Aliso Creek - Watershed Management Plan

Table Of Contents

Chapter I: Introduction

1.1 Purpose

The Aliso Creek Watershed Management Plan (WMP) is a collection of recommendations that have been developed with the advice and participation of community representatives; Federal, State, and local agency representatives; private citizens; and local citizen interest groups. Where possible, specific practices are listed that may be adopted by landowners and managers. Because there is usually more than one way to pursue any given land use, the practices include many alternatives from which to choose, dependent on specific site conditions and personal preferences. In many cases, the recommendations would serve to fill gaps in existing information. Furthermore, these recommendations help develop additional practices that would assist the citizens of the Aliso Creek watershed maintain a healthy, sustainable natural resource system. It is designed to be flexible and will be updated by local entities as new information and new techniques become available. The recommendations in this WMP are intended for use as a technical and educational resource for landowners and managers in the watershed who want to help ensure the long-term protection of the soil, water, and other natural resources of the watershed.

The recommendations in this WMP should be reviewed for effectiveness and completeness during the next two years. Public workshops and forums will be used to provide the widest participation possible. Implementation assistance such as funding and technical assistance will be sought from various Federal and State agencies to supplement the local effort and a thorough monitoring plan will generate needed information to maintain a proper assessment of the effectiveness of implementation. With that information, adjustments can be made, and further recommendations can be developed to help maintain the health of the watershed for the use and enjoyment of future generations.
Photo 1: Outlet of Laguna Niguel Lake (Sulphur Creek Reservoir)

1.2 Goals and Objectives

This integrated WMP is designed to address numerous water and land related problems in the Aliso Creek watershed. With increasing population and intensity of land use in the watershed, watershed management becomes more necessary in order to decrease negative impacts of human activities and to increase the positive impacts. Economic resources are necessary to enable the community to address and solve resource problems such as non-point source pollution. In order to keep the system in balance, decisions must be made with full knowledge of the likely long-term results of those decisions. Establishment of a goal-oriented management program can prevent problems before they occur and will result in much less expensive and much more efficient use of community energy.
The effort to attain this goal will include programs to reach several listed objectives of the plan. These objectives are measurable milestones that will enable the community to track progress toward maintaining a natural balance in watershed resources. Most of the objectives are to promote and encourage practices and

behavior that supports development of a healthy environment for the watershed. Education is therefore a major characteristic of this management program. Education is desirable regarding not only the technological issues related to watershed management but also social interaction that promotes more complete understanding of the respective needs of the citizens of the Aliso Creek watershed. The objectives of the WMP include:

- Promote stream stabilization
- Reduce soil erosion
- Increase biological diversity
- Encourage land stewardship
- Improve aquatic and riparian habitat
- Reduce invasive species
- Improve Water Quality

1.3 Stakeholders in Watershed Planning and Management

The preparation of the WMP is coordinated by the U.S. Army Corps of Engineers Los Angeles District (USACE) and Orange County, California. However, the USACE and Orange County are only two of the players in watershed planning and management. The following stakeholders all play an important role in this process:

Local Government

- City of Aliso Viejo
- City of Lake Forest
- City of Laguna Hills
- City of Laguna Beach
- City of Laguna Niguel
- City of Laguna Woods
- City of Mission Viejo

Water Districts

- Aliso Water Management Agency
- El Toro Water District
- Los Alisos Water District
- Municipal Water District of Orange County
- Moulton Niguel Water District
- South Coast Water District

State and Federal Agencies (local representatives)

- California Coastal Commission
- California Game and Fish Department
- San Diego Regional Water Quality Control Board
- U.S. Fish and Wildlife Service

Special Interest Groups

- Surfrider Foundation
- Trails 4 All
- Clean Water Now!

Citizen Groups

- Civic Organizations
- Homeowners/Neighborhood and Community Associations
- Landowners
- Youth Groups

Universities, Colleges, and Schools

- SOKA University
- Capistrano Unified School District
- Laguna Beach Unified School District

Representatives from the above groups have provided significant direction for the preparation of the WMP and it is anticipated that their support will continue through the implementation and monitoring stages of the WMP.

1.4 Report Format

This WMP presents a summary of an extensive analysis effort. Chapter 2 provides an introduction to the watershed problems and technical issues analyzed. Chapter 3 provides a summary of the key recommended actions. Conclusions and next steps are discussed in the final chapter. Appendices A through D contain specific recommended actions for various focus groups (i.e., individual, neighborhood groups, local, State, and Federal government) for keeping the Aliso Creek watershed healthy.

