container/cutting plantings or below twelve inches in height (whichever is lower). The Contractor shall avoid treating areas of native seedling establishment with herbicide. The Contractor shall be responsible for distinguishing between noxious weeds and desired planted and seeded plants and native volunteers. The Project Biologist will assess areas from which non-native plants are removed and will make recommendations for the supplemental seeding of these areas with native understory species if necessary.

Volunteer native seedling recruitment will also be examined and, based on the Project Biologist's recommendation the Contractor will avoid using herbicide in areas of native seedling establishment for non-native plant control. Hand removal methods may be recommended for these areas in order to better foster native volunteer growth. Extreme care will be taken at all times to avoid herbicide drift onto restoration plantings or preexisting native cover. Any plantings killed by contractor misuse of herbicide will be the responsibility of the contractor to replace at his own expense.

7.9 STAKING

Staking of trees will be avoided as much as possible, and any stakes used will be removed as soon as a tree can support itself adequately. The Project Biologist may make the recommendation for staking some trees during the first two years after planting for stabilization. All stakes will be removed before the completion of the 5-year monitoring period or earlier, as recommended by the Project Biologist. All stakes taken off trees will be removed from the restoration areas. The Contractor shall immediately notify the Project Biologist if any unauthorized persons, vehicles, or large domestic animals enter the restoration areas.

7.10 PEST CONTROL

The Contractor shall make periodic inspections for plant pests and diseases, and alert the Project Biologist should problems occur. Plants that are severely diseased will be removed and replaced, to prevent the spread of diseases and insects. Pesticides will be avoided, unless recommended for special problems by the Project Biologist. Rodent control, if necessary, will be restricted to trapping or anti-coagulants with no

secondary poisoning effect. Any pest control measures which require pesticide use will be conducted by a licensed pest control advisor with review and approval by the Project Biologist.

7.11 FERTILIZATION

For the first two years after planting, all tall canopy tree container plantings (including Fremont cottonwood, coast live oak, and western sycamore) should receive one application of slow release fertilizer (18-6-12) in March. One tablespoon should be applied per plant. The fertilizer should be dug at least one-inch into the soil within the drip lines of the plants. No fertilization should be used after the second year of project installation unless recommended by the Project Biologist.

8.0 GUIDELINES FOR MONITORING RESTORATION AREAS

While all projects will be required to meet the conditions of monitoring of restoration areas as outlined by the applicable jurisdiction and resource agencies, projects of five acres or greater may usually require compliance with an approved monitoring plan. While each project will need to comply with any project specific regulatory permits, these guidelines reflect a typical monitoring plan.

8.1 TIME FRAME AND PURPOSE

The monitoring program's purpose has two-goals. The first goal is to assess progress toward meeting restoration success standards for each project implemented under the Plan. The second goal is to evaluate and make recommendations for appropriate changes in the landscape installation and maintenance practices to assure performance standards will be met. Botanical monitoring will be the primary method for evaluating achievement of the first goal; a combination of horticultural and botanical monitoring would be used to evaluate achievement of the second goal.

The monitoring program will begin with the project preconstruction meeting A similar contractor education meeting will be held prior to the start of the 5-year maintenance period. Monitoring will continue for each of the habitat restoration projects implemented under the Plan for 5 years after completion of installation.

8.2 HORTICULTURAL MONITORING

8.2.1 Monitoring Responsibilities

Horticultural monitoring will consist of reviewing the horticultural maintenance practices of the Maintenance Contractor to determine whether they are consistent with the specifications for site maintenance and, as needed, making additional recommendations (e.g., additional irrigation, or additional exotic plant control, or cessation of irrigation) designed to assure restoration plantings meet the performance standards specified in this Plan.

A written memorandum will be prepared by the Project Biologist after each post-construction site visit listing existing conditions in need of remedial measure and recommended methodology. The memorandum will be sent to the Contractor for implementation. These memoranda will focus on any and all problems concerning project horticulture including weeding, irrigation scheduling, trash removal, pruning, pest control, etc. The Project Biologist will be responsible for all required dead and diseased plant counts and the approval of any substitutions. The Project Biologist will be responsible for recommending all remedial measures implemented and would set irrigation scheduling and decide when to phase out irrigation.

8.2.2 Monitoring Frequency

Restoration projects would be monitored by the Project Biologist on a minimum bi-weekly basis during the installation phase and monthly during the first year after planting. Thereafter, the project biologist would visit the individual habitat restoration projects a minimum of six times a year, or more frequently if required to ensure that restoration maintenance is being properly performed.

