

9.0 Hydrology and Water Quality

9.0 WATER QUALITY MANAGEMENT

The park is located within the Aliso Creek watershed, which encompasses a drainage area of approximately 36 square miles. The terrain in the Aliso Creek watershed varies dramatically along the course of the creek. While much of the upper and lower watershed is surrounded by reserved parkland, the middle reaches of the watershed are highly developed. The increasing urban development within the watershed has impacts on the creeks that flow into the park. Runoff from this development can adversely affect water quality by contributing sediment and other pollutants to creeks and streams in the park.

Aliso Creek and its tributary drainages are critical resources for much of the wildlife of the park. For this reason, the integrity of these drainages is a focus of resource management within the park. However, the majority of the Aliso Creek watershed lies outside the park boundary and thus, outside the direct control of park staff. Educational programs such as those offered through a Good Neighbor Program can help to diminish problems associated with potential contaminated urban runoff entering the wildlife habitat of the park's watercourses. Park staff should be alert to signs of potential contamination of park water resources resulting from park activities, as well as, urban runoff from outside park boundaries. The County should be apprised of proposed projects that may affect or change water quality and/or quantity within AWCWP.

9.1 EXISTING WATERSHED PROGRAMS

As described in Section 2.3.3, extensive study has been conducted to identify problems in the Aliso Creek watershed since 1995. The Aliso Creek watershed is also addressed as part of the South Orange County Integrated Water Resources Management Plan (IWRMP). These various studies and plans are described below.

9.1.1 U.S. Army Corps of Engineers Watershed Studies

The U.S. Army Corps of Engineers (Corps), Los Angeles District, completed a reconnaissance study of the Aliso Creek watershed in 1997. The study reviewed and assessed past and current activities and conditions in the watershed to help identify management opportunities. Issues addressed in this reconnaissance study included geomorphology, geology and soils, land use, environmental resources, hydrology, hydraulics, sedimentation, groundwater, water quality and economics. The findings from this study supported the identification and refinement of watershed problems and opportunities, involvement of key stakeholders, and conceptual watershed solutions.

Following completion of the reconnaissance study, a more detailed feasibility study was initiated in 1998. This phase of the watershed study built upon the findings of the reconnaissance study and developed more detailed technical data across a range of study

categories. After screening proposed management measures, a final array of alternative plans were proposed as components of the Aliso Creek Watershed Management Plan (WMP) (Corps 2001). The components of the WMP included ecosystem restoration projects, water quality projects, streambank erosion control, floodproofing plans and comprehensive plans. These components are described below:

- **Aliso Creek Mainstem Ecosystem Restoration Project.** This management measure proposes stream restoration and stabilization of the Aliso Creek in the reach beginning just upstream of the Coastal Treatment Plant and ending at Pacific Park Drive. This project includes the following components:
 - **Lower Aliso Creek Stabilization Plan**, a measure that includes a series of low riprap drop (or “riffle”) structures with pools in between. The pools will have the long-term equilibrium slope necessary for a stable channel while the drops provide the fall necessary to meet the overall gradient of the creek. Each structure consists of a buried soil cement grade control, a grouted riprap riffle slope, a dumped riprap scour pad, and a side slope of open-celled articulated concrete revetment with vegetation planted in the voids. This stabilization measure begins in the reach just upstream of the South Coast Treatment Plant and ends at the Aliso Water Management Agency (AWMA) bridge.
 - **Middle and Upper Aliso Creek Stabilization Plan** extends the pool and riffle concept into the Aliso Creek reach beginning just upstream of the AWMA access road bridge and ending at Normandale. The riffles are intended as a replacement for the vertical concrete drops that currently segment the stream and restrict movement of aquatic, amphibious, and terrestrial wildlife species. The existing riprap will be removed and replaced with vegetation.
 - **Floodplain Riparian Habitat** proposes to flatten and terrace the vertical banks. In terms of stream stabilization, the modified sections will reduce stream velocities and unit discharges, and will be less erosive. In terms of restoration, the flattened slopes will provide a stable surface for plantings and for establishment of riparian and upland habitat. With a stable profile combined with flattened, terraced, and vegetated side slopes, lateral instability will be reduced.
 - **Off-Channel Aquatic Habitat and Riparian Restoration** proposes to construct an off-channel riparian and aquatic habitat in the abandoned oxbow near the confluence of Aliso Creek and Wood Canyon. A low-flow channel would be constructed along the outside of the abandoned bend with the appropriate depth, velocity, substrate, and vegetation to provide for fish spawning and rearing. The side slopes would be vegetated with emergent, riparian, and upland species at the appropriate elevations.
 - **Modify Existing Grade Control Structures (Interim Measure):** The two 10-foot vertical concrete drops located upstream of the AWMA road bridge result in wide shallow ponding on the upstream side. This ponding can be eliminated by cutting a low-flow triangular notch in each of the structures. This measure is a low-cost, interim solution that will immediately reduce ponding, but is not considered a permanent restoration alternative.

- **Aliso Creek Riparian Revegetation Plan** involves the planting of native vegetation within this reach of the Aliso Creek mainstem.
- **Sulphur Creek Ecosystem Restoration Project.** This management measure proposes restoration of Sulphur Creek in the reach beginning just upstream of the water treatment plant to the community center access road along Crown Valley Parkway. This restoration involves the modification of the existing flow control structure at the upstream boundary of the reach, modification of the small basins at the upstream and downstream ends of the reach, restoration of the riparian terraces and stabilization of side slopes, and reestablishment of native riparian vegetation.

The measure also proposes to restore riparian habitat in the reach along the Crown Valley Parkway between La Plata Drive and Moulton Parkway. This project includes the replacement of the concrete low-flow V-ditch with a natural meandering low flow channel, removal of non-native species, as well as reestablishment of native riparian vegetation.

- **Wood Canyon Ecosystem Restoration Project.** The restoration alternatives included in this management measure are as follows:
 - **Gabion Removal and Stream Restoration** which proposes to remove the 300-foot gabion structure and realign the tributary from the end of the culvert until its terminus at the Wood Canyon Creek. Modification would include stream lengthening and meander restoration, creation of wetlands, and reestablishment of native riparian vegetation.
 - **Restoration at the Wood Canyon Detention Basin** proposes to modify the outlet of a detention basin located at the upstream extent of Wood Canyon.
 - **Localized Stream Restoration** addresses localized erosion and stream degradation sites located in heavily vegetated portion of upper Wood Canyon, approximately 3 miles from the gate at the AMWA Road.
- **English Canyon Ecosystem Restoration Project.** This management measure proposes to restore emergent wetland and riparian habitat along the English Canyon Creek between the confluence with Aliso Creek and Los Alisos Boulevard. This project would include the removal of riprap and exotic species, limited excavation and regrading of the north bank of the creek (between the Aliso Creek confluence and the existing culvert at the Los Alisos crossing), and the reestablishment of native riparian vegetation.
- **Pacific Park Basin Ecosystem Restoration.** The proposed measure is located just upstream of Pacific Park Drive. The area under consideration extends from Pacific Park Drive to the San Joaquin Hills Transportation Corridor and is bound by the ball fields on the west and the road embankment on the east. This measure proposes an emergent freshwater wetland and riparian habitat along a 2,460-foot section of Aliso Creek within the existing Pacific Park detention basin.
- **Expansion of Program, Monitoring, and Evaluation of Best Management Practices (BMPs).** This program involves expansion of the BMP Program to include on-site biofiltration, landscape controls, and enforcement of ordinances on pet waste disposal. This program also provides for a detailed review of design and development standards for Orange County and associated cities within the Aliso Creek watershed. The review

should be based on the need to have water quality controls on stormwater runoff as well as water quantity management. Also, the review needs to address BMPs from the perspective of implementation and effectiveness relative to water quality benefits.

Monitoring programs (i.e., Orange County NPDES Stormwater Program Drainage Area Management Plan, Management guidelines for the use of Fertilizers and Pesticides, etc.) to evaluate effectiveness of current standards need to be implemented. This program will identify opportunities for retrofitting current facilities and modifying standards.

- **Small Wetlands for Water Quality.** This management measure proposes to construct wetlands or wet detention areas at the confluences of Dairy Fork/Aliso Creek and English Canyon/Aliso Creek. At each location, the wetland area would be shaped by a combination of excavation and fill to provide for a variety of habitats, ranging from a relatively deep water zone to shallow water zone, with dry islands that support riparian vegetation and provide shading.
- **Bank Stabilization Study - SOCWA Treatment Plant.** This measure proposes to address the potential for failure of the South Orange County Wastewater Authority Treatment Plant Bridge. An abandoned, encased sewer pipe crosses the invert at grade immediately upstream of the bridge. This pipe contains residual sewage solids and is a potential health threat if it breaks. The modification includes installation of a soil cement grade control immediately downstream of the bridge, pavement of the invert with riprap, and capping and removal of the pipe.
- **English Canyon Erosion Control.** This management measure proposes to install riprap bank protection on the outside of a bend on English Canyon Creek between Los Alisos Boulevard and Trabuco Road. The bend may potentially threaten Los Alisos Boulevard. The measure will also repair the existing scour holes downstream of the Via Noveno and Vista del Lago bridges, and below the pipe outlet just downstream of Entidad. The scour, if unchecked, could eventually threaten the structures.
- **Floodproofing at Aliso Creek Inn.** Within the watershed, there are several locations at which flood damages cannot be addressed by cost-effective flood control solutions that would address more than a single beneficiary. This situation appears to be the case in the lower reach of the Aliso Creek watershed. Six general non-structural floodproofing methods could reduce the occurrence of flooding and/or the hazards associated with flood events. Unless a source of funds could be identified which is not tied to benefit-cost analyses, the current situation will continue. A flood warning system may be a viable alternative to structural measures at this site, should there be a desire to pursue this option.
- **Watershed Education.** The goal of this management measure is to provide technical guidance for the development of local education programs for K-12 that address scientific and cultural impacts of urbanization as it specifically relates to the Aliso Creek watershed. A significant opportunity exists to direct some of the potential community service hours required by some of the high schools into a focus on the watershed ecology and monitoring.

The curriculum program should help students develop a sense of stewardship toward their environment and community, and give them a background to make educated and

informed decisions regarding wise resource management as part of their day to day life. The program should also focus on observation and appreciation, relationships and interaction, and how an understanding and application of scientific principles impacts watershed management, policies, and regulations.

In addition to the local schools and universities located within the watershed, there is a need for additional facilities that are dedicated to watershed program activities and community education. The opportunity for siting and developing an education center that provides a staging area for research-oriented science programs and community education should be further explored. Funding mechanisms for such a facility may be pursued through public-private partnerships with corporate sponsors contributing to the operation and maintenance of the facility.

- **Non-Point Source Public Awareness.** This program represents the second component of the overall education initiative. This effort targets the remainder of the general public living, recreating, vacationing, or conducting business within the Aliso Creek watershed. The public awareness program would target the residents and businesses within the watershed informing them how their activities have a direct influence on the creek and its quality. A general lack of understanding exists with limited information available to residents and proprietors about the purpose and impacts of best management practices (BMPs) that they can implement themselves.
- **Water Quality Monitoring Plan.** Water quality monitoring is an iterative process that will develop as the needs for subsequent sampling are determined by previous results. Availability of funding can also be a constraint for continued sampling. A volunteer program is proposed to involve the public in monitoring of the Aliso Creek watershed. This plan would increase public awareness of the status of Aliso Creek as well as supplement data available to agencies involved.
- **Exotic Species Eradication Program.** The goal of this program is to enhance habitat by allowing native plants to reestablish in the areas where non-native species have displaced natives. This plan would include removal and control approaches, as well as public education. The plan will also outline an annual monitoring element to track the progress of eradication and to locate any new outbreaks of the species within the Aliso Creek watershed.

A number of projects recommended in the WMP have been pursued. The current status of projects outlined in the WMP is shown in Table L.

Table L: Status of Projects Recommended in Aliso Creek Watershed Management Plan

Project	Status
Aliso Creek Mainstem Ecosystem Restoration	
- Lower Aliso Creek Stabilization Plan	Part of SUPER (see below)
- Middle and Upper Aliso Creek Stabilization Plan	Part of SUPER (see below)
- Floodplain Riparian Habitat	Part of SUPER (see below)
- Off-Channel Aquatic Habitat Restoration Project	No Plans to Pursue
- Modify Existing Grade Control Structure (Interim Measure)	Perhaps in the Future
- Aliso Creek Riparian Revegetation Plan	Part of SUPER (see below)
Sulphur Creek Ecosystem Restoration Project	Completed
Wood Canyon Ecosystem Restoration Project	In Progress
- Gabion Removal and Stream Restoration	Perhaps in the Future
- Restoration at Wood Canyon Detention Basin	Completed
- Localized Stream Restoration	Perhaps in the Future
English Canyon Ecosystem Restoration Project	In Progress
Pacific Park Basin Ecosystem Restoration Project	No Plans to Pursue
Expansion of Program, Monitoring and Evaluation of BMPs	Perhaps in the Future
Small Wetlands for Water Quality	No Plans to Pursue
Bank Stabilization Study – SOCWA Treatment Plant	In Progress
English Canyon Erosion Control	No Plans to Pursue
Exotic Species Eradication Program	In Progress

9.1.2 Aliso Creek Concept Plan – SUPER Project

Aliso Creek runs north to south from the Cleveland National Forest's Santiago Hills to the outlet at the Pacific Ocean near South Laguna Beach with a total length of 19.5 miles. The lower reach of the creek passes through AWCWP, a large land reserve that is relatively undeveloped within a heavily urbanized area. The surrounding large-scale urbanization has resulted in a decline in the watershed stability, degradation in the Aliso Creek channel and concern for water quality.