Chapter II: Watershed Resource Issues

2.1 Problem Statement

The Aliso Creek watershed suffers from a number of problems related to water resources. Not all of these problems are human-induced. Some of these problems are only the response of a natural system to variation in rainfall, sediment fluxes, and other occurrences that are part of the evolution of a watershed. Some perceived problems, such as erosion and flooding are actually natural processes within any

watershed. However, human actions and land uses can magnify the scale of these problems, particularly downstream. This is not to say, however, that no actions should be undertaken to correct problems in the Aliso Creek watershed. For example, where human infrastructure has been placed in areas naturally prone to erosion and flooding, they can suffer damages and may require protection. It may also be beneficial to protect remaining habitats in order to prevent localized extinction of species.

The list of problems currently evident in the Aliso Creek watershed is certainly not 100 percent complete, but contains the most significant factors that were agreed upon by the individuals, agencies, and other parties that participated in its development. A number of public meetings and workshops, study team meetings (stakeholders), and site investigations were held to develop this list. The identified problems are grouped in four general categories: creek instability, water quality, loss of fish and wildlife habitat, and flooding damages (Table 1). Specific problems within these categories are briefly discussed in the following sections.

Table 1: Identified Watershed Problems

Creek Instability	Channel Degradation/Migration and Erosion Damages
	Poor Floodplain Moistures Lost Terrestrial/Riparian Habitat
	Lost In-Stream Habitats Expansion of Invasive Species
	Devalued Recreation Experience
Water Quality	Poor Surface Water Quality
	Lost Aquatic Species
	Reduced Recreation Opportunity
Loss of Fish and Wildlife	Habitat s Lost Terrestrial/Riparian Habitat
	Lost In-Stream Habitat
	Expansion of Invasive Species
Flooding Damages	FloodingDamages to Land and Improvements

2.2 Creek Instability

The problem of channel instability is regarded as one of the most fundamental problems in the Aliso Creek watershed, which affects other identified problems. This problem has been related to natural channel change, development inside the watershed, increased flood flow peaks and/or volumes, increased dry weather (low-flow) discharge, impervious surface runoff increases, the random nature of recent large flood events, and other issues. Whatever the reasons, degradation (lowering) of the channel invert, which historically would be interspersed with periods of channel aggradation (or infilling), has turned into an increasingly destructive trend as the cyclical erosion and fill cycle has been replaced by continued degradation. It can be seen that replacement of bare soils in the watershed by development has cut off the traditional source of sediment in the watershed. This being the case, it may be that the now hungry or sediment-poor runoff from the watershed is compensating by

picking up more of its characteristic sediment load from the channel bed itself. Ultimately, a lack of sediment as a source will result in continued erosion in other locations, and eventually a lower sediment delivery to the coast. This will have long-term negative effects on beaches downcoast, as sooner or later, the channel source will also be exhausted, robbing the beaches of needed sediment.

Degradation can contribute to:

- infrastructure damage (e.g., water pipes, sewer pipes, roads, bridges, bank protection)
- land loss
- decreasing floodplain soil moisture levels
- gradual disappearance of historical floodplain and riparian zone vegetation and related wildlife species
- conversion of vegetation to xeric species
- destruction of "pool-and-riffle" sequences (i.e., disappearance of the sequences of "falls" and "pools" that once characterized the stream channel)
- disappearance or reduction of aquatic and riparian-related species, and other problems.

2.2.1 Erosion-Caused Land Loss

Erosion by surface water flow is currently causing land loss to adjacent properties. This is largely due to degradation of the channel (channel instability), which has been increasing since the late 1960s. Although this has been related to development of the watershed, increased impermeability, and increases in flood flow peaks and volumes, there is no definitive cause-and-effect relationship. It is sufficient to recognize that erosion of channel bed and banks is increasing and that land loss is accelerating. It is also recognized that treatment of the existing channel instability problem may reduce, or in some cases halt land loss by erosive forces. Because there is less damage attributable to land loss than that of overall environmental degradation, treatment of this problem is viewed as being only an incidental benefit of a larger environmental restoration campaign. Therefore, this problem will be discussed and evaluated as part of the larger watershed problem of channel instability and related environmental degradation. See Photo 2 at the top of this page.

2.2.2 Loss of Floodplain Habitat

Floodplain habitat, as discussed here, refers to vegetation complexes that would be found within the floodplain, or overflow area from most flood events.