8.3 BOTANICAL MONITORING

Botanical monitoring will focus on quantitatively measuring the vegetation development in the individual restoration areas over time and will be conducted concurrently with horticultural monitoring annually for five years beginning with the first year after project installation. Monitoring will be conducted near the end of the active growing season from April to September. Several types of monitoring will be used to assess project progress depending on the type of restoration strategy being used.

Visual Assessment of Exotics Cover

Visual monitoring alone may be used to assess whether any non-native vegetation has persisted or reinvaded the areas. One formal assessment will be made between August and September to visually quantify the percentage of coverage of invasive non-native species and for invasive exotic species per site. In addition, a visual determination will also be made of the percentage of cover of native versus overall non-native species cover on each site. Sampling times should be consistent from year to year. Data collected will become part of required annual reports.

In addition to an annual visual assessment of invasive non-native cover, several additional quantitative methods will be used to measure whether plantings are meeting the performance standards. Botanical monitoring will be conducted near the end of the active growing season from Mid-August through September in order to measure the maximum growth for the current growing season and at appropriate times of year for remedial planting. Sampling times should be consistent from year to year. Data collected will become part of required annual reports.

The larger site restoration botanical monitoring will consist of the following six basic elements:

Visual Assessment of Exotics Cover

During every horticultural monitoring visit, the Project Biologist will evaluate the persistence of non-native species at each of the habitat restoration sites. In addition, one formal assessment will be made between August and September to visually quantify the percentage of coverage of invasive non-native species at each site. In addition, a visual determination will also be made of the percentage of cover of native versus overall non-native species on each site. Sampling times should be consistent from year to year. Data collected will become part of required annual reports.

Annual Container Plant/Cutting Survival Assessments

The number of dead container plants and cuttings at each individual habitat restoration site will be counted annually to determine whether permit conditions are being met.

Native Vegetation Cover Monitoring

Starting in Year 3 and continuing annually through Year 5 of post-installation monitoring, vegetation cover development within the restoration sites will be sampled using 100-foot transects. Five transects per acre will be used. In smaller areas, a greater number of shorter transects can be used for sampling so long as the total transect length per acre is 500 feet. These transects will be placed in a stratified random fashion so as to representatively sample each site. Monitoring and transect locations will be permanently marked and the locations can be entered into a Global Positioning Systems (GPS) unit for future relocation. Also, in a four foot wide belt transect centered on the line transect a list of all groundcover species (all plants less than 3 feet in height including volunteer species) will be compiled.

Data collected will include the survivorship and health/vigor of container plants (where applicable), and the percentage cover of species planted. For riparian areas, data will also be collected on the percent overstory cover for all planted species over three feet in height. Total overstory cover, as well as cover by species, will be calculated annually based on these transect assessments to determine if canopy cover performance standards are being met.

Container Plant/Cutting Height Assessments

A representative sample (5-10% depending upon species) of planted trees for which performance standards are set will be tagged in the second year of monitoring to monitor tree height growth. Tagged trees should be evenly distributed over planted areas. Each species will be sampled separately. This data

will be used as a means for measuring site plant growth progress towards meeting project tree height performance standards.

Annual Photo Documentation

Sample locations will be selected to monitor the success of the vegetation in restoration sites. The monitoring sample locations will be randomly selected and photographed at the location of one or more first year transects at a restoration site. Monitoring and transect locations will be permanently marked and the locations can be entered into a Global Positioning Systems (GPS) unit for future relocation.

Wildlife Monitoring

During monitoring visits to all revegetation sites, a list of representative animal species either directly or indirectly observed at the individual restoration sites will be noted and included as part of annual reports.

8.4 MONITORING REPORTS

Written monitoring reports will be required from the Project Biologist during construction and each year for five years after plant establishment.

8.4.1 During Construction

Progress reports will be made to the project proponent a minimum of once a month during the 120-day maintenance period. If planting installation is delayed for more than three months after non-native plant removal, a written report shall be filed by the Project Manager with the permitting agencies describing the reasons for the delay and the new schedule for planting. At the end of the 120-Day Plant Establishment Period, the Project Biologist shall write a letter to the Project Manager and permitting agencies, certifying completion of project implementation.

8.4.2 After Installation

Annual Progress Reports

After the plant establishment period, annual project progress reports would be filed with the Project Manager, permitting agencies, and other appropriate parties for a minimum of five years. These reports will summarize the results of the year's horticultural and botanical monitoring efforts and detail any remedial measures implemented. The annual report will include an analysis of the botanical monitoring data collected, and an evaluation of project progress relative to performance standards. Draft copies of all yearly monitoring reports will be sent to the project proponent for comment prior to final printing. After the incorporation of these comments, final copies will be sent to the project proponent for forwarding to the appropriate jurisdictions and all resource agencies that require them.