The Aliso Creek Water Quality SUPER project united individual efforts that were initiated to address the needed stability of the Aliso Creek Channel. A majority of the Aliso Creek Water Quality SUPER project will be built within the boundaries of AWCWP. The project name addresses the four goals of the project:

- Water Quality
- Stability of the Creek Bed and Banks
- Utility Protection
- Environmental Restoration

The County of Orange, SOCWA (South Orange County Wastewater Authority), MNWD (Moulton Niguel Water District), and SCWD (South Coast Water District) propose to implement the Aliso Creek Water Quality SUPER Project. The SUPER Project will provide water quality benefits, stabilize stream bed and banks, protect utility infrastructure, and restore ecosystems in Aliso Creek beginning at Aliso Creek Road then downstream to the SOCWA Coastal Treatment Plant Bridge and from the Pacific Ocean upstream and through the County owned property.

The water quality treatment and beneficial use component of the project includes: diverting low flows of Aliso Creek just upstream of the Pacific Coast Highway, treating the water to beneficial use standards, and selling the water to users within the watershed for irrigation.

The stabilization and ecosystem restoration component of the project will include: constructing a series of low riprap drop structures to control grades and establish aquatic habitat connectivity, shaving side slopes to reduce vertical banks, removing invasive species and revegetating with native riparian species, and restoring floodplain moisture.

The infrastructure protection component of the project will include locking the low flow channel in place by placing rock at the toe of the channel with soil wraps above the rock.

The project follows a multi-objective approach to Aliso Creek watershed development and enhancement, to accommodate water quality improvements, to stabilize channels, to reduce flood hazards, to allow economic uses, to provide aesthetic and recreational opportunities, and to address habitat concerns.

Background. The Aliso Creek Water Quality SUPER Project originally began as two separate projects:

- The Aliso Creek Mainstem Ecosystem Restoration Project (County of Orange)
- The Aliso Creek Emergency Sewer Relocation Project (South Orange County Wastewater Authority (SOCWA), Moulton Niguel Water District (MNWD))

During the Integrated Regional Water Management Plan (IRWMP) process, it became apparent that the two projects were linked and thus they were combined.

The main project features of the Aliso Creek Water Quality SUPER project are described below.

- A series of two-foot grade control structures downstream from the Aliso Creek Wildlife Habitat Enhancement Project (ACWHEP) and two six-foot grade control structures downstream from the confluence with Sulphur Creek will stabilize the channel gradient and reduce erosion. As a result, a low flow natural channel will be able to meander in a natural state over the grade control structures. It is anticipated that the width of the low flow channel will vary, at times hiding the grade control structure and at other times leaving a portion of the grade control structure dry and visible. In the floodplain areas, the grade control structure will be buried. The grade control structures in the low flow channel would be constructed of soil cement and would include other aesthetic improvements such as the use of large boulders, designed to achieve a natural appearance. Soil cement uses native soil in the cement mix allowing the color of the structure to match the natural environment. Vegetation will also help to mask the grade control structure.
- Grading and contouring will re-establish connectivity between the creek channel and the floodplain. Reconnecting the creek channel to the floodplain will reduce the high velocity

of flood waters and also provide added natural water quality treatment and habitat enhancement to the entire reach.

- Native habitat restoration will increase the abundance of wildlife, create natural water quality treatment opportunities for urban runoff, help detain and infiltrate water, and assist in the sustenance and development of natural wetland systems.
- The existing ACWHEP structure located about 2.5 miles upstream from Aliso Beach will be retrofitted. This structure has exacerbated downstream erosion and created a large drop in the downstream channel, thereby segmenting the creek and causing substantial habitat degradation. The downstream area will be re-graded and restored to match the elevation of the upstream area and the existing structure will be buried and retrofitted to match up with the other grade control structures.
- A new low flow water diversion and treatment facility will be constructed that will divert dry-weather flows from the creek and provide water for beneficial use. This project element will reduce pollutants in the urban runoff that would otherwise reach the coastal zone and the creek mouth, and as a result will protect public health and ocean resources at Aliso Beach. This project element will also reduce dry-weather flows at the mouth of the creek to proximate natural flow levels and will alleviate the need to maintain the mouth artificially to protect safety and property.
- In conjunction with this project, ongoing implementation of best management practices (BMPs) in the watershed will help to reduce the contribution of pollutants to Aliso Creek from the upstream urban areas.

Funding for the SUPER Project. As of January 2008, the SUPER project has secured a \$1 million Department of Water Resources grant and a \$4.6 million State Water Resources Control Board grant funded by Proposition 50. The Corps will continue to allocate funds for the SUPER project with the Water Resources Development Act in 2007 allocating \$5 million. The County of Orange, as the local sponsor, will continue to work with local, state and federal agencies to obtain the balance of the funding.

Next Steps for SUPER Project. The Corps is updating hydrologic, hydraulic and sediment transport analytical tools to address water resources and sedimentation issues with work anticipated to be complete by June 2009. A public scoping meeting will take place in May 2009; this will initiate the National Environmental Quality Act (NEPA) process along with the California Environmental Quality Act (CEQA) process. Engineering design and required permitting will follow.

Impacts of SUPER Project. Implementation of the SUPER project has the potential to affect resources in the park. These potential impacts are described below.

Trails and Public Access. The Water Quality SUPER project has the potential to affect several trails, crossings and AWCWP access points adjacent to Aliso Creek during installation of grade control structures, grading and contouring, habitat restoration, and other water quality improvement activities. The project area runs 4.5 miles along Aliso Creek from the northern limit at the AWMA Road Bridge to the southern limit at Pacific Coast Highway

bridge. The following trails and entrances are adjacent to the project site and access to these sites may be limited or closed temporarily due to improvement activities:

- Aliso Creek Trail
- Aliso Creek Bikeway
- AWMA Utilities Road
- Gates # 1,3,14,15,18,19 & 20
- Access # 12

The public should be notified in advance of any water quality improvement activities, and should be informed if access will be restricted to any of the above trails or access points. Notification could include signs at all entry points and/or a posting on the AWCWP web page. The County could also take the opportunity to educate the public on the importance of water quality protection and habitat restoration.

Natural Resources. The portion of Aliso Creek within the SUPER project area is set on young axial channel deposits, overlain primarily with sandy loam and clay loam soils. A portion of the project area is directly below slopes which are prone to landslides. The upland portion of the project area is comprised primarily of grassland and scrub vegetation communities, with smaller amounts of maritime chaparral towards the southern end of the creek. The creek itself is vegetation with willow forest and riparian scrub communities, with extensive stands of non-native giant reed. There are several sensitive plant species in the SUPER project area, including vernal barley, small-flowered microseris, thread-leaved brodiaea, Turkish rugging and many-stemmed dudleya. In addition to native and sensitive plant species, a number of invasive exotic plants exist along the creek corridor, especially in the grassland habitat. The creek and surrounding habitat is also used by a variety of native fish, birds, reptiles, amphibians, mammals and invertebrates, including several species listed as threatened or endangered.

During SUPER project water quality improvement and restoration activities, care should be taken to prevent erosion, protect sensitive plant species, prevent the spread of invasive exotic plants and minimize impacts to fish, nesting birds and other wildlife.

Cultural Resources. Many of the archaeological resources within AWCWP are located along the Aliso Creek Drainage. Specifically, a National Register eligible resource is located at the upper end of AWCWP along Aliso Creek, and other un-evaluated resources are present along lower reaches of the drainage. Some of the sites along Aliso Creek are also deeply buried, with one significant resource located over 18 feet (6 meters) below the existing landform. These important sites are known to contain important artifacts, human and animal burials, and be significant for scientific research (Dr. Gary Hurd, personal communication, 1999). Proposed project activities, including slope and streambed stabilization, have a high likelihood for causing substantial adverse impacts to cultural resources. The specific project designs should be evaluated by a qualified archaeologist. Steps to minimize project impacts should include a comprehensive survey of the SUPER Project area to identify cultural resources, evaluation of all sites that have not had prior California or National Register evaluations, development – in conjunction with appropriate

consultation with local Native American and advocational groups – of a suitable mitigation plan to allow scientific excavation to recover important scientific data, and promote preservation in place of the archaeological resources. Cultural resource monitoring during construction should also be required to allow recovery of incidental discoveries from known archaeological sites, and to allow evaluation and treatment of any buried resources discovered through construction.

9.1.3 South Orange County IRWMP

The South Orange County Integrate Regional Water Management Plan (IRWMP) includes the Aliso Creek watershed. The IRWMP is a result of a collaborative effort of local and regional agencies – 12 cities, seven water and wastewater agencies, and the County of Orange – to achieve total watershed efficiency in the southern Orange County area. The purpose of the IRWMP is to identify potential projects intended to improve water quality and supply in order to investigate their feasibility, engage in long range water planning, to establish priorities among the proposal of the member entities, and to obtain potential funding. The IRWMP focuses primarily on the projects and plans of the member agencies, with an emphasis on water supply and water quality. The principal challenges facing South Orange County are reflected in each of the individual member agencies, with a focus on the following:

- Water Reliability
- Watershed Management
- Seasonal Storage
- Environmental Protection
- Water Quality
- Grant/Agency Funding
- Water Recycling

The projects identified in the IRWMP for the Aliso Creek watershed rely on the Aliso Creek Watershed Management Plan described above. Current activities to improve water quality within the Aliso Creek Watershed include:

- Aliso Creek Water Quality SUPER (Stabilization, Utility, Protection, and Environmental Restoration) Project
- Sulphur Creek Ecosystem Restoration Project
- Sulphur Solution Restoration Project
- Development of plans for English Canyon Ecosystem Restoration Project, Wood Canyon Emergent Wetland Project, and Aliso Creek Mainstem Ecosystem Restoration Project
- Continued monitoring and benefits from the Wetland Capture and Treatment Network, a constructed, multi-purpose wetlands
- Aliso Beach Clean Beach Initiative Project

- Munger Storm Drain Pilot Sand Filter Project
- Giant Reed Removal

9.2 EXISTING WATER QUALITY PROGRAMS

In California, the regulation, protection, and administration of water quality are carried out by the State Water Resources Control Board (SWRCB) and nine California Regional Water Quality Control Boards. The Aliso Creek Watershed is within the San Diego Regional Water Quality Control Board (RWQCB) area (Region 9). The RWQCB is responsible for adopting and implementing water quality control plans, issuing waste discharge requirements, and performing other functions concerning water quality control within their region. Currently, three regulatory programs are on-going to address water quality issues within Aliso Creek: the Clean Water Act 303(d) List, the Aliso Creek California Water Code §13225 Directive and the Bacteria-Impaired Total Maximum Daily Load (TMDL) Project for Beaches and Creeks in the San Diego Region.

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9.2.1 Aliso Creek Watershed Action Plan

The 1972 amendments to the Federal Water Pollution Control Act prohibit the discharge of any pollutant to navigable waters from a point source unless the discharge is authorized by a National Pollution Discharge Elimination System (NPDES) permit. Since 1990, operators of stormwater systems in Orange County have been required to: (1) develop a stormwater management program designed to prevent harmful pollutants from being dumped or washed by stormwater runoff into the stormwater system and into local waterbodies, and (2) obtain a NPDES permit.

Entities within the Aliso Creek Watershed, including the cities of Aliso Viejo, Laguna Beach, Laguna Hills, Laguna Niguel, Laguna Woods, Lake Forest, and Mission Viejo, County of Orange, and the Orange County Flood Control District (Permittees), have obtained, renewed, and complied with three NPDES permits: First (1990-1996), Second (1996-2002) and Third (2002-2007). Each permit renewal has required the Permittees to continue to implement ongoing stormwater quality management programs and develop additional programs in order to control pollutants in stormwater discharges.

In 2006, the Aliso Creek Watershed Action Plan was developed to: meet the requirements for a Watershed Urban Runoff Management Plan (WURMP) contained in the NPDES stormwater permit (Third), identify the most significant water quality issues, focus pollution

prevention and source control programs, incorporate information obtained from prior planning studies, and develop an integrated plan of action that results in meaningful water quality improvement in Aliso Creek at a watershed scale. The Aliso Creek Watershed Action Plan is part of the larger Drainage Area Management Plan (2003).

9.2.2 Clean Water Act 303(d) List

Under Section 303(d) of the 1972 Clean Water Act (CWA), states are required to develop a list of water quality segments that are not meeting water quality standards. The CWA requires that the regulatory authorities establish priority rankings for water bodies on the lists and develop action plans, called Total Maximum Daily Loads (TMDL), to improve water quality. Aliso Creek is currently listed on the 2002 CWA 303(d) List for bacteria indicators, phosphorus and toxicity. The mouth of Aliso Creek is listed for bacteria indicators. The 2008 CWA 303(d) List is currently under development, but includes no new listings for Aliso Creek.

9.2.3 Aliso Creek California Water Code §13225 Directive

On March 2, 2001 the San Diego RWQCB issued a directive pursuant to California Water Code Section 13225 (Directive) to the County of Orange, the Orange County Flood Control District, the City of Laguna Beach, the City of Laguna Hills, the City of Laguna Niguel, the City of Laguna Woods, the City of Lake Forest and the City of Mission Viejo (Watershed Permittees) for an investigation of urban runoff in the Aliso Creek watershed. The Directive found that the Watershed Permittees may be discharging waste with high bacteria levels from municipal storm drain outfalls into Aliso Creek and its tributaries. Since the issuance of the Directive, the City of Aliso Viejo was officially incorporated on July 1, 2001 and currently participates in compliance activities under the Directive.