The gradual conversion of floodplain habitat from trees and bushes of certain more water-dependent types, dominated by the complex known as "California Oak Woodland," to those of a more xeric (drought tolerant) nature is related by many observers who have spent much time in the watershed. Several long-term residents have noted that the trees once found in the floodplain are now largely gone, replaced by scrub and dry grasses. It is believed that many trees were cut in the "Mission"

period, as the oaks, sycamores, and other species were a valuable resource in the production of ships, structures, charcoal, and other uses. Still, many trees survived into this century, as evidenced by in-person accounts with older residents. It is not definitively known what caused the recent disappearance of trees in the floodplain, particularly in the lower watershed, but it has been noted that areas dominated by channel degradation have few resident trees, and those not suffering from appreciable degradation have a much greater associated tree population. Given that the degradation of the channel has been accompanied by a decline in floodplain soil moisture levels, it may be the case that the source of water for these large trees has disappeared and taken the trees with them. Tap roots for these trees, although lengthy, may have been of insufficient length to reach the far deeper groundwater table under current conditions.

Environmental resource agencies, land managers, and wildlife specialists have indicated that historic floodplain vegetation is rapidly disappearing in southern California. Given that much of the lower reaches of Aliso Creek are currently in public stewardship (i.e., Aliso and Wood Canyons Regional Park), this may provide a unique opportunity for restoration of the historic floodplain vegetation complex, and the wildlife dependent on it.

2.2.3 Loss of Riparian Habitat

This issue shares similar factors to that of floodplain habitat. Much of the riparian habitat in the Aliso Creek watershed has also suffered the same kind of destruction as that on the floodplains. Some regrowth is evident in some reaches, but tends to disappear with each flood event. This could be lessened if the structure of the stream channel were more stable. Riparian habitat, which supports fish, reptiles, insects, and mammals that traditionally occupied the watershed, is more evident in the Wood Canyon sub-watershed, and within some of the upper reaches of Aliso Creek. Since this habitat is dependent on both water availability and structural stability, much of the success of a riparian environmental restoration campaign is dependent on the success of channel restabilization measures.

2.2.4 Non-Native Species

Non-native (exotic) species are those not naturally found in a given area but through some transport mechanism have successfully occupied a biological niche. Often, these species have the ability to outcompete native species through specialized adaptations or an absence of predators. The increase of non-native species negatively impacts riparian ecosystems by decreasing the diversity of native habitat and frequently forming dense monocultures.

The giant reed (Arundo donax) is the primary exotic species to invade the Aliso Creek system. Giant reed is a hydrophyte, growing along lakes, streams, drains, and other wet sites. It uses prodigious amounts of water to supply its incredible rate of growth. Under optimal conditions, it can grow more than three inches per day (TNC, 2000).


Photo 3: Arundo donax along a river

This species is well adapted to the high disturbance dynamics of riparian systems as it spreads primarily vegetatively. Flood events break up clumps of Arundo and spread the pieces downstream. Fragmented stem nodes and rhizomes can then take root and establish as new plant clones.

Establishment and success of giant reed within a riparian corridor thus results in a decline in the diversity of native riparian plant species. All evidence indicates that giant reed does not provide either food or habitat for native species of wildlife. Areas largely taken over by this species are therefore deprived of wildlife.

Two other non-native invasive plants that are reported to be in the lower Aliso Creek riparian zones are the castor bean (Ricinus communis) and purple thistle, which is most likely bull thistle (Cirsium vulgare). A more complete list of non-native species found in Aliso Creek is given in Table 2.

Table 2: Non-Native Species in Aliso Creek

Arundo donax	giant reed
Brassica sp.	mustard
Cortaderia dioca	pampass grass
Eucalyptus sp.	eucalyptus tree
Nicotiana glauca	tree tobacco
Ricinus communis	castor bean
Schinus spp.	pepper tree
Tamarix spp.	tamarisk (salt cedar)
Vinca major	periwinkle
Centaurea solstitialis	yellow starthistle
Cynara cardunculus	artichoke thistle
Cirsium arvense	Canada thistle
Cirsium vulgare	bull thistle
Salsola Tragus	Russian thistle

2.2.5 Loss of Recreation Opportunities

The size and natural diversity of the landscape in the Aliso Creek watershed produces numerous opportunities for public recreation, education, and environmental awareness. Recreational activities available throughout the watershed include bird watching, fishing, hiking, jogging, surfing, golfing, and mountain biking. Many recreational parks and facilities are linked to a local watercourse within the watershed. In fact, some of these parks and facilities depend on Aliso Creek, or one of its tributaries.