Contractor Remedial Recommendations

In addition to annual progress reports, the Project Biologist would provide written reports documenting horticultural maintenance recommendations to the Project Manager. The Project Manager shall, in turn, direct the Maintenance Contractor, as needed.

Final Certification Report

At the completion of the five year monitoring period for each habitat restoration site, the Project Biologist will submit a letter to the Project Manager of the local jurisdiction, permitting agencies, OVRP Management Staff and other appropriate agencies as identified by the jurisdictional Project Manager summarizing the degree to which Plan performance standards have been met and making recommendations for future maintenance as appropriate.

9.0 PERFORMANCE STANDARDS AND REMEDIAL MEASURES

9.1 MONITORING

Performance standards and remedial measures for restoration areas requirements may vary on a project-by-project basis. Project sites that are less than 5 acres will need to comply with performance standards and remedial measures as set forth at the discretion of the applicable jurisdiction and resource agencies. Project sites that are greater than five acres will usually require compliance with more formalized performance standards and remedial measure requirements. This section outlines the optimal approach, and identifies necessary performance standards and remedial measures for restoration projects. It is expected that the appropriate jurisdiction will review the guidelines below on performance standards and remedial measures for restoration areas and incorporate these guidelines into the project conditions.

9.1.1 Purpose and Basis for Standards

This section defines yearly performance standards for evaluating the progress of habitat restoration projects implemented under this Plan. These standards will be used to determine the timing of appropriate remedial measures to correct any problems that may arise. These standards are not intended to be used to require remedial measures to meet them beyond the five year post-installation monitoring period unless such standards are a part of individual project permit conditions. Remedial measures are only partially defined here. The ultimate remedial measures are left to the discretion of the horticultural monitor, since the measures proposed here will not necessarily always be the appropriate or cost effective remedy. Remedial measures will include, but not necessarily be restricted to, additional weeding, fertilization, pest control, replanting, modifications to the irrigation regime, changes to the irrigation system, and species substitution.

9.2 PROJECTS LESS THAN FIVE ACRES

The following section delineates the specific performance standards which will be used to evaluate the success of small project restoration efforts conducted in each of the habitat restoration project areas.

9.2.1 Erosion Control

No erosion which will either threaten structural integrity, damage native vegetation cover, or effect downstream water quality will be allowed to take place in the restoration areas.

9.2.2 Establishment of Seeded Species

Criteria for success for an individual habitat restoration project requires that 50 percent of species seeded must be established in each acre of restoration at the end of the five year monitoring program.

9.2.3 Control of Non-native Exotic Plant Cover

Non-Native Plant Cover

While the goal of a restoration project is to remove all non-native annual and perennial non-native plant species from understory areas of the individual sites during the five year monitoring program, the criteria for success requires no more than thirty percent cover in understory areas and ten percent cover outside of canopy areas, capable of supporting non-native species cover at the end of the five year monitoring period. This cover will be determined by annual visual estimates at the peak of the growing season.

9.2.4 Container Plant Survival

One year after installation, container plant survival will be 100 percent (cuttings75 percent) of original plantings, or remedial planting will be implemented. In years two to five of the monitoring program, container plant survival will be 80 percent (cuttings 60 percent) of original plantings, or remedial planting will be implemented. Larger sized plants or substitute species may be recommended by the Project

Biologist in years two to five if considered warranted to achieve project performance standards by year five.

9.2.5 Native Overstory Canopy Cover

The criteria for success for native overstory canopy is 65 percent cover after three years, and 80 percent at the end of five years at each restoration site.

9.2.6 Tree Height Growth by Species

The tree height goals delineated in this Plan will be met for each species planted for the project to be considered successful.

Table 9-1. Conceptual Habitat Plan Five Year Performance Standards and Recommended Remedial Measures for the Restoration Sites

Type	Standard
Restoration Projects less than 5 acres	
1. Erosion Control	No significant erosion of soils within restoration site or adjacent wetlands
2. Establishment of Seeded Species	50% establishment of species seeded (excludes annual nurse crop species)
3. Weed Control	
3a. Removal of Invasive Exotic Species	100% control of all invasive exotic species
3b. Control of Other Non-Natives	Less than 30% cover under native canopy Less than 10% cover outside of canopy
Restoration Projects 5 acres or greater	
1. Erosion Control	No significant erosion of soils within restoration site or adjacent wetlands
2. Establishment of Seeded Species	70% establishment of all species seeded (excludes annual nurse crop species)
3. Exotic Plant Control	
3a. Removal of Invasive Exotic Species	100% Control of all invasive exotic species
3b. Control of Other Non-Natives	Less than 30% cover under native canopy Less than 10% cover outside of canopy
4. Establishment of Planted Species	
4a. Container Species	100% survival during Year 1 80% survival in rest of monitoring years
4b. Cuttings	75% survival during Year 1 60% survival in rest of monitoring years
5. Native Overstory Canopy Cover	65% at 3 years 80 % at 5 years
6. Tree Height Standards	Meet all tree/shrub height standards
7. Survival Without Supplemental Irrigation	All other success standards must be met after restoration plantings have survived a minimum of 1-year without supplemental