9.2.4 Bacteria-Impaired Waters TMDL Project I for Beaches and Creeks in the San Diego Region

The CWA requires states to establish Total Maximum Daily Loads (TMDLs) for waters placed on the CWA 303(d) List. The purpose of a TMDL is to restore the beneficial uses and to attain the water quality objectives in the waterbody. A TMDL represents the maximum amount of the pollutant of concern that the waterbody can receive and still attain water quality standards. Once this maximum pollutant amount has been calculated, it is then divided up and allocated among all of the contributing sources in the watershed.

Due to frequent, high concentrations of bacteria, the RWQCB placed 38 waterbodies in the San Diego Region on the 2002 CWA List of Water Quality Limited Segments. Bacteria densities have been found to frequently exceed the numeric water quality objectives (WQOs) for total, fecal, and enterococci bacteria as defined in the RWQCB's Water Quality Control Plan for the San Diego Basin (Basin Plan). The RWQCB is currently calculating the TMDLs for the impaired waterbodies through the development of Region-wide watershed models. This project, known as the Bacteria-Impaired Waters TMDL Project I for Beaches and Creeks (Bacteria Project I), was developed to address 17 out of the 38 bacteria-

impaired waterbodies on the 2002 CWA Section 303(d) List in the San Diego Region, including Aliso Creek. This project includes TMDL calculations for roughly 24 miles of coastal shoreline and creeks. In order to meet the TMDL, an Implementation Plan is also developed that describes the pollutant reduction actions that must be taken by various responsible parties to meet the allocations. The Implementation Plan includes a time schedule for meeting the required pollutant reductions and monitoring requirements to assess the effectiveness of the load reduction activities in attaining water quality objectives and restoring beneficial uses.

9.3 AWCWP WATER QUALITY

A supplemental study, the Water Quality Technical Memorandum (See Appendix J), was prepared to provide detailed information on water quality conditions within the park. The Water Quality Technical Memorandum includes:

- Background Research on existing surface water, storm water, dry weather flow and water quality regulations
- List of Constituents to be used to evaluate potential options including specific surface and groundwater quality objectives, re-use criteria, and/or compliance with local and state regulations
- Conceptual Programmatic Approach for water quality preservation and/or improvement that identifies potential opportunities that are compatible with RMP objectives, have a recognized and expected effect on site conditions, can be integrated within the existing drainage system and address constituents of concern

These three elements are described in more detail below.

9.3.1 Regulatory Background

In California, surface water quality is protected by several statutes and regulations promulgated at the federal, state, and local (e.g., municipal) levels. Regulations that pertain to the AWCWP are described below.

- The Clean Water Act (CWA) (federal): NPDES permits and TMDLs, as described in previous sections.
- California Toxics Rule (CTR) (federal): The CTR is within the Code of Federal Regulations (40 CFR 131.38) and was issued by the U.S. EPA to provide water quality criteria for potentially toxic constituents in receiving waters with human health or aquatic life designated uses in California. It includes criteria for 57 constituents based on human health, and 23 constituents based on the health of aquatic life. These criteria have not yet been implemented by the RWQCB for the AWCWP, but will likely be utilized in evaluations related to TMDL implementation by 2019.

- Porter-Cologne Act (state): The Porter-Cologne Act requires the SWRCB and the RWQCBs to adopt plans and policies to regulate discharges to surface and groundwater, including a region specific water quality control plan (Basin Plan).
- San Diego Basin Plan (local, state mandated): The San Diego Basin Plan provides quantitative and narrative criteria for a range of water quality constituents applicable to certain receiving water bodies within the San Diego Region.
- Ocean Plan (state): The Ocean Plan provides water quality objectives for beach and near-coast waters; important to the Aliso Creek watershed in that surface waters discharge to the ocean.
- Permits (federal, state and local)
 - Industrial and Construction Stormwater Permits: Under CWA Section 402, permits are required for stormwater discharges from industrial activities and construction sites. A Stormwater Pollution Prevention Plan (SWPPP) is required to obtain these permits.
 - MS4 Permit: The Orange County Flood Control District and the southern Orange County cities (including the project site) are required to obtain an MS4 Permit from the San Diego RWQCB (#CAS0108740) for discharges to the municipal separate storm sewer system in southern Orange County. A Drainage Area Management Plan (DAMP) that includes a Model New Development and Redevelopment Program is used to implement the MS4 requirements. This Model Program includes a Model Water Quality Management Plan (WQMP) that provides guidance for complying with MS4 permit requirements for project specific planning, selection, and design of BMPs in new development or significant redevelopment projects (DAMP Section 7 and Exhibit 7.II). Major redevelopment projects (which could take place in areas surrounding the AWCWP) are required to develop and implement a WQMP that addresses regional or watershed programs and relevant BMPs.
 - Stream Protection: Section 404 of the CWA regulates the discharge of dredged and fill material into waters of the United States, including wetlands. Section 404 of the CWA is administered by the U.S. EPA and the U.S. Army Corps of Engineers.
 - Lake or Streambed Alteration Agreement: Under CDFG Section 1602, a Lake or Streambed Alteration Agreement is required if a project that proposes to substantially divert or obstruct the natural flow or substantially change the bed, channel, or bank of any river, stream, or lake or use materials from a streambed is determined by the CDFG to adversely affect existing fish and wildlife resources.

9.3.2 Existing Surface Water Quality Studies and Constituents of Potential Concern

Surface water quality has been studied extensively over the past approximately 15 years within the Aliso Creek watershed. These studies initially focused on the degraded nature of

waters within the watershed and specifically the Park due to incising of Aliso Creek. Several historical and recent studies have concluded that the incising of Aliso Creek is due to the increased quantity and peak flow rate of stormwater (i.e., “wet weather”) discharges to the creek due to development. More recently, studies within the watershed have focused on individual chemical constituents within the surface waters in Aliso Creek and its tributaries.

In addition, the watershed stakeholders have implemented an extensive program of both structural and non-structural BMPs in drainages leading to the Aliso and Wood Canyons to address both wet weather and dry weather water quality of discharges into the canyons. Three interrelated water quality planning processes were developed by the stakeholders: the DAMP/Local Implementation Plan (LIP), DAMP/Watershed Action Plan (WAP), and a third process focused on watershed system integrity [City of Aliso Viejo, et. al., quarterly reports]. These processes were implemented in response to the city stakeholder involvement in the DAMP, as well as the RWQCB 13225 Directive (for bacteriological indicator monitoring).

Water quality data for dry weather flow was collected from many of these BMP programs and was used to develop the Constituents, Parameters, or Conditions of Potential Concern (CPCOPCs) for the surface urban runoff waters flowing through the Park. In addition, these projects serve a critical role as demonstration projects for other water quality BMPs considered within the Park and on adjacent property having an influence on drainage through the Park.

The above studies and BMP programs identified the CPCOPCs listed below based on: 1) their prevalence in urban storm water runoff, 2) water quality standards in the park vicinity, 3) protection of park facilities, 4) receiving water body impairments as indicated by the 2006 CWA 303(d) List, and 5) regulatory requirements and guidance outlined in the Basin Plan, MS4 Permit, and the DAMP implementation plan. The CPCOPCs are as follows:

- Bacteriological indicators
- Toxicity (specifically chlordane, dieldrin, heptachloroperoxide, PCBs)
- Temperature

The CPCOPCs list may change depending on regulatory standards, new or updated toxicological information, and/or changing conditions within the watershed. Based on additional information developed within the watershed, as well as information provided by OC Parks personnel, other constituents or conditions exist that have the potential to affect Park resources. These include:

- Erosion and resulting Sediments (Total Suspended Solids)
- Biostimulatory Nutrients (Phosphorus and Nitrogen)

Similar to the CPCOPCs described above, this list of issues may change depending on regulatory standards, new or updated toxicological information, and/or changing conditions within the watershed.

9.3.3 Surface Water Quality Conceptual Programmatic Approach

The following is a summary of the five key elements in the AWCWP conceptual programmatic approach to evaluating projects that may affect surface water quality, as described in the Water Quality Technical Memorandum.

1. Steps in Project Evaluation-Qualitative Steps: Six step process for evaluating projects highlighted in the DAMP: 1) Consider the project characteristics as provided by the applicant, 2) Identify receiving waters, 3) Determine the sensitivity of the receiving waters, 4) Characterize the potential water quality impacts, 5) Identify hydrologic conditions of concern, and 6) Assess project impact significance to water quality. This process can be followed for any size project.
2. Significance Criteria for evaluating projects: The criteria that can be used for evaluating the significance of a proposed project on CPCOPCs within surface waters and the thresholds for significance (for projects within the Park) are summarized below:
 - CEQA Standard (pre-project): In order to evaluate significance under CEQA, potentially substantial increases to pollutant concentrations and/or loads resulting from a project will be evaluated for significant adverse impacts to receiving water quality by comparing pre-project and post-project water quality concentrations and loads. Analysis of potential significant impacts will be based on the results of water quality modeling and qualitative analysis that takes into account water quality controls that will be considered Project Design Features (PDFs).
 - Water Quality Permitting (pre-project): Satisfaction of MS4 NPDES permit requirements, and General Construction Permit and General Waste Discharge Requirements will establish compliance with water quality regulatory requirements applicable to stormwater runoff. Natural resource permits (from CDFG, USFWS, or ACOE), especially timing related to acquiring such permits, need to be considered.
 - Water Quality Criteria (post project): Comparison of post-project water quality concentrations in the runoff discharge with benchmark receiving water quality criteria as provided in the Basin Plan and the CTR (for comparison/guidance) will facilitate analysis of the potential for runoff to cause or contribute to exceedances of receiving water quality standards or adversely affect beneficial uses. Narrative and numeric water quality objectives contained in the San Diego Basin Plan apply to the Project's receiving waters.
 - Maintenance Evaluation (post project): Following the construction or implementation of a project, the performance monitoring should be coupled with operational evaluations. The project should be evaluated with respect to effectiveness, ease of operation and maintenance, cost / time intensiveness of operation and maintenance. The operational and maintenance qualities of the project, as constructed or implemented, have the ability to affect long term effectiveness of the project.
3. Park-Specific- Qualitative Evaluation Items: Specific evaluation tools issues related to the Park's operation and maintenance that may not be issues for other engineered or

constructed projects. These qualitative criteria need to be developed with OC Parks personnel in order to prioritize them and relate them to Park-specific resource protection goals (e.g., sensitive species identification and impact assessment).

4. **Project/BMP Selection Methodology- Quantitative Steps:** A quantitative evaluation of projects for project prioritization and BMP selection. A potentially useful template being utilized in Los Angeles consists of the following steps: catchment prioritization, project area screening, general BMP screening and site-specific BMP evaluation. Based on discussion with the OC Parks, preference will be given to BMP approaches: having low or minimal impact on existing habitat or recreational uses within the Park; focused on restoring the natural ecological system (and natural assimilative capacity) to the greatest degree possible; incorporating designs that re-connect the riparian zone to the mainstem creek; and having a source-based approach that addresses the observed water quality impairment as close to the source of the impairment as possible. The County's preference includes non-structural BMPs that advocate education, water conservation (e.g., advanced landscape irrigation), good housekeeping practices, and chemical-free weed control/pest management. With respect to structural BMPs, preference will be given to BMPs having a natural treatment approach, as opposed to above-ground or mechanical "systems" that are constructed adjacent to the flow line of the creek. These include: wet ponds or constructed wetlands, vegetated swales/biofilters, dispersed micro-catchment enhancements to the flow line of the creek (e.g., bio-structural solutions, including crib and streambank designs that replicate the surrounding riparian corridor to the greatest extent possible). Each of these structural BMPs ideally would incorporate a soil mantle that allows for vegetation to grow, versus hard-armored approaches such as concrete veneers.
5. **Adaptive Management:** Although several definitions of adaptive management exist, the approach is founded on testing assumptions systematically to achieve a desired outcome, in this case, improved water quality and protection of Park resources. Adaptation involves modifying the implementation plan or action, based on the results of monitoring. The County of Orange is currently part of watershed stakeholder groups that are participating in a series of in-depth analyses of water quality issues within and adjacent to the Park. The evaluations are not yet complete, and therefore will need to be incorporated as the results become available. In addition, the RDMD can apply adaptive management approaches for evaluating existing projects both within Park boundaries and adjacent to its border.

9.4 RECOMMENDATIONS

General Actions

- Continue to actively participate in watershed planning efforts.
- Assess projects and recommendations resulting from watershed planning efforts for their potential impacts to park resources.
- Incorporate water quality education and BMPs into public outreach efforts. Most of the objectives of the WMP are to promote and encourage practices and behavior that supports development of a healthy environment for the watershed. Education is

therefore a major component of a watershed management program, as well as enhanced public outreach to promote a more complete understanding of the environmental problems and the ecological value of the Aliso Creek watershed.

- Conduct water quality monitoring within the park at appropriate intervals for the presence of manmade debris, nutrients, and other non-point source pollutants.
- Recognize efforts of on-going regulatory programs to address water quality in Aliso Creek. Ensure that park activities do not exacerbate existing water quality conditions.
- Use the findings and recommendations of the Water Quality Technical Memorandum to guide the evaluation and prioritization of projects and BMPs.