Photo 4: Contaminated water sign at Aliso Beach

In the watershed study area, residential development has increased at a rapid pace, making the existing recreation parks and facilities even more valuable for humans, as well as pockets of wildlife habitat. Orange County conducted a recreation analysis that examined opportunities throughout the watershed, identifying two major areas for detailed analysis, Aliso and Wood Canyons Regional Park and the Aliso Beach Park. These areas were selected because they have a history of lost recreation opportunities tied to Aliso Creek's poor water quality problems. As recreational opportunities are lost due to creek instability, watershed management practices become critical for preserving some of the area's parks and facilities.

2.3 Water Quality

While Aliso Creek channel instability is most pronounced in the lower reaches, poor water quality is a pervasive problem throughout the entire watershed. Surface water quality in Aliso Creek has been in a state of decline since intense development of the watershed began in the 1960s.

2.3.1 Poor Surface Water Quality

The Aliso Creek watershed has been designated by the San Diego Regional Water Quality Control Board (SDRWQCB) as a target watershed for priority water quality enhancement efforts. Aliso Creek is listed as a Category I Impaired Priority Watershed (Aliso-San Onofre, #18070301) in the California Unified Watershed Assessment List (USEPA, 2000). The section of the creek from Aliso Beach to one mile upstream is designated as impaired for high coliform concentrations under the 1998 Clean Water Act Section 303(d). The primary causes of impairment of this watershed are non-point source pollution. Residential and commercial use of fertilizers and pesticides, and pet and waterfowl waste, are most likely the primary contributors to the nutrient and potential stormwater toxic impacts and elevated bacteria load. High temperatures also contribute to poor water quality.

Water temperature is a crucial factor in stream restoration for the following reasons:

- Dissolved oxygen solubility decreases with increasing water temperature, so the stress imposed by oxygen-demanding waste increases with higher temperatures.
- Temperature governs many biochemical and physiological processes in cold-blooded aquatic organisms, and increased temperatures can increase metabolic and reproductive rates throughout the food chain.
- Many aquatic species can tolerate only a limited range of temperatures and shifting the maximum and minimum temperatures within a stream can have profound effects on species composition.
- Temperature also affects many abiotic chemical processes, such as reaeration rate, sorption of organic chemicals to particulate matter, and volatilization rates.

2.3.2 Decrease/Disappearance of Aquatic Species

Recent surveys of Aliso Creek indicate a lower diversity and abundance of aquatic wildlife than is recorded in historical accounts. Small fish and some aquatic insects like the dragonfly (Macromia sp.) and the non-native mosquito fish (Gambusia affinis) still inhabit the creek's waters, but the effects of aquatic and riparian habitat degradation are clearly evident. In addition, flood events have severely impacted aquatic wildlife. For example, following the 1983 flood all remaining large fish including the bluegill (Lepomis macrochirus) and non-native bass (Micropterus spp.), and large indigenous frogs totally disappeared from the watershed (PFRD, 2000).

The degradation and loss of formerly stable riparian and floodplain areas combined with exceptional natural events have caused the elimination of critical aquatic species from the waters of Aliso Creek. Historical accounts indicate that steelhead trout may have been present in Aliso Creek until the late 1960s or early 1970s (USACE, 1997). In 1999, an aquatic life assessment was conducted by Orange County to provide a qualitative and quantitative evaluation of the existing aquatic community in Aliso Creek. Six benchmark sites, listed below, were identified and sampled.

- Lower Aliso Creek near former station ACJ01
- Aliso Creek below Sulphur Creek above Wood Canyon near ACJ01
- Aliso Creek above Sulphur Creek near ACJ01
- Upper Aliso Creek near Trabuco Road
- Lower Sulphur Creek below box culvert near SDCAM
- Upper Sulphur Creek above reservoir near SCBJ03

These sites were chosen for their ability to represent the typical range of conditions found within the Aliso Creek channel. Of these sites, Upper Sulphur Creek station exhibited the poorest habitat due to the large accumulation of organic sludge in the substrate generated by excessive algal growth. In general, most organisms still present in the creek were tolerant of degraded conditions and further underscore the fact that the water quality conditions in the watershed are poor.