9.2.4 Small Project Remedial Measures

The main remedial measures used to achieve vegetation restoration goals on smaller sites will be: hand removal, herbicide applications, and seeding of understory species. Additional remedial recommendations are left to the discretion of the Project Biologist to assure restoration success. Such recommendations may include remedial container plant/cutting plantings if areas fail to recover sufficiently due to natural invasion.

All significant erosion will be reported to the Project Biologist and repaired immediately by the Installation or Maintenance Contractor, as appropriate. Best Management Practices (BMPs) will be used to stabilize eroding slope areas and may include: surface meshing, reseeding, and replanting container plants/cuttings. Additional measures involving filters or silt fencing may be required to prevent the degradation of downstream water quality.

Table 9-2. Revegetation Tree/Shrub Height Standards

Species	3 Year Height*	5 Year Height*
Tall Canopy Trees		
Platanus racemosa	4	9
Quercus agrifolia	3	5
Populus fremontii	8	20
Taller Willows		
Salix lasiolepis	5	12
Salix gooddingii	5	15
Salix laevigata	5	12
Salix lucida ssp.	5	12
Small Willows and Shrubs		
Baccharis salicifolia	4	6
Salix exigua	4	6
Pluchea sericea	4	6
Hymenoclea monogyra	4	5
Sambucus mexicana	4	5

Note: * Given in feet

9.3 PROJECTS FIVE ACRES OR GREATER

The following section delineates the specific success standards which will be used to evaluate the success of larger site restoration efforts conducted in the project area.

9.3.1 Erosion Control

No erosion which will either threaten its structural integrity, damage native vegetation cover, or significantly effect downstream water quality will be allowed to take place in the restoration areas.

9.3.2 Establishment of Seeded Species for Restoration

Criteria for success for an individual habitat restoration project requires that 70 percent of species seeded must be established in each acre of restoration at the end of the five year monitoring program.

9.3.3 Non-Native Exotic Plant Cover

Invasive Non-Native Species

Criteria for success for a Plan restoration project requires that there must be no invasive exotic species targeted for removal left on site (assuming control only on properties where access has been granted). The goal is to attain 100 percent control of invasive exotic species on an annual basis throughout the five-year monitoring effort, including any new seedlings which may establish during this period.

Non-native Understory Non-Native Plant Cover

While the goal of a restoration project is to remove all non-native annual and perennial non-native plant species from understory areas of the individual sites during the five year monitoring program, the criteria

for success requires no more than thirty percent cover in understory areas and ten percent cover outside of canopy areas, capable of supporting non-native species cover at the end of the five year monitoring period. This cover will be determined by annual visual estimates at the peak of the growing season.

9.3.4 Container Plant Survival

One year after installation, container plant survival will be 100 percent (cuttings75 percent) of original plantings, or remedial planting will be implemented. In years two to five of the monitoring program, container plant survival will be 80 percent (cuttings 60 percent) of original plantings, or remedial planting will be implemented. Larger sized plants or substitute species may be recommended by the Project Biologist in years two to five if considered warranted to achieve project performance standards by year five.

9.3.5 Native Overstory Canopy Cover

The criteria for success for native overstory canopy is 65 percent cover after three years, and 80 percent at the end of five years at each restoration site.

9.3.6 Remedial Measures

The main remedial measures used to achieve vegetation restoration goals on larger sites will be: hand and herbicide applications, reseeding of understory species, additional plantings, substitute species planting, mulching, and fertilization. Other remedial recommendations may be recommended by the Project Biologist to assure restoration success.

All significant erosion will be reported to the Project Biologist and repaired immediately by the Installation or Maintenance Contractor, as appropriate. Best Management Practices (BMPs) will be used to stabilize eroding slope areas and may include: surface meshing, reseeding, and replanting container plants/cuttings. Additional measures involving filters or silt fencing may be required to prevent the degradation of downstream water quality.

Modification of Monitoring Period

The performance monitoring period will be five years after completion and approval of installation, unless specified differently by a regulatory agency. Monitoring and maintenance efforts may discontinue prior to the five year performance monitoring period upon written approval of the appropriate regulatory agency.

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APPENDIX A
Map Book Index Sheets

APPENDIX B
Example Plant Palettes