10.0 Cultural Resources

10.0 CULTURAL RESOURCES MANAGEMENT

In 1990, LSA prepared a Resource Management Plan that identified all of the known cultural resources within AWCWP. At that time a record search showed that a total of 51 resources have been previously recorded within AWCWP. Of these 51 sites, 33 are broadly identified as Habitation Sites that include rock shelters and midden sites, four are Native American Heritage Value Sites that encompass rock art and rock alignments, six are Lithic or Artifact Scatters, and eight are Historic Sites.

Results of test excavations of several archaeological sites in the AWCWP reveal prehistoric occupations of long duration, often spanning several thousands of years. Furthermore, some of these sites include components of several recognized Coastal Southern California traditions including Milling Stone, Intermediate, and Late Periods. This dates occupation of the AWCWP area to as early as approximately AD 150 to as recent as approximately AD 1800. Since only a few of the sites within the AWCWP have been thoroughly excavated, there are still many unknown resources within known sites, and there exists much research potential.

Historic resources are also found within the AWCWP. Sites include historic structures associated with the ranching of AWCWP, a set of wagon tracks worn into sandstone, and rock graffiti and the Mormon Trading Post from the 1850s. Numerous unevaluated vehicular and aircraft wreck sites are present within the AWCWP, with the most notable being an aircraft wreck dating to 1946.

Information potential for prehistoric settlement and subsistence activities is high, and there also exist many significant historic resources in the AWCWP. Impacts could be considered significant even on sites that have already been investigated to some degree. Some of the cultural resources within AWCWP have been or are in danger of being destroyed by human or natural disturbances and/or neglect. As a result, all sites within the AWCWP are considered highly significant, with site preservation as a priority. Whenever possible, the preservation of archaeological sites is an objective of the AWCWP by maintaining park resources in an undisturbed condition. The locations of cultural resources are a major factor in the placement of both park facilities and their improvements.

The overall goal of the RMP is to present a comprehensive, long-term management plan for AWCWP. In dealing with the cultural resources located within the AWCWP, the specific fundamental objective is the identification of the best way to manage, protect, and enhance park resources while still providing educational opportunities to the public, as well as a safe recreational environment. The cultural resource management plan is discussed in detail below.

10.1 RECORD AND COLLECTION MANAGEMENT

A cultural resource records management system needs to be established for AWCWP that incorporates previously recorded sites within the AWCWP, in addition to the discovered resources of the future. The first step is the creation of a relational database system in Microsoft Access for site inventory information, including photographs and locational maps. With its Model Curation Program, California State University, Fullerton (CSUF) has put much time and effort into creating a format for the reporting and subsequent cataloguing of cultural resource collections from Orange County (Eisentraut and Cooper 2002). Using this format as a template, a condensed version of the CSUF database should be created for the AWCWP collection to record pertinent site information. Once in place for the existing collection, this database can be continually updated to include new information about the resources, as well as document newly discovered cultural resources.

In addition to this recommended database, known park resource boundaries should be digitized into a GIS format in order to produce a base map of AWCWP. Once created, this base map can be used to overlay existing resource conditions. In using a GIS format, this base map can also accommodate a global positioning system (GPS) as a source of data input for resource mapping. Creation of this type of map using GIS programs will allow for the presentation of either the base maps or the resource maps in both small- and large-scale formats. On a smaller scale, these data can be used to produce a constraints map to help identify areas where sensitive cultural resources may occur. Larger formats will aid in presentations to the public. This flexibility in formatting scale is also important for review and use within the park system.

The existence of both GIS information and a resource database allows for the linkage of a multitude of data regarding cultural resources, existing collections, and park resources. For example, geographical locations can be compared with any of the following: stratigraphic formations, artifact and site provenience information, specific project information including reports and other site documentation, site and/or collection photographs, and the scientific status of the resource. Creating these data resources with this level of technology will aid in resource identification, investigation, evaluation, determination, and interpretation, as well as the documentation and curation of these resources for future generations.

The County of Orange currently maintains its collections and records through the OC Parks Historical and Cultural Programs office. Standards for the proper collection, preparation, curation, and long-term management are provided in Part IV of the California State University, Fullerton Proposed Policy and Procedural Guidelines document developed by Eisentraut and Cooper (2002). These Guidelines can be found on the World Wide Web at: <http://www.ocparks.com/uploadgraphics/CSUF%20final%20curation%20report.pdf>.

Since OC Parks has adopted the proposed policies for format of the reporting and cataloguing cultural resources put forth by CSUF, the OC Parks Historical and Cultural Programs office should play a central role as a custodian in the work pertaining to the collections and records for AWCWP.

10.2 RESOURCE IDENTIFICATION AND RECORDATION

A current records search needs to be completed for the AWCWP. This search of the records maintained at the South Central Coastal Information Center at CSUF should include a review of all recorded historic and prehistoric archaeological sites. A review of known cultural resources surveys and excavation reports within the AWCWP should also be conducted. In 1991, a records search was done for AWCWP, and from that search LSA has an inventory of what work has been previously completed in the area. At that time a total of 51 known cultural resources were within the AWCWP. Information obtained through the Information Centers is protected by a confidentiality agreement that restricts access to site information to qualified individuals. The current Policy Manual of the California Historical Resources Information System provides a thorough discussion of the required qualifications for access to the site information. These policies should be observed concerning this proprietary information.

The updated records search will show what archaeological or historical surveys have been conducted within the AWCWP and what cultural resources have been identified. From the information gathered from the records search, a site inventory checklist should be created that would be the instrument for inventorying all archaeological sites in the AWCWP. A major feature of the checklist should be a section that details threats to the site. Such threats include natural processes of weathering, fire, and erosion; unauthorized trails running close to or through site locations; and vandalism and theft of cultural resources. This site inventory checklist should be recorded within a Microsoft Access database format in order to keep the data compatible with other AWCWP resource management information. Once this checklist is drafted and subsequently approved, archaeologists working with park stewards would have a greater ability to systematically inventory and document cultural resources. Thus, the site inventory checklist can be used as a resource management tool.

A park-wide systematic reconnaissance survey should be conducted by an Orange County certified archaeologist. Survey work should be completed to a level that will satisfy the requirements of Section 106 of the National Historic Preservation Act, the California Environmental Quality Act (CEQA), and the County of Orange. To help staff this endeavor, qualified volunteer groups should be utilized to assist in the survey of the AWCWP, possibly using students from local archaeological field schools or members of local professional societies. When sites and/or isolates are located during a survey, they should be recorded on California Department of Parks and Recreation (CDPR) 523 series forms. Locational data should be recorded using a handheld GPS unit, so that the data can be imported into existing park resource management databases. Site updates, including photos and maps, should be completed for previously documented sites that are reevaluated; site updates can augment or correct information that is known about a specific resource by corroborating that the existing record remains accurate. Previously recorded information that appears to be erroneous should be noted, especially when changes occur to the resource or its immediate setting. A resource should have a new CDPR 523 form filled out only when extensive changes to the resource are visible. For resource protection, confidentiality should be maintained for all records of cultural site locations. Surface collection is recommended for any materials encountered if the site appears to be threatened by natural or human factors.

A total of four Native American Heritage Value Sites that include rock art and rock alignments have been previously recorded with AWCWP boundaries. It is recommended that a Sacred Lands File search be conducted by the Native American Heritage Commission (NAHC) for the lands within the AWCWP in order to identify further Traditional Cultural Areas. These areas include ceremonial and/or procurement sites. Native American groups should be involved with park management personnel in checking sacred sites and/or natural resources procurement areas. Further discussion of this involvement can be found below in discussing stewardship programs for the AWCWP.

If human remains are encountered during survey activities within AWCWP, State Health and Safety Code Section 7050.5 states that the County Coroner should make a determination of origin and disposition pursuant to Public Resources Code Section 5097.98. The County Coroner must be notified of the find immediately. If the remains are determined to be Native American, the County Coroner will notify the NAHC, which will determine and notify a Most Likely Descendant (MLD). With the permission of the Director of Harbors, Beaches, and Park, or his designee, the MLD may inspect the site of the discovery. The MLD shall complete the inspection within 24 hours of notification by the NAHC. The MLD may recommend scientific removal and nondestructive analysis of human remains and items associated with Native American burials.

10.3 RESOURCE INVESTIGATION AND EVALUATION

The AWCWP has a variety of recorded cultural resources within park boundaries, all with different levels of impacts associated with proposed park usage. Potential effects on archaeological resources that would occur as a result of construction of a trail may differ from those caused by maintenance of park facilities such as biological restoration activities, weed removal, and fire management practices. When site-specific plans are created that detail future park improvements, they can be compared with the AWCWP resource constraints map to identify cultural resource sites that are known to be significant in the area. If a known significant site will undergo direct impacts, an Orange County certified archaeologist shall be consulted to both recommend and implement mitigation measures that are appropriate for the impacts to these sites. Preference shall be given to avoidance of impacts through project design to eliminate site disruption. Impact avoidance may be paired with other measures to protect the resource such as capping, fencing, or planting native vegetation that would be difficult to penetrate.

When the significance of an archaeological resource is unknown, prior to any grading or development in the vicinity of the site that will undergo direct impacts from park development, an Orange County certified archaeologist shall conduct test level excavations at those sites. The archaeologist shall provide recommendations for further action based on the findings of test level excavations. Recommendations may include:

- Adjustments to site-specific development plans to avoid disturbance of the site
- Preservation of the site through capping, fencing, or planting of impenetrable vegetation
- Complete excavation
- No further action required

When a park project will indirectly impact sites where the significance of a resource is unknown, the site will undergo test excavation followed by recommendations for further action.

An Orange County certified archaeologist shall provide a Cultural Resources Survey of the area within the AWCWP prior to activities that may impact sites, both known and unknown for exposed artifacts and/or features. The surveys shall be completed with both their findings and recommendations incorporated into the mitigation program prior to any grading or development in these areas.

In addition, a Research Design Program needs to be prepared by an Orange County certified archaeologist that identifies research strategies to be implemented by subsequent research within the AWCWP. Topics of the Research Design should include the appropriate research to be conducted on sites that are known to occur within the AWCWP but that were not addressed as part of any prior mitigation program (e.g., those surveys of the park property that were conducted prior to its designation as a park). These sites should include those not anticipated to undergo either a direct or indirect impact. The Research Design shall also address what additional research may be appropriate for sites that have been preserved and/or tested as a result of the mitigation program. As field work proceeds in AWCWP, this Research Design Program should be periodically updated.

Any AWCWP project that involves earth disturbing activities in culturally rich soils, including but not limited to biological enhancement programs, fire prevention activities, or general construction activities, should not occur unless a trained archaeologist is present to monitor the work. Artifacts that are unearthed during this construction should be collected with provenience information when available. Archaeological monitors shall have the authority to divert construction if cultural features are encountered during construction until the discovery can be assessed by a qualified archaeologist.

The implementations of the measures cited above by the AWCWP will successfully avoid and/or reduce impacts to cultural resources to a level below significance. If human remains are encountered during ground-disturbing activities in the park, State Health and Safety Code Section 7050.5 states that no further disturbance shall occur until the County Coroner has made a determination of origin and disposition pursuant to Public Resource Code (PRC) §5097.98. The County Coroner must be notified of the find immediately. If the remains are determined to be Native American, the County Coroner will notify the NAHC, which will determine and notify an MLD. With the permission of AWCWP or its authorized representative, the MLD may inspect the site of the discovery. The MLD shall complete the inspection within 24 hours of notification by the NAHC. The MLD may recommend scientific removal and nondestructive analysis of human remains and items associated with Native American burials.

10.4 RESOURCE RESEARCH AND INTERPRETATION OPPORTUNITIES

The range of cultural resources that have been documented within the AWCWP signifies a somewhat comprehensive representation of the human settlement and use history of the

San Joaquin Hills. Sites within the AWCWP are a priceless source of anthropological information for the public interpretation of local prehistory, archaeology, and larger anthropological concepts. As previously mentioned, a current and comprehensive survey of the AWCWP is lacking, and very few of the sites that have been recorded within the AWCWP have been thoroughly excavated. Until a complete inventory of park resources has been compiled, little can be known about the interrelationship of these cultural resources. This fact signals that there exists much research potential, as well as many unknown resources within the AWCWP.

The cultural work that is discussed in this Resource Management Plan provides a framework for both the existing and discovered information to be stored for future research. Potential research can focus on a variety of topics such as:

- The sites of AWCWP and the larger picture-site types and regional settlement patterns
- Resource utilization and trade
- Subsistence strategies and what drives change over time
- Human adaptation to environmental change
- Prehistoric Southern California political organization
- Native American religion and cosmology

These general topics are an indication of the limitless opportunities for resource interpretation for AWCWP.

As previously stated, a major goal in dealing with the cultural resources located within AWCWP is to provide educational opportunities to the public. This goal can be realized through the creation of a cultural resources information hub that would help to disseminate information from the AWCWP to both the public and the scientific communities. Given their close proximity to the AWCWP, either the NHM or Soka University would be viable options as locations for such an information hub.

10.5 RESOURCE STEWARDSHIP

The topic of resource stewardship comes into play on several levels for the AWCWP. Stewardship needs to be designated for the basic management of AWCWP collections and records. Site recordation and maintenance also requires stewardship. Additionally, there are stewardship opportunities in dealing with Native American sacred sites and resources.