2.4 Flooding

This problem is defined as the inundation of structures and other valuable property by floodwaters in such a way that monetary damage is caused. It is important to understand that ANY structure in the watershed could be inundated by water at any time. Water entering a home or business may not come from one of the obvious channels in the area, but might come from a slope upstream, a backed-up storm drain, or a burst water main. It is also in the nature of rainfall in southern California that a high-intensity storm cell may "park" itself over a neighborhood and exceed the ability of local drains to carry the runoff away. Repair of damages caused by these events is not normally covered by homeowner's insurance. This is why any homeowner, even those far removed from an obvious storm drain or channel would benefit from obtaining a flood insurance policy. Currently, there are not many sites within the Aliso Creek watershed that are at a significant risk of flood inundation.

The Aliso Creek Watershed Management Feasibility Study (USACE, 1999) included an analysis of the current flood threat in the Aliso Creek watershed. The results indicated that most structures in the watershed, and all continuously occupied residences, have a very low probability of flood inundation at this time. Several schools and at least one church are currently at the margins of the "100-year" floodplain. The 100-year floodplain encompasses an area in which the risk of inundation is, on average, one percent in any given year. This means that this size flood event is rare and should only occur, on average, approximately once in a 100-year period. It does not mean that this size flood cannot occur several times in a century, or even twice in one year. The given frequency is not a guarantee, but an estimate based on limited knowledge of past flood events. The schools and church are not currently at a high risk of inundation. It would take a major flood to threaten these institutions. During such events, it would be wise for staff from these facilities to monitor water height in the channel nearby and have a plan in place to evacuate to higher ground should water go over the banks. It does not, however, make economic sense to floodproof these structures at this time due to the high cost involved and low probability of inundation.

The single most vulnerable site in the Aliso Creek watershed is that of the Aliso Creek Inn and Resort in the canyon mouth and a small number of properties in close proximity. This site has been determined to be within a "25-year" floodplain, or to have a risk of inundation of, on average, approximately four percent in any given year. The Aliso Creek Inn and Resort has suffered significant damage during moderate to large flood events. The sites in the canyon mouth have been at risk from flood inundation since prior to development of the Flood Information Study generated by the Corps of Engineers and the County in 1973.

Photo 5: Debris on Aliso Creek Inn Golf Course after 1997 – 1998 floods.

Chapter III: Recommended Management Actions

3.1 Introduction

This chapter discusses the recommendations that address the water resource issues described in Chapter 2. The recommendations generally reflect those that the Study Management Team agreed would best address the needs and requirements of each of the water resource problem. The timeframe for recommendations generally ranges from 0 to 5 years for implementation to be initiated.

The Aliso Creek Study Management Team (SMT) is composed of the study partners who provided financial support, direction, data, and conducted analytical studies. The study partners include:

- U.S. Army Corps of Engineers, Los Angeles District
- County of Orange
- City of Aliso Viejo
- City of Laguna Beach
- City of Laguna Hills
- City of Laguna Niguel
- City of Laguna Woods
- City of Lake Forest
- City of Mission Viejo
- Aliso Water Management Agency
- El Toro Water District
- Los Alisos Water District
- Municipal Water District of Orange County
- Moulton Niguel Water District
- South Coast Water District

The SMT also include representatives from other government agencies, non-governmental organizations, special interest groups, and watershed residents.

Historically, natural resource management planning has been done on one resource only, or to deal with a single problem. The WMP is an attempt to begin integrating the many parts of the watershed through recommendations for practices and programs developed with the complexity of the Aliso Creek system in mind. Voluntary implementation of the recommendations in this WMP will not only help deal with identified problems, but will prevent others from occurring. Solutions to problems identified by citizens, agencies, public interest groups, etc. are easily realized when problems are treated as interests to be addressed instead of positions to be defended. This WMP provides a first step toward the mutual education within the community that will provide the basis for broad cooperative actions. No amount of government funding or regulation can equal the effects of broad voluntary participation on the part of individuals in the effort to provide long-term protection to the Aliso Creek watershed's natural resource system.

The Aliso Creek Watershed Management Feasibility Report presents and evaluates various structural and non-structural management measures to address a range of specific problems occurring in the Aliso Creek watershed. Throughout the watershed study, iterations of screening were conducted to ensure the development of efficient and effective solutions. Some measures were deemed not viable based on engineering analysis, environmental soundness, and public acceptability. The following sections describe the management measures that were recommended for inclusion in an integrated WMP. Implementation of these measures will require a continued cooperative effort among the various stakeholders.