Currently, the OC Parks Historical and Cultural Programs Office maintain the collections and records for the County of Orange. It is, therefore, recommended that the OC Parks play an integral role in the collection and record management for AWCWP. This would include assistance to the AWCWP in the establishment of a volunteer program for artifact analysis and inventory work, as well as aiding in the creation of a database and GIS mapping system to accommodate proper recordation of cultural resources from the AWCWP.

The contents of archaeological sites are largely unpredictable, with the greater portion of the material existing beneath the ground surface. This buried archaeological information is often discovered when it is exposed on the ground's surface as the result of a variety of impacts, from natural erosional factors to disturbances caused by animals and humans. Within the AWCWP, human remains have been found at a total of seven sites; the most recent burial was exposed as a result of erosion in 1998 at ORA-403 in Spring Canyon. Given the existence of a wide cross-section of site types in the AWCWP, as well as the prevalence of sites within the AWCWP where Native American remains have been found, the creation of a site stewardship program for the protection of AWCWP resources is crucial.

The OC Parks Historical and Cultural Programs Office should also play a central role in developing a stewardship program for the AWCWP. Due to the amount of work involved with the identification, recordation, investigation, and evaluation of the cultural resources within the AWCWP, it is recommended that a volunteer program be put into place to assist with this work. Volunteers for the AWCWP site stewardship program may be found from local professional societies such as PCAS. Locally run archaeological field schools may also be involved in the survey, recordation, and subsequent curation processes.

Most important for the protection of the resources is a schedule of routine patrols in culturally sensitive areas in order to help evaluate known archaeological sites. These sites should be evaluated in terms of the potential effects on the resources by the natural weathering and erosion of sites and the impacts of park visitors (such as the indiscriminate collection and/or vandalism of sites and the creation of illegal trails that could potentially erode site components and produce negative effects on sites). As GPS mapping becomes more prevalent in our society, using this technology to assist in the location and recordation of resources by volunteers will be key for the AWCWP.

A total of four Native American Heritage Value Sites have been recorded within the AWCWP. The AWCWP should make a concerted effort to develop a Native American stewardship program. Native Americans can implement an evaluation of sacred sites or resources that they have deemed important to ensure the protection of the resource in perpetuity.

In conjunction with a stewardship program, the implementation of an emergency response plan for sites that have been exposed by erosion is a necessity. When cultural resources including artifacts or features are encountered, either during a planned patrol or in another unexpected manner, an Orange County certified archaeologist shall be consulted. The certified archaeologist will both recommend and implement mitigation measures that are appropriate for the impacts to the sites. If human remains are encountered during any routine patrols of AWCWP cultural resources, the County Coroner must be contacted immediately to make a determination of origin and disposition pursuant to PRC §5097.98. If the remains are determined to be Native American, the County Coroner will notify the NAHC, which will determine and notify an MLD. With the permission of AWCWP or his/her authorized representative, the MLD may inspect the site of the discovery. The MLD shall complete the inspection within 24 hours of notification by the NAHC. The MLD may recommend scientific removal and nondestructive analysis of human remains and items associated with Native American burials.

10.6 RECOMMENDATIONS

General Actions

- Establish a cultural resources records management system.
 - Create a relational database system to record pertinent site information using the Modal Curation Program, CSUF as a template.
 - Digitize known park resources into a controlled-access GIS format to produce a base map of AWCWP.
- Implement a formal procedure for care of existing collections with AWCWP through the OC Parks Historical and Cultural Programs office. Use standards provided in Part IV of the CSUF Proposed Policy and Procedural Guidelines (Eisentraut and Cooper 2002) and relevant County P&Ps.
- In association with a qualified archaeologist, establish a volunteer program to help complete necessary artifact analysis and inventory. Create a training manual for working with archaeological collections. Volunteers should be organized through the County's Adopt-a-Park program.
- Create a site inventory checklist for inventorying all archaeological sites within AWCWP. A major feature of the checklist should be a section that details threats to the site. Digital photographs of the site conditions, and GPS location data should be incorporated.
- Conduct a search of the Native American Heritage Commission (NAHC) Sacred Lands Files in order to identify Traditional Cultural Areas within the park. Native American groups should be appropriately consulted by park management personnel in identifying sacred sites and natural resources procurement areas; and to help develop management programs for these resources.
- When site-specific plans are created that detail future park improvements, they can be compared with known cultural resource locations in the vicinity of disturbance. In addition, focused pedestrian surveys consistent with the County SCA A01 should be conducted for all future park improvements.
- For any cultural resource work conducted within the Park, an Orange County certified archaeologist should prepare a Research Design that identifies research strategies to be implemented during the research program. A review team of cultural resource professionals should establish research priorities for the park, and cultural resource work within the park should be designed to address these priorities.
- Create a cultural resources interpretive display or hub to help disseminate information from the park to both the public and the scientific communities.
- Routinely patrol culturally sensitive areas in order to help evaluate ongoing impacts to known archaeological sites. Sites should be evaluated in terms of the potential effects on the resources by natural weathering and erosion of site and the impacts of park visitors.

- Make a concerted effort to develop a Native American stewardship program. Native Americans can implement an evaluation of sacred sites or resources that they have deemed important to ensure the protection of the resource in perpetuity.

As – Needed Actions

- When sites and/or isolates are located, they should be recorded on California Department of Parks and Recreation (DPR) 523 series forms. Location data should be recorded using a handheld GPS unit. Site updates, including photos and maps, should be completed for previously documented sites that are reevaluated. Surface collection is recommended for any materials encountered if the site appears to be threatened by natural or human factors. Forms should comply with both the CSUF Model Curation Program format, and the California Historical Resources Information System (CHRIS) Format. Updates and new forms should be submitted to the South Central Coastal Information Center of the CHRIS.
- If human remains are encountered during survey and/or ground disturbing activities, State Health and Safety Code Section 7050.5 states that no further disturbance shall occur until the County Coroner has made a determination of origin and disposition pursuant to Public Resources Code §5097.98.
- If a known significant site will undergo direct impacts, an Orange County certified archaeologist should be consulted to both recommend and implement appropriate mitigation measures. Mitigation Measures should follow the County Standard Conditions of Approval (SCA) A01 – A04.
- When the significance of a site is unknown, an Orange County certified archaeologist should conduct test excavations at those sites to determine if they are eligible for listing on the National Register of Historic Places and/or the California Register of Historical Resources. The archaeologist shall provide recommendations for further action based on the findings of test level excavations.
- Monitoring of any project that involves earth disturbing activities in culturally rich soils should be conducted by a trained archaeologist under the supervision of an Orange County Certified Archaeologist. Artifacts that are unearthed during this construction should be collected with provenience information when available. Monitoring should comply with County SCA A04.
- Implement an emergency response plan for sites that have been exposed by erosion. When cultural resources, including artifacts or features, are encountered, either during a planned patrol or in another unexpected manner, an Orange County certified archaeologist should be consulted. The certified archaeologist will both recommend and, with parks approval, implement mitigation measures that are appropriate for the impacts to the sites.

Ten Year Actions

- Presence/Absence archaeological surveys are considered to have limited lifetime. The park has not been surveyed for cultural resources in over ten years. A park-wide systematic reconnaissance survey should be conducted every ten years under the direction of an Orange County certified archaeologist. To help staff this endeavor, qualified volunteer groups could be utilized to assist in the survey of the AWCWP. Update the park-wide survey every five years, particularly in high visitation, and high erosion areas.

11.0 Paleontological Resources

11.0 PALEONTOLOGICAL RESOURCE MANAGEMENT

11.1 LOCALITY AND COLLECTION MANAGEMENT

A paleontological management system needs to be established for AWCWP that incorporates previously recorded localities within the AWCWP, in addition to localities that will be discovered in the future. The first step is the creation of a relational database system in Microsoft Access for locality inventory information, including photographs and locational maps. With its Model Curation Program, CSUF has put a great deal of time and effort into creating a format for the reporting and subsequent cataloguing of paleontological resource collections from Orange County (Eisentraut and Cooper 2002). Using this format as a template, a condensed version of the CSUF database should be created for the AWCWP collection to record pertinent locality information. Once in place for the existing collection, this database could be continually updated to include new information about previously recorded localities, as well as document newly discovered localities.

In addition to this recommended database, known park resource boundaries should be digitized into a geographical information system (GIS) format to produce a base map of AWCWP. Once created, this base map could be used to overlay existing conditions such as the boundaries of geologic formations. In using a GIS format, this base map could also accommodate a global positioning system (GPS) as a source of data input for locality and geologic mapping. Creation of this type of map using GIS programs would allow for the presentation of either the base maps or the locality maps in both small- and large-scale formats. On a smaller scale, these data could be used to produce a constraints map to help identify areas where sensitive paleontological resources may occur. This could be used to determine where to build, or not build park trails and facilities. Larger formats will aid in presentations to the public. This flexibility in formatting scale is also important for review and use within the park system.

The existence of both GIS information and a locality database allows for the linkage of a multitude of data regarding paleontological resources, existing collections, and park resources. For example, geographical locations can be compared with any of the following: stratigraphic formations, sediment types, locality provenience information, fossil types, specific project information including reports and other locality documentation, collection photographs, and the scientific status of the resource. Creating these data resources with this level of technology will aid in resource identification, investigation, evaluation, determination, and interpretation, as well as the documentation and curation of these resources for future generations.

The County of Orange currently maintains its collections and records through the OC Parks Historical and Cultural Programs office. Standards for the proper collection, preparation, curation, and long-term management are provided in Part IV of the California State University, Fullerton Proposed Policy and Procedural Guidelines document developed by

Eisentraut and Cooper (2002). These Guidelines can be found on the World Wide Web at: <http://www.ocparks.com/uploadgraphics/CSUF%20final%20curation%20report.pdf>.

Since OC Parks has adopted the proposed policies for format of the reporting and cataloguing cultural resources put forth by CSUF, the OC Parks Historical and Cultural Programs office should play a central role as a custodian in the work pertaining to the collections and records for AWCWP.

11.2 PERIODIC LOCALITY PROSPECTING AND SALVAGE COLLECTING

A park-wide systematic reconnaissance survey should be conducted under the direction of an Orange County certified paleontologist. Survey work should be completed to a level that will satisfy the County of Orange Standard Condition of Approval A05. To help staff with this endeavor, volunteer groups, possibly students from local geology field schools or members of local professional societies, could assist in the survey of the AWCWP.

When fossil localities are located during a survey, they should be recorded on fossil locality sheets that will document important information about the find such as a temporary field number, tentative identification of the find(s), description of the sediments, formation name, location of the find within the AWCWP, elevation, and GPS locational information. Locational data should be recorded using a handheld GPS unit so that the data can be imported into existing park resource management databases, and when needed, the resource can be easily relocated. Locality updates, including photos and maps, should be completed for previously documented localities that are reevaluated; locality updates can augment or correct information that is known about a specific resource by corroborating that the existing records remain accurate. Previously recorded information that appears to be erroneous should be noted, especially when changes occur to the resource or its immediate setting. For resource protection, confidentiality should be maintained for all records of fossil site locations. Every effort should be made to preserve the resource in situ for future generations. Collection by staff or volunteers under the direction of a County-certified paleontologist is recommended for significant fossil materials encountered if the fossil appears to be threatened by natural or human factors. Therefore, surveyors, and park rangers, should at a minimum have access to picks, shovels, rock hammers, dental picks, brushes, mason trowels, one-quarter-inch mesh screens, plaster medical bandages, and chemical hardeners to help stabilize and collect fossil resources.

In addition, prior to any proposed ground disturbing activities within the AWCWP, whether routine or emergency trail maintenance, biological revegetation efforts, or construction of new facilities, a paleontological assessment survey of the proposed construction area should be completed under the direction of a County-certified paleontologist to identify both the rock types present in the area and the potential for significant fossil resources to be discovered. If significant fossils are identified during the survey, these should be scientifically salvaged prior to initiation of construction activities. A County-certified paleontologist should develop a paleontological resources impact mitigation program (PRIMP) consistent with guidelines developed by the Society of Vertebrate Paleontologists (SVP 1995) to direct resource monitoring of excavations in order to collect and properly curate any fossils that may be discovered during the ground-disturbing activities. Standards

for the assessment survey and monitoring program can be found in the County Standard Conditions of Approval A05 (Survey), A06 (Salvage), and A07 (Monitoring).

11.3 RESEARCH OPPORTUNITIES AND INTERPRETIVE THEMES

The paleontological resources that may exist within the AWCWP can range in age from the Late Eocene through the Pleistocene and may be either marine or nonmarine organisms. Localities within the AWCWP are a priceless source of paleontological information for the public interpretation of local prehistory. As previously mentioned, a current and comprehensive survey of the AWCWP is lacking, and very few of the localities that have been recorded within the AWCWP have been thoroughly studied. Until a complete inventory of park localities has been compiled, little can be known about the interrelationship of these paleontological resources. This fact signals that there exists much research potential, as well as many unknown resources within the AWCWP.

The paleontological work that is discussed in this RMP provides a framework for both the existing and discovered information to be stored for future research. Potential research can focus on a variety of topics such as:

- What types of plant and animal life existed in the County at specific times in the past? Provide an epoch-by-epoch description of the gradual changes that affected both the landform and fauna of the County.
- What geologic conditions are represented by the sediments and fossils at specific times in the past? Was the area under water? If so, how deep? Was the area a flood plain? Was the area a swamp?
- Are there any new species that may help shed light on evolution or evolutionary processes?
- Do some specific sediment types produce more fossils than others?
- The geological history of the Sespe/Vaqueros Formations has been proposed to be one of a large river delta that was eventually diverted through activation of the San Andres Fault system along the western margin of the United States. Fossils from this time are found in the Sespe deposits within the AWCWP.