3.2 Multi-Objective Planning

In general, stream work in the Aliso Creek watershed for the past several decades addressed only one issue at a time. Usually, stream alteration was done for flood hazard reduction, and relied heavily on engineered channels. Maintenance of these projects is particularly costly, and other aspects of the river system, such as vegetated and riparian corridors, wetlands, public recreation, and geomorphological stability were not fully considered in the final product. Wildlife enhancement projects frequently focused only on wildlife and did not consider flood threat impacts of the enhancement work. Drainage work for urban uses often did not consider either flood control or wildlife in their design and construction. A multi-objective approach to Aliso Creek watershed development and enhancement includes all these factors and seeks to recreate a sustainable system that requires much less long-term maintenance and provide a far greater range of benefits. By anticipating and utilizing the natural energy of the creek, a complete design accommodates channel stabilization, flood hazard reduction, economic uses, aesthetic and recreational opportunities, and habitat concerns.

3.2.1 Aliso Creek Mainstem Ecosystem Restoration

This management measure proposes stream restoration and stabilization of the Aliso Creek in the reach beginning just upstream of the South Coast Treatment Plant and ending at the Pacific Park Drive. The components are as follows:

- 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 (e.g., Armorflex) 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.

TOTAL ESTIMATED COST: $16 million

The positive effects of this management measure include:

- Reduced erosion in the Aliso-Wood Canyon reach
- Removal of barriers to wildlife movement; Increased terrestrial wildlife connectivity
- Water quality improvement by aeration and temperature reduction for the low flows
- Attenuation of certain pollutants
- Creation active floodplains
- Riparian revegetation
- Restoration of floodplain moisture
- Reestablishment of native species

3.2.2 Sulphur Creek Ecosystem Restoration

- 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 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 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.

TOTAL ESTIMATED COST: $2 million

The positive effects of this management measure include:

- Restore natural hydrologic regime
- Restore and stabilize riparian terraces
- Reestablish riparian vegetation
- Restore aquatic habitat

3.2.3 Wood Canyon Ecosystem Restoration

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 the heavily vegetated portion of upper Wood Canyon, approximately 3 miles from the gate at the AWMA Road gate.

TOTAL ESTIMATED COST: $550,000

The positive effects of this management measure include:

- Reduced erosion in the Wood Canyon reach
- Create wetlands
- Riparian revegetation
- Water quality improvement through filtration

3.2.4 English Canyon Ecosystem Restoration

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 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.

TOTAL ESTIMATED COST: $660,000

The positive effects of this management measure include:

- Reestablish emergent wetland and riparian vegetation
- Water quality improvement through filtration and sediment retention
- Water temperature reduction by added shade

3.2.5 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.

TOTAL ESTIMATED COST: $260,000

The positive effects of this management measure include:

- Construction of new habitat
- Encourage development of biodiversity in the watershed
- Water quality improvement through filtration and sediment retention
- Water temperature reduction by added shade

3.2.6 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. It 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 will identify opportunities for retrofitting current facilities and modifying standards.

TOTAL ESTIMATED COST: Variable based upon the intensity of the program developed.

The positive effects of this management measure include:

- Generate information needed to continue BMP program, or develop new measures if BMPs are not effective
- Encourage individual participation in BMPs by showing BMPs values to watershed

3.2.7 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.

TOTAL ESTIMATED COST: $1.5 million

The positive effects of this management measure include:

- Construction of new habitat
- Encourage development of biodiversity in the watershed
- Water quality improvement through filtration and sediment retention

3.2.8 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.

TOTAL ESTIMATED COST: $300,000

The positive effects of this management measure include:

- Prevention of sewage spill into Aliso Creek
- Prevention of bridge failure
- Restoration of aquatic species passage
- Revegetation

3.2.9 English Canyon Erosion Control

This management measure proposes to (a) 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.

TOTAL ESTIMATED COST: $790,000

The positive effects of this management measure include:

- Streambank stabilization
- Decreased erosion
- Protection of existing infrastructure

3.2.10 Floodproofing at Aliso Creek Inn

Within the watershed, there are several locations at which flood damages can not be addressed by cost-effective flood control solutions that would address more than a single beneficiary. This appears to be the case in the lower reach of the Aliso Creek watershed. There are six general non-structural floodproofing methods to reduce the occurrence of flooding and/or the hazards associated with flood events. These include the following:

- Structure elevation
- Levees and floodwalls
- Wet floodproofing
- Dry floodproofing
- Relocation
- Demolition

None of the floodproofing methods above has been identified as an economically viable option. 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.