These general topics are an indication of the opportunities for resource interpretation for AWCWP. Research objectives to direct scientific investigations in the park may be more easily developed in conjunction with a local museum (Orange County Natural History Museum) or university (CSUF). An ad hoc committee of local paleontologists could develop a list of relevant research questions that might be investigated in AWCWP. A review panel, including a County Certified Paleontologist, could review paleontological research proposals designed to aid park resource management and make recommendations to park staff on approval of research.

A major goal in dealing with the paleontological resources located within AWCWP is to provide educational opportunities to the public. This goal could be realized through the creation of a paleontological resources display (possibly housed within a kiosk) that would

help to disseminate information from the Park to both the public and the scientific communities. The County Paleontologist at the Ralph B. Clark Interpretive Center, could also be contacted to assist in developing materials and locations for conducting paleontology outreach as an interpretive element of the park.

The Pecten Reef area contains significant invertebrate fossils, but an interpretive facility, ranging from simple kiosks to an interpretive center, could be constructed in this area, with impacts to paleontological resources mitigated below a level of California Environmental Quality Act (CEQA) significance. Education could focus on several topics such as the differences between an archaeologist and a paleontologist. Another topic could deal with defining a fossil and the processes required to form a fossil. Other topics could concentrate on what scientists can learn from studying fossils and why it is important to collect locational information, sediment descriptions, descriptions of other associated fossils, etc. along with the find. It should be stressed that a fossil without all this other information is not very useful to science since the complete story of the fossil is lost. Paleontological interpretive and visitor education programs should be coordinated with other interpretation and education efforts throughout the park. Information about paleontological resources should also be included in general information and maps of the park.

11.4 FOSSIL RESOURCE STEWARDSHIP

The topic of resource stewardship comes into play on several levels for the AWCWP. Stewardship needs to be designated for the basic management of AWCWP collections and records. Locality recordation and maintenance also requires stewardship.

Currently, the OC Parks Historical and Cultural Programs Office maintain the collections and records for the County of Orange. Fossil analysis and inventory work should occur at the County curation facility, or at the AWCWP under the direction of the County curation facility. However, it is recommended that the OC Parks play an integral role in the collection and record management for AWCWP. This would include assistance to the County in the establishment of a volunteer program for fossil analysis and inventory work, as well as aiding in the creation of a database and GIS mapping system to accommodate proper recordation of paleontological resources from the AWCWP.

The contents of paleontological localities are largely unpredictable, with some areas exhibiting abundant remains in one area, while a few feet away there will be fewer or even no remains. Paleontological information is most often discovered when it is exposed on the ground's surface as the result of a variety of impacts, from natural erosional factors to disturbances caused by humans through excavations to modify the landscape. Given the existence of a wide variety of sediment types in the AWCWP, with the potential to produce vertebrate and invertebrate fossil remains, the creation of a site stewardship program for the protection of AWCWP resources is crucial.

The OC Parks Historical and Cultural Programs Office should also play a central role in developing a stewardship program for the AWCWP. Due to the amount of work involved with the identification, recordation, investigation, and evaluation of the paleontological resources within the AWCWP, it is recommended that a volunteer program be put into place to assist

with this work. An active stewardship program can also be established for the monitoring and management of known paleontological resource localities within the park. Volunteers for the AWCWP site stewardship program may be found from local professional societies. Locally run geologic field schools may also be involved in the survey, recordation, and subsequent curation processes. Sources for paleontological volunteers include: 1) Ralph B. Clark Interpretive Center, 2) County Curation facility, 3) Paleontological consulting community, and 4) City of Laguna Hills Community Center.

Most important for the protection of the resources is a schedule of routine patrols in paleontologically sensitive areas to help evaluate known and as yet undiscovered paleontological localities. These localities should be evaluated in terms of the potential effects on the resources by the natural weathering and erosion of the locality and the impacts of park visitors (such as the indiscriminate collection and/or vandalism of sites and the creation of illegal trails that could potentially damage rare fossils within the locality and produce negative effects on it). These efforts will assist AWCWP in prioritizing paleontological resources for protection and management measures and actions. As GPS mapping becomes more prevalent in our society, using this technology to assist in the location and recordation of resources by volunteers will be key for the AWCWP.

In conjunction with a stewardship program, the implementation of an emergency response plan for localities that have been exposed by erosion or planned park maintenance is a necessity. When paleontological resources are encountered, during either a patrol or Park maintenance, an Orange County certified paleontologist shall be consulted. The certified paleontologist will both recommend and implement mitigation measures that are appropriate for the impacts to the locality. The mitigation may range from simple recording of location and noting the types of fossils present with no material actually being collected, to collecting a representative sample of the exposed fossil material, to a full-scale excavation to salvage the resource before further damage occurs.

11.5 RECOMMENDATIONS

General Actions

- Establish a paleontological resources records management system.
 - Create a relational database system to record pertinent site information using the Modal Curation Program, CSUF as a template. Once in place, this database should be continually updated to include new information about previously recorded localities, as well as document newly discovered localities.
 - Digitize known park fossil resources into a access-controlled GIS format to produce a base map of AWCWP.
- Implement a formal procedure for care of existing collections with AWCWP. Collections are managed through the OC Parks Historical and Cultural Programs office using standards provided in Part IV of the CSUF Proposed Policy and Procedural Guidelines (Eisentraut and Cooper 2002) and relevant County policies and procedures.
- Place paleontological resource collections from AWCWP in a suitable repository within Orange County.

- Conduct a park-wide systematic reconnaissance survey under the direction of an Orange County certified paleontologist. Survey work should be completed to a level that will satisfy Orange County Standard Condition of Approval A05.
- Create a site inventory checklist for inventorying all paleontological sites within AWCWP. A major feature of the checklist should be a section that details threats to the locality.
- Develop research objectives to direct scientific investigations in the park.
- Create paleontological resource information exhibits that would help to disseminate information about AWCWP to both the public and scientific communities.
- Develop an interpretive facility in the Pecten Reef area with impacts to resources mitigated below a level of California Environmental Quality Act (CEQA) significance.
- Coordinate paleontological interpretive and visitor education programs with other interpretation and education efforts throughout the park.
- Schedule routine patrols in paleontologically sensitive areas to help evaluate known and as yet undiscovered paleontological localities. Localities should be evaluated in terms of the potential effects on the resources by the natural weathering and erosion of the locality and the impacts of park visitors.

As-Needed Actions

- When fossil localities are identified, they should be recorded on fossil locality sheets that will document important information about the find such as a temporary field number, tentative identification of the find(s), description of the sediments, formation name, location of the find within the AWCWP, elevation and GPS locational information. Every effort should be made to preserve the site in situ for future generations. Collection is recommended for any materials encountered if the fossil appears to be threatened by natural or human factors.
- Prior to any proposed ground disturbing activities within AWCWP, conduct a paleontological assessment survey under the direction of a County-certified paleontologist to identify both the rock types present in the area and the potential for significant fossil resources to be discovered. The survey should comply with SCA A05.
- If significant fossils are identified, they should be scientifically salvaged prior to initiation of construction activities. A County-certified paleontologist should develop a paleontological resources impact mitigation program (PRIMP) consistent with guidelines developed by the Society of Vertebrate Paleontologists (SVP 1995) to direct resource monitoring of excavations in order to collect and properly curate any fossils that may be discovered during the ground-disturbing activities. Salvage activities should comply with County SCA A06.
- Implement an emergency response plan for sites that have been exposed by erosion or planned AWCWP maintenance. When paleontological resources are encountered, an Orange County certified paleontologist should be consulted. The certified paleontologist will recommend mitigation measures that are appropriate for the impacts to the locality.

12.0 Public Outreach and Education

12.0 PUBLIC OUTREACH AND EDUCATION PLAN

12.1 INTRODUCTION

A comprehensive interpretative program is the means to convey information about the AWCWP and the nature of the land it was established to protect. Trail use lends itself to an active recreational experience that can be enhanced by educating trail users on the local environment and history. The County has initiated several interpretive displays and programs to convey information about the park. These displays and programs include interpretive panels, kiosks, and signs along with interactive outreach programs. The County thus provides the public with trail maps, public safety information, and rules and regulations along with descriptions of local wildlife, habitats, and the environmental values of the park.

12.2 EXISTING INTERPRETATION AND EDUCATION

12.2.1 Interpretive Panels

Interpretive panels are a valuable tool to educate the public on issues such as wildlife habitat, habitat restoration, environmentally sensitive areas, benefits of using the designated system of roads and trails, trail safety, and detriments of non-system trail use. Interpretive panels also provide important information on unique park resources such as geologic formations, sensitive habitats, scenic vistas, and historical features. Currently, interpretive panels are located at Top of the World, Dripping Cave, Old Corral, and at the Pecten Reef Trail.

12.2.2 Information Kiosks

Information kiosks convey information and communicate with users of the park. Information kiosks currently exist throughout the park at the following locations:

- Main Park Entrance
- Aliso and Wood Canyons Confluence
- Moulton Meadows
- Top of the World
- Intersection of the Wood Canyon and Mathis Canyon trails
- Intersection of the Wood Canyon and Cholla trails
- Intersection of the West Ridge and Cholla trails
- Intersection of the West Ridge and Mathis Canyon trails
- Base of Meadow Trail adjacent to the foot trail

Informational kiosks address a variety of topics including rules and regulations, maps of the park, safety information, wildlife information and sightings, and upcoming events.

12.2.3 Signs

Information signs are posted throughout the park to convey information to park users. Signs are used to post use restrictions, regulations, or other important information. Signs include warnings about potential safety hazards from wildlife, such as mountain lions and snakes, as well as poison oak, ticks, and steep slopes. Directional signs are also used at trail intersections to identify trails and indicate trail lengths.

12.2.4 Public Outreach

Park rangers conduct a free 30 minute nature walk on the second and fourth Saturday of every month, limited only by the current number of available staff. Topics explored include native flora and fauna as well as the cultural and historical resources of AWCWP. These nature walks introduce residents to the many resources of the AWCWP lands and promote public understanding of the value of wildlife and habitat.

The Laguna Canyon Foundation conducts tours for underprivileged 4th grade students from an inter-city Santa Ana elementary school. These outdoor science classes are oriented specifically for children with little or no experience with the natural world. The program offers a unique combination of environmental science, outdoor skills and learning by experience, and leadership activities. The program is ongoing and will continue into the future, targeting different schools each year (Stan Bengtson, pers. comm.).

12.3 PUBLIC OUTREACH AND EDUCATION PLAN

Interpretation provides the means to deepen an appreciation and encourage the protection of AWCWP. Interpretation provides lasting benefits to individuals and the local communities. Interpretive services can introduce visitors to the intrinsic values of the park and educate about the appropriate management of natural and cultural resources. The following discusses interpretation in the context of Resource Management for AWCWP using guidelines for State Park planning as outlined in the Planning Handbook, California State Parks, February 2002.

Interpretive goals and guidelines provide the basis to prepare interpretive plans that expand upon the interpretive themes, and detail methods, media and programs for the park. Specific project interpretive plans and exhibit plans that focus on more detailed interpretation may then follow in future documents. Three main goals are identified for the park's interpretive programs:

- Visitors will understand and appreciate the importance of California's native habitats.

- Visitors will learn about and understand how humans have affected California's native habitats.
- Visitors will understand the need for ongoing protection and enhancement of the natural, cultural, and recreation resources for present and future generations.

12.3.1 Interpretative Themes

AWCWP contains intact native habitat and remnants of Southern California's historic landscape. Interpretation will include the significance of the historical use of the land, the local wildlife and their habitat still present, and the need for preservation of the land for the future to instill a sense of place and stewardship of the natural community.

- Develop an Interpretive Plan that reflects the unifying and primary themes outlined below. The Plan should articulate strategies necessary to implement the goals and objectives for interpretation, including interpretive trails and displays; enhancement of existing facilities and displays; interpretive programming; and interpretive methods, such as live programs, tours, brochures, maps, and school programs.
- Adopt interpretive themes that establish the overall interpretive direction and tone, as outlined below. Unifying themes provide overall focus to interpretive development for AWCWP. The unifying theme must relate to the resources, the definition of a wilderness park and the interests of visitors. Primary and supporting interpretive themes elaborate and further describe the unifying theme.

UNIFYING THEME:	Natural forces, plants, animals and people continually change the fragile and endangered habitats of AWCWP.
Primary Theme:	AWCWP contains a diverse collection of plant and animal species that depend on the native habitat.
Secondary Theme:	The urban edge effects wildlife and the native habitat. Visitors and adjacent residents must learn about the importance of AWCWP and how to co-exist. The diverse ecosystems within AWCWP require that recreational use must be balanced to provide long term preservation.
Secondary Theme:	The Nature Reserve of Orange County (NROC), of which AWCWP is a part, preserves a microcosm of the California Floristic Province, an identified biodiversity hot spot in North America and a genetic reserve for the continent.
Secondary Theme:	AWCWP is an important location for migratory birds, such as the endangered least Bell's vireo, the lazuli bunting, the little willow flycatcher, and the white-crowned sparrow.
Primary Theme:	AWCWP contains a landscape that is rich in both history and culture.

- Secondary Theme:** Native people depended on the land for their way of life. This theme will explore traditional uses of the natural resources. Native people had an intimate knowledge of plants, water and the cycles of nature. The theme allows for comparison with later settlers and present day visitors.
- Secondary Theme:** Early settlers helped to shape the communities that are present today.
- Secondary Theme:** Development of the automobile for travel, touring and business changed settlement patterns, lifestyles and transportation in Southern California.
- Secondary Theme:** Past agricultural practices (e.g., ranching and grazing) helped shape the landscape as we see it today.
- Primary Theme:** **AWCWP is part of a much greater watershed that begins in the Santa Ana Mountains.**
- Secondary Theme:** Humans have impacted the natural resources of the Aliso Creek watershed.
- Secondary Theme:** Natural resources of AWCWP play an important role in the health of the Aliso Creek watershed.
- Primary Theme:** **AWCWP has a wealth of paleontological resources that provide evidence of the ancient plant and animal species of AWCWP.**
- Secondary Theme:** AWCWP is a dynamic and naturally evolving area. Fossils help us to understand how past geologic events, processes, and environmental conditions have resulted in the park we see today.

12.3.2 Park Brochures/Internet

Brochures. Park literature should include maps and information about park regulations and hours of operation, park access and recreation, NCCP/HCP, park geology, plant communities, wildlife habitat, history and pre-history, environmental restoration programs, resource conservation issues, and educational programs offered by the park.

Internet. The internet provides an opportunity to better communicate information to a broad spectrum of County residents, Southern Californians, and the world. OC Parks could contract with a professional group to update and enhance the County's website, including the site for AWCWP. Topics for the AWCWP site could include:

- Topographic maps as an overlay to aerial photographs with trails and key access points
- Plant lists, bird lists, and wildlife sightings available on line for trail users
- Fire safety including information for residents who live adjacent to AWCWP (e.g. appropriate landscaping, emergency exits)
- Resource management and the need for active and ongoing work by both the County and local residents to ensure the future of this park
- Park events (e.g. night hikes, bird walks)
- Water quality/pollution
- Good neighbor policies/how to co-exist with the wilderness

12.3.3 Outreach Programs

The education of park visitors may well be the most important element of the resource management program. The location of the park in the midst of an urban environment renders it subject to profound influences of human activities. Many of the potential human impacts upon the park resources stem from a lack of understanding of the often complex relationships between human activities and natural processes in the environment. A diverse educational program designed to appeal to a broad spectrum of park users and County residents should be offered.

Interface with Schools and Youth Groups. AWCWP can provide an outdoor classroom for educational programs in the natural science, history, and pre-history for students ranging from pre-school to high school levels and other youth groups such as scout organizations. Schools located adjacent to AWCWP, in particular, should be targeted for such programs. Programs should coordinate interpretive and educational programs for pre-K-12 age groups with the California Department of Education's framework and content standards. Special programs could include events such as field trips with guided nature walks or cultural presentations. Students could then share their knowledge and enthusiasm with their families. Schools can be a vehicle to enhance public awareness of park resources. AWCWP could conduct a competition with local high school art students to create ideas for entry gates to the park that could later be constructed by a local artisan. The Puente Hills Landfill Native Habitat Preservation Authority has successfully conducted such competitions that produce intriguing iron entry gates with natural motifs at multiple entrances to their property.

Academic Research or Internships. AWCWP can also provide opportunities for academic research at the junior college or university level. Such research could involve specific technical studies and expand knowledge of existing resources, as well as encourage field visits and resource documentation. Due to its proximity to AWCWP, Soka University, in particular, provides a unique opportunity for developing research partnerships. Create youth and adult educational, research, and interpretive opportunities. Develop an ongoing relationship with local school districts, colleges, and universities. The County could provide opportunities for academic internships related to park resources. Interns could monitor visitor impacts on park resources, trails and other high use areas; research and develop

interpretive displays; document plant and animal species occurring in the park; research on habitat restoration techniques; document wildlife corridors; and present interpretive talks.

Docent Training. AWCWP could initiate a docent program that eventually could be self-sustaining with minimal staff oversight. Volunteer professionals (e.g., Laguna Greenbelt) could begin the process of training docents about the natural and cultural resources of AWCWP. Upon completion of a defined program trainees could be eligible to serve as AWCWP docents. Docent programs should include: plant communities, wildlife and wildlife habitats, sensitive plants, watersheds (impacts of nonpoint source pollution), cultural and paleontological history.

Volunteer Stewardship Program. Staff could solicit and encourage the development of a volunteer organization dedicated to stewardship of AWCWP. Such a group could be organized and run by volunteers with support, guidance, and supervision from park staff. Volunteers could participate in habitat restoration and revegetation, invasive weed eradication, biologic inventories and bird counts, observation and documentation, protection of archaeological and paleontological sites, park tours, trail and slope stabilization, Earth Day festivities, and preparation of educational/interpretive materials (e.g. photography, specimen collection). Establish an oral history program. Keep an active list of people associated with the history of AWCWP including the history of preserving the land for future generations. Obtain and preserve oral histories of these people.

Good Neighbor Program. AWCWP should provide educational materials for visitors who live in the vicinity of the park. Such educational materials should include information about invasive landscape plants, non-point source water pollution, conflicts between domestic pets, urban edge effects, urban wildlife coexistence, wildfire risk and prevention, trail safety and wildlife habitat, and wildfire prevention. These materials should be made available to the public at the AWCWP and LCWP main entries, the Laguna Niguel Regional Park ranger office, other County offices, and adjacent schools and property owners (if possible). Interpretive talks geared to local residents, including those living in the watershed of upstream of Aliso Creek, could be offered. Park staff should meet on an annual basis with Homeowners' Associations and other local groups to discuss planned management actions in the park, ongoing management problems, and to seek neighbors' comments on problems they have observed.

Adopt-a-Creek Program. AWCWP could start an Adopt-a-Creek program to encourage local residents to take an active role in helping to preserve the health and beauty of their local creeks. Adopt-a-Creek participants adopt an area of creek and make a commitment to protect and preserve it. Participants could assist the County by: regularly picking up trash, planting site-appropriate native plants and/or removing non-native plants, and studying and reporting on water quality and habitat.

Arts Community Outreach. Given the strong local interest in the arts, AWCWP could enlist the help of these artists to help the park on many different levels. Art events could attract both artists and those who appreciate artwork. Local artists who have used AWCWP for their landscape work (e.g., photography, plein air painting, sculpture) could display their work at the main park entry. Local art groups could conduct day events such as outdoor

watercolor or photography classes. Local artists could participate in the park's educational and interpretive programs. Artistic events (e.g., short plays, puppet shows, music or dance) could communicate information about park resources and conservation issues. Events could include walking on the trails, touching or smelling plants, bird calls. Events could be advertised through public service announcements on the television or radio, or on the County's website. Design competitions could be initiated to create a unique logo or "brand" for AWCWP that could be used on the website, park literature, and signs throughout the park.

Orange Coast Watershed and Environmental Center (OCWEC). AWCWP should continue partnerships with other environmental and educational organizations, including the OCWEC, for public outreach and education. Public agencies, nonprofit organizations, and educational groups can work together to develop regional and local programs for public education.

12.4 SIGNAGE

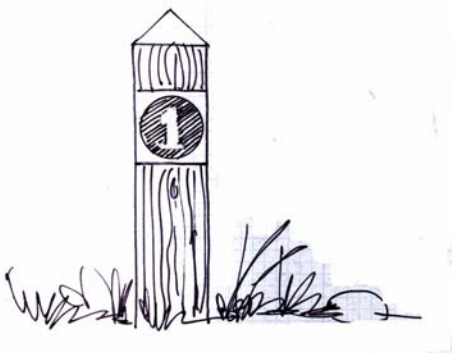
Park signs are required to convey four types of information: directions, regulations, interpretation, and identification. As with other wilderness park management tools, signs must be related to specific park management objectives. A goal will be to accomplish these objectives with the fewest number of signs necessary to prevent "sign clutter." Whenever, possible, maps and informational brochures should be used in place of signs. In general, park signs should be low profile to preserve the full wilderness experience and constructed of durable materials to complement the park's wilderness character. Graphic symbols will be used to convey information in a simple manner. Braille and/or audible signage should be included to assist the visually impaired.

- Place directional signs to convey trail and park facility locations, and distance to destination where appropriate. Directional signs shall be placed at access points, trailheads, and trail intersections.
- Define the rules and regulations of the park and convey acceptable and restricted use within the park. Regulatory signs shall be placed at access points and trailheads.
- Implement a clear hierarchy of signs, consistent with the hierarchy of entries outlined in Section 7.4.1 and detailed in Table E. The location of these entries is depicted on Figure 19, Public Access.
- Convey interpretation and education using a wide range of methods including, but not limited to, brochures, signs, special events, and web-based strategies. Provide interpretive kiosks at key locations throughout the AWCWP including: Level 1-3 entries, major trail junctions and key resource sites such as Dripping Cave, Pecten Reef, and Old Corral.

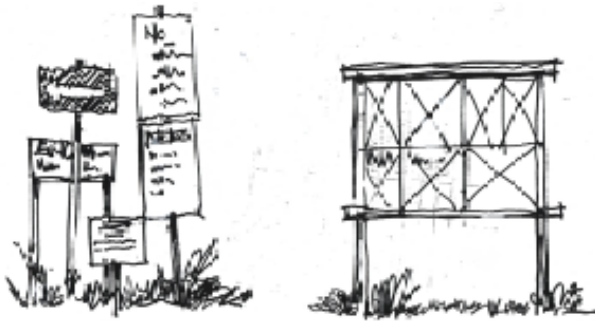
Signage Concepts. AWCWP needs a well-designed, coherent signage system to notify users of park rules, wilderness safety, direct the public to appropriate use areas, present and interpret park resources, explain recreational opportunities, and encourage public participation the stewardship of the park.

The County should prepare a signage guidebook specific to AWCWP, to include detailed specifications for sign design. Basic considerations should include the following.

- The signage program should include a unique logo or icon to represent the overall park identity for AWCWP. Under this main logo, the secondary identities of the individual park areas and features can be developed.
- The signage program should convey an understanding of the natural and historic rural character of AWCWP. It should also use creativity, quality of craftsmanship, durable materials, simple design, and an economy of words.
- An integrated sign system should include coordination of sign types, sizes, shapes, and colors.
- Signage should be limited in quantity and size to that which is necessary for information and safety purposes in order to avoid visual clutter.
- Signs should be as unobtrusive as possible. Natural materials are generally preferred, such as sand-blasted wood; to improve resistance to vandalism, recycled plastic and metal graphics should also be considered.
- Signs should be designed for ease of production and replacement. Consideration should be given to use of materials and paints that would be resistant to color fading.
- If signs include maps or aerial photos, the graphic should be oriented correctly (i.e., as seen from the viewer's point of view, and with the north arrow on map pointing north).
- The signage program should consider achieving the fewest signs and be located in the most appropriate places. Where possible, signs should be clustered.
- Where appropriate, particularly for signs related to public health and safety, signs should include languages in addition to English.
- Whenever feasible, the signs specified in the signage program should comply with universal access requirements (e.g., ADA). Raised characters and Braille for the visually impaired should be used where possible on onsite park maps and other essential graphic information.
- The existing signage should be gradually phased out and replaced to conform to an integrated signage system.



Typical Trail Marker Post– with carved white letters on raised, dark brown panels with a light brown background --



Reduce clutter (above left) by consolidating sign messages (above right).

12.5 RECOMMENDATIONS

General Actions

- Adopt interpretive themes that establish the overall interpretive direction and tone for AWCWP.
- Offer a diverse educational program to include primary and secondary schools, academic institutions, neighbors, volunteers, local artists and other agencies and non-profit groups.
- Develop a well-designed, coherent signage system.
- Coordinate with the Orange Coast Watershed and Environmental Center (OCWEC) and other partners and non-profit groups to provide interpretive opportunities for the public.

Five Year Actions

- Develop a comprehensive Interpretive Plan for AWCWP that includes recommendations for interpretive trails and displays; enhancement of existing facilities and displays; interpretive programming; and interpretive methods, such as live programs, tours, brochures, maps, and school programs. Update the Interpretive Plan every 5 years.
- Prepare a signage guidebook specific to AWCWP, to include detailed specifications for the design of all signs.

Ten Year Actions

- Update the Interpretive Plan every 10 years.

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13.0 Fire Management

13.0 FIRE MANAGEMENT PLAN

13.1 EXISTING FUELS AND FIRE HAZARD CONDITIONS

Droughts coupled with high temperatures, and often human influence, have caused frequent wildfires in Orange County. Although regular fires are an essential component of the ecology of certain AWCWP habitats, such as CSS and chaparral, an excess of plant fuel may increase the severity of a wildfire and threaten native habitat and neighboring development. As such, plant fuels may need to be controlled, requiring either prescribed burns or regular fuel reduction.

Existing fuel modification areas and zones are located on the edges of AWCWP where they meet residential developments. The current maintenance procedures for the fuel modification zones require the residential developments to mow, disc, weed whip, and hand-thin/clear these areas according to the fuel management plans for individual development areas. Fuel modification areas are also located along access roads to the Coastal Treatment Plant in the southernmost section of Aliso Canyon and along some trails within AWCWP.

Excessive fuel management practices allow nonnative invasive weeds, rather than natives, to become easily established within the fuel modification zones and adjacent natural areas. Existing fuel management and long and short term fire management practices appear to be severe (erosion, denuded slopes) along some of the areas between residential development and AWCWP. For example, in recent years, goats have been used to clear vegetation in some areas, leading in some cases to complete removal of habitat, type conversion of habitat and invasions of weeds. Proper management of these areas is important for erosion and weed control, and wildlife management.