ESTIMATED COSTS:

- Structure elevation $6.4 million
- Levees/floodwalls $1.6 million
- Wet floodproofing Not viable
- Dry floodproofing $764,000
- Relocation $8.2 million
- Demolition $5.4 million

3.2.11 Watershed Education

Watershed Education Plan

The goal of this management measure is to provide technical guidance for the development of local education program for K-12 that addresses scientific and cultural impacts of urbanization as it specifically relates to the Aliso Creek watershed. A significant opportunity exists by directing 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.

TOTAL ESTIMATED COST: Variable based upon the intensity of the program developed

- The positive effects of this management measure include:
- Short-term environmental restoration improvements associated with field exercises
- Long-term environmental benefits associated with stewardship and modification of behaviors
- Community consensus for watershed management need and direction

Also includes:

Non-Point Source Public Awareness

This element 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. There is a general lack of understanding and limited information available to residents and proprietors about the purpose and impacts of best management practices (BMPs) that they can implement themselves. Appendices A and B provides recommendations on management practices that can influence the water quality in the Aliso Creek watershed. These recommendations promote and

encourage practices and behavior that will support development and maintenance of a healthy environment for the Aliso Creek watershed.

TOTAL ESTIMATED COST: Variable based upon the intensity of the program developed.

The positive effects of this management measure include:

- Improvements in water quality
- Improvements in stormwater runoff
- Improvements in environmental quality
- Improvements in instream habitat in Aliso Creek
- Public awareness of cause and effect relationship of individual actions to watershed health

3.2.12 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. As presented in Appendix C of this document, a volunteer program is proposed to involve the public in monitoring of the Aliso Creek watershed. This would increase public awareness of the status of Aliso Creek as well as supplement data available to agencies involved. A generic water quality monitoring plan is presented in Appendix D for the continued monitoring of the Aliso Creek watershed.

TOTAL ESTIMATED COST: Variable based upon the intensity of the program developed

The positive effects of this management measure include:

- Determine if Aliso Creek meets water quality standards
- Encourage individual participation in BMPs and watershed issues

3.2.13 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, such as why planting these species in their yards affects the watershed. 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. The exact methods used to eradicate the plants will depend on several factors, but the use of volunteer resources including school program should be explored. However, due to castor bean's potential toxicity, children should not carry out physical removal and handling of this species. The effective removal of thistle will probably incorporate herbicides, which also limits the range of volunteer action that could be taken. A program outline is presented in Appendix D.

TOTAL ESTIMATED COST: Variable based upon the intensity of the program developed. Currently estimated at $9 million.

The positive effects of this management measure include:

- Reestablishment of native vegetation that provides higher-valued, diverse habitat

Overall, the watershed resource issues and recommended management actions discussed in this WMP could be summarized into the following common themes:

- Preservation, conservation, enhancement, and restoration of natural resources in the Aliso Creek watershed;
- Conservation and improvement of water quality and quantity;
- Utilization of environmentally sound land use practices;
- A need to reduce overlap and duplication of services and programs offered for resource management; and
- Communication needs for resource management

Taking Responsibility

All stakeholders must recognize their responsibility in natural resource management. Environmental issues and concerns in the Aliso Creek watershed need to be addressed promptly and efficiently. The state of the environment must not fall victim to "finger pointing" or financial constraints. Watershed stakeholders need to continue to work cooperatively to improve, preserve, enhance, and rehabilitate the environment.

Streamlining and Coordination

Resource management programs and services must be streamlined and coordinated to provide an efficient delivery of services.

Partnerships

Partnerships between any stakeholder group involved in watershed planning and management need to continue. Regardless of who is involved in the process, partnerships are an effective solution to many resource management issues in the Aliso Creek watershed.

Policy Implementation

Where there is significant concern for a particular resource and no policy is in place, efforts should be made to establish a local policy.

Effective Communication

People need to be informed and educated about natural resource management. Effective communication is a key component to watershed planning and management. It can change attitudes, create awareness, improve land use practices, and improve relations between watershed stakeholders.

Chapter IV: Implementation and Monitoring of the Plan

4.1 Implementation

The goals, objectives, and recommendations of the Aliso Creek Watershed Management Plan (WMP) can be implemented through a wide variety of methods. For each watershed resource issue discussed in the WMP, the means to resolve such issues are provided as recommended management actions.

Table 3 provides a summary of the key recommended actions and indicates stakeholder responsibility for implementing these actions. In general, the implementation of this WMP can occur through land use planning documents, subwatershed plans, local agency policy and programs, and land stewardship initiatives. It is important to note that all watershed stakeholders have an important role in the implementation of this WMP. With cooperation from all stakeholders, the Aliso Creek watershed resources can be managed more effectively and consistently.