13.2 EXISTING FIRE MANAGEMENT PROGRAMS

In response to the 1993 Laguna Fire, a required component of the NCCP/HCP is preparation of a Fire Management Plan. This Plan is currently being finalized. The purpose of the Fire Management Plan is to address the role of fire in the NROC and to provide for appropriate short and long term fire management policies that are sensitive to species conservation while providing for effective fire protection of urban development adjoining the NROC. Among the policies adopted as part of the Fire Management Plan are:

- The Orange County Fire Authority's (OCFA's) typical fuel modification zone standard of maintaining a 170-foot fuel modification zone adjoining residential structures.
- A requirement for development adjoining the NROC to use a formally approved plant palette in fuel modification zones that is free of invasive non-native plant species.

- The prohibition of fuel modification zones from being included in the NROC, with the exception of limited and identified areas adjacent to already developed areas located in proximity to the NROC boundary (e.g., Emerald Bay and Top of the World).

The Fire Management Plan is currently undergoing revision to refine management compartments boundaries, identify appropriate standards for maintenance of fire roads and fire breaks, and to identify fuel management needs that may have been overlooked in the first draft Fire Management Plan. The extension of the NCCP/HCP fuel modification limits to achieve the 170-foot wide zone will be considered for those few areas where no building setbacks were required at the time of initial development.

13.3 FUTURE FIRE MANAGEMENT PROGRAMS

Park boundary fuel management. The proximity of residential development to natural areas of the park prompts the issue of wildfire safety. Fuel modification zones are primarily the responsibility of individual owners or Home Owners Associations (HOA), although local agencies may take on this responsibility. These areas are designed to reduce flame length and radiant heat and allow firefighters to safely protect structures from approaching fires.

Fuel modification around the park boundary includes: 1) areas where fuel modification is allowed within the park boundaries due to previous agreements with adjacent developments or fuel modification zones established by the NCCP/HCP outside the Reserve both within the park, 2) areas where fuel modification occurs within the development adjacent to the park boundary, and 3) areas where fuel modification is not allowed but either has occurred or may potentially occur in the future within the NROC.

OC Parks must survey the park and the NCCP/HCP defined fuel modification boundaries and delineate the limits of the various NCCP/HCP authorized fuel modification zones with high visibility field markers. In addition, OC Parks should conduct an outreach program with the affected homeowners, HOA, and cities to advise them of the limits of the authorized fuel modification activities. In the outreach program to follow approved fuel modification/landscaping plans, limited use of herbicides, fuel modification should be suggested that can both lessen the impacts on resources and potentially reduce costs; for example, selective removal of vegetation, preserving or planting plants that are not detrimental or that are helpful (e.g., cactus) within the fuel modification zones.

Park interior fuel management. Since the park is surrounded by urban development, prescribed burns are not feasible. However, the supervising park ranger will develop a program to consult the OCFA once every five years to determine if fuel loads within the park reach dangerously high levels. If fuel levels are ever determined to be dangerously high, then a fuel reduction plan shall be prepared and reviewed by the USFWS and CDFG to ensure that it will not negatively affect the park's natural resources including "target and identified species." The fuel modification plan might entail actions such as mulching significant dead wood build up, and spreading the mulch over the ground. In addition, a meeting with local fire agencies should be conducted once every five years to coordinate

on-site drills (include where to stage fire fighters, where to land helicopters, etc.) and to develop emergency access maps.

13.4 FUEL MODIFICATION RECOMMENDATIONS

Recommendations for the installation and maintenance of the fuel modification areas adjacent to the Park are described below. These should be encouraged for use by adjacent property owners especially those that must conduct fuel modification on AWCWP property.

- Maintain fuel modification areas to:
 - Comply with the most current OCFA Fuel Modification Plan Guidelines
 - Establish the maximum vegetation cover allowed by the OCFA guidelines that provide habitat for native animal species and reduces the edge effect to the park.
- Implement fuel modification using the following procedures:
 - Use container plants, that are low fire hazard natives identified by OCFA as appropriate for planting adjacent to Reserve and compatible with the adjacent native habitat, for the fuel modification area with CSS or chaparral adjacent to the site (see Table I: Recommended Container Plants List, in section 8.2.3 Biological Resource Management).
 - Use seed mixes with a genetic source from within 10 miles of the Park and of similar microclimate regime (see Table J: Recommended Seed Mix, in section 8.2.3 Biological Resource Management).
 - Remove trash and inorganic debris associated with site preparation activities prior to installation.
 - Remove all exotic species including enough of the root mass to prevent resprouting. These exotic species include but are not limited to the list in Table M: Exotic Plant Species, below.
 - Individuals whose root mass is too large to remove should be cut horizontally above ground and immediately (within 15 seconds) treated with a 100 percent solution of Roundup Pro.
 - Manually remove all other high fire hazard native species not allowed within the fuel modification zone, including enough of the root mass to prevent resprouting (see Table N: Nonapproved Native Plant Species List, below)
 - Apply vesicular-arbuscular mycorrhizal fungi inoculum during hydroseeding at the rate of 80 pounds per acre.
 - Install plants and seed according to the installation technique described in the Habitat Restoration Methods (section 7.3.1). Refer to OCFA Fuel Modification Plan Guidelines to determine the allowed spacing.
 - Thin and maintain the fuel modification area according to the most current OCFA Fuel Modification Plan Guidelines.
 - Remove nonnative weeds to reduce the amount of competition for natural resources.

Table M: Exotic Plant Species to be Removed from Fuel Modification Areas

Scientific Name	Common Name
Cortaderia selloana	pampas grass
Atriplex semibaccata	Australian saltbush
Acacia spp.	Acacia
Eucalyptus spp.	Eucalyptus
Washingtonia sp.	Mexican fan palm
Festuca rubra	red fescue
Pennisetum setaceum	fountain grass
Picris echioides	bristly ox tongue
Erodium cicutarium	red-stemmed filaree
Sonchus oleraceus	common sow-thistle
Baccharis pilularis pilularis	dwarf baccharis
Nicotiana glauca	tree tobacco
Cistus creticus	purple rock rose
Nerium oleander	Oleander
Tamarix sp.	Tamarisk
Lobularia maritime	sweet alyssum
Coprosma kirkii	creeping coprosma
Salsola tragus	Russian thistle
Carduus pycnocephalus	Italian thistle
Conium maculatum	Poison hemlock
	other nonnative grasses

Table N: Nonapproved Native Plant Species List

Scientific Name	Common Name
Baccharis salicifolia	Mulefat
Dichelostemma capitatum	Blue dicks
Eriophyllum confertiflorum	Golden yarrow
Eschscholzia californica	California poppy
Galium angustifolium	Chaparral bedstraw
Gnaphalium californicum	California cudweed
Isocoma menziesii	Coast goldenbush
Lasthenia californica	Coastal goldfields
Leymus condensatus	Giant wildrye
Lotus scoparius	Deer weed
Melica imperfecta	Coast melic
Mirabilis californica	California wishbone bush
Nassella lepida	Foothill needlegrass
Nassella pulchra	Purple needlegrass
Plantago erecta	California plantain
Poa secunda	Perennial blue grass
Sambucus Mexicana	Mexican elderberry
Sisyrinchium bellum	Blue-eyed grass
Solanum xanti	Chaparral nightshade

13.4.1 Installation Methods

The plants and seed should be installed according to the installation techniques described in the Habitat Restoration Methods (Section 8.3.1). The plantings should be spaced in natural-looking patterns to replicate the character of the adjacent native habitat with fuel modification characteristics and with consideration of the microclimate requirements for each species. The spacing of the plants will be sparser than in non-fuel modification areas. The OCFA Fuel Modification Plan Guidelines must be referenced to determine the allowed spacing for a particular area. It is also advisable to meet with the OCFA to get their feedback on what they will approve for a particular area. If trees are placed within the fuel modification area, they should be spaced much farther apart than the shrubs.

The container plants should be installed in the fall, by November 30, to allow the container plants to become established during the wet season, so they will survive through the first summer.

Maintenance. The fuel modification area should be thinned and maintained in accordance with the most current OCFA Fuel Modification Plan Guidelines. Normal maintenance will include weeding, thinning, herbivore and erosion control, and supplemental irrigation and planting as necessary.

Maintenance should commence immediately following installation of container plants and the application of the seed. During this time, the plant community should be regularly maintained to ensure its successful establishment.

Weed Control. In order to help establish the developing plant community, all nonnative weeds should be removed to reduce the amount of competition for natural resources including water, nutrients, and sunlight. The amount of weeding required will be determined by the amount of weed seed in the soil, weather conditions, and the diligence in removing the weeds, thereby reducing the weed seed bank. Intense weeding should only be required for the first few years if done properly.

Irrigation. Native vegetation does not require supplemental irrigation under normal conditions. However, if the vegetation is planted in the irrigated zone, then irrigation will be necessary to meet the minimum requirements of the OCFA. Within the two thinning zones, the vegetation should receive temporary irrigation when environmental conditions (e.g., low seasonal rainfall, severely hot winds) are such that the plants exhibit signs of stress, in order to prevent loss of the plantings and dieback that creates fine fuel. The use and method of irrigation will depend on the location of the fuel modification area. All water used for irrigation should be free of impurities, excess chlorine, and salts.

Pruning, Thinning, and Leaf Litter Removal. The fuel modification areas should be thinned according to the OCFA guidelines. Thinning and litter removal will take place within the fuel modification zones where it is required. All litter removal should be in accordance with the OCFA Fuel Modification Plan Guidelines that follow.

13.5 FIRE MANAGEMENT PLAN

For existing and proposed developments in the unincorporated areas, the Laguna Beach Fire Department and the Orange County Fire Authority are active in insuring that proper fuel modification zones are established and maintained along the urban/wildland interface.

Following adoption of the fire management plan for the entire NCCP/HCP Reserve, a specific fire management plan should be prepared for AWCWP by working with appropriate agencies such as CDFG, USFWS, and county and city fire departments. The plan should address all aspects of wildfire planning, including prevention, pre-suppression, and suppression.

Pending completion of the Reserve-wide plan, development of a long-term fire management plan for AWCWP should consider the following fire management policies:

- Restrict the use of bulldozers and other mechanical land altering equipment used to widen and improve existing (access) roads.
- Any necessary new firebreaks shall be created with hand crews whenever practicable or feasible.
- Consider backfiring from existing fire access roads, natural features, trails (or fuel breaks) as preferable to constructing new fire control lines and other means of suppression.
- Use natural features such as ridgelines along with roads and firebreaks for containment lines.
- Allow the minimum number of fire suppression vehicles considered necessary for effective fire control by the command fire agency or ground tactical units.
- Use water saturation as a mop up technique rather than digging out and stirring hot spots in areas with significant resources and in areas subject to significant post fire erosion.
- Prepare a wildfire management plan in coordination with the OCFA and the Nature Reserve of Orange County that is consistent with NCCP/HCP guidelines and fire planning requirements.

The fire management plan shall include the following information:

- A discussion of the natural and historic role of fire, the existing fire environment, ecological effects of fire
- A summary of natural resources (topography, climate, hydrology, geology, soils, vegetation and wildlife)
- An assessment of the fuel load and the fuel characteristics for each vegetative community (e.g., measuring tree canopy crown height, shrub crown height, litter depth)
- Use of fuel characteristics to assess the potential fire behavior in each vegetation community and to determine the fire risk from existing fuel levels

- Documentation of management alternatives (*e.g.*, proposed action, no action, mechanical treatment, manual treatment, chemical, grazing, prescribed fire)
- A detailed fire program by management unit with priorities, treatment schedule and exclusion zones
- A discussion of treatment constraints such as air quality and smoke management, wildlife, geologically sensitive areas, aesthetics, and public safety
- A discussion of fire response readiness
- A description of the urban-wildland interface including local regulations for fire protection for homes adjacent to the park
- A description of community relations and public education

13.6 RECOMMENDATIONS

General Actions

- Incorporate applicable provisions of the NROC Fire Management Plan, when completed, into the RMP. That plan, through NROC, is currently in preparation.
- Continue existing fire control methods required by the City of Laguna Beach and OCFA within the designated zones at the urban-wildland interface.
- Develop one fuel modification plan for the park in cooperation with the applicable agencies. Encourage the HOAs would to adopt a section of the park in a “good neighbor” program.
- Develop and implement a program to educate local jurisdictions, park neighbors, and the public about wildfire management. Include the natural role of fire in native vegetation communities, fire safe practices in designing and building structures in interfaces areas and in landscaping.
- Collaborate with the OCFA, local fire agencies, fire safety councils, neighborhood groups, and others in implementation of the NROC Fire Management Plan.
- Precisely locate and permanently mark fuel modification areas in the field.

As-Needed Actions

- Locate park facilities away from fire hazard areas.
- Document the location and dates of wildlife occurrences.
- Evaluate soil, slope and vegetation of burned areas in the aftermath of a wildfire in the park. Employ temporary soil/slope stabilization measures if area is subject to soil or slope erosion or failure before vegetation can recover.

Annual Actions

- Monitor fuel modification areas required for adjacent properties to ensure that no park areas are being adversely impacted by fuel modification zone maintenance practices being conducted by other parties.

Five Years

- Develop a program in which the Park Ranger will consult with the OCFA and the City of Laguna Beach Fire Department once every five years to determine if fuel loads within the park reach dangerous levels.