4.1.1 Land Use Planning Process

In order for a watershed plan to achieve success, it is essential to incorporate the plan's goals and objectives into municipal land use planning documents. To ensure that land use planning occurs in an environmentally responsible manner, it is important that official plans promote and implement the objectives of this WMP. It is recommended that official plans identify implementation mechanisms (i.e., subwatershed plans and stormwater management plans) to ensure the linkage between watershed planning and land use planning is established. Specific details from this WMP could be implemented through comprehensive and site-specific zoning bylaws, site plan and subdivision agreements, and a purposed development permit process.

4.1.2 Subwatershed Plans

Subwatershed plans are an important mechanism for implementing watershed plans. A subwatershed plan will concentrate on resource features identified in watershed plans, undertake a more detailed study to identify the details of the natural systems, and further identify areas for preservation, conservation, enhancement, rehabilitation, and development. Subwatershed plans can also provide more detailed goals, objectives, and recommendations for issues of concern identified in the watershed plan and can be implemented by smaller jurisdictions.

It is not the intent of this WMP to delay development pending the implementation of subwatershed studies. Rather, the undertaking of subwatershed plans is a voluntary process that municipalities may undertake.

4.1.3 Policies and Programs

Policies and programs conducted by local agencies are other mechanisms that can implement the WMP. If a local government agency identifies an area of concern with regard to water resources, the ideologies and objectives in the WMP can be used to support the proposed policy and ensure its compatibility with other watershed policies and programs.

4.1.4 Land Stewardship

Another method for implementing the Aliso Creek WMP is through land stewardship initiatives. For example, a landowner resource center could provide watershed residents with a common place to obtain resource management information and advice. Furthermore, the center could provide services such as tree planting, or bioengineering expertise needed to enhance, restore, or rehabilitate natural resources in the Aliso Creek watershed.

4.2 Monitoring

Monitoring the success of this WMP and the achievement of its goals and objectives will occur in the following manner:

- It is intended that the WMP shall be subject to continuing review by the Aliso Creek Study Management Team members. Whenever it is deemed necessary, due to changing environmental, economic, technical, or social trends in the Aliso Creek watershed, the WMP will be amended. Significant amendments will involve a public participation process.
- It is recommended that the County of Orange, the lead local agency, hold a yearly meeting for presenting data collected that year and determining the need for revisions to the WMP.
- In reviewing this WMP, appropriate documents will be forwarded to municipalities and Study Management Team members for input and review. It is also recommended that a notice be given in local newspapers to provide any concerned stakeholders with an opportunity to obtain a copy of relevant information for input and review.

Monitoring the performance and success of the management actions used to achieve the objectives will occur in the following manner:

- Water quality sampling data will be used as an indicator of water quality. This data will indicate whether the recommendations provided in the WMP have maintained and/or improved water quality in the Aliso Creek watershed.
- A "Watershed Report Card," a user-friendly method for assessing watershed health, could be used to determine the health of the Aliso Creek watershed

each year, identify areas of concern, and reassess what can be done to improve the overall quality of resources in the watershed.
- A questionnaire circulated to municipalities, Study Management Team members, and other stakeholders two years following the adoption of the WMP to determine if the WMP is useful, implementable, and generally

LEGEND:

Stakeholder Role:
L - Lead, **D** - Direct, **A** - Advisory, **--** Not Applicable

Priority:
h - High, **m** - Medium, **l** - Low

Funding Requirements:
$ - Funding in moderate amounts required (<$100,000)
$$ - Funding required (>$100,000, <$1,000,000)
$$$ - Funding required in significant amounts (>$1,000,000,)
V - Variable

	Corps of Engineers	Orange County	State Agencies	Other Fed. Agencies	Cities	Water Districts	Watershed Residents	Schools & Universities	Special Interest Groups	Business/Business Owners	Priority	Funding Requirements
1. Aliso Creek Mainstem Ecosystem Restoration	L	D	A	A	D	D	--	--	--	--	h	$$$
2. Sulphur Creek Ecosystem Restoration	L	D	A	A	A	L	--	--	--	--	m	$$$
3. Wood Canyon Ecosystem Restoration	L	L	A	A	D	D	--	--	--	--	m	$$
4. English Canyon Ecosystem Restoration	L	D	A	A	D	D	--	--	--	--	m	$$
5. Pacific Park Basin Ecosystem Restoration	L	D	A	A	D	D	--	--	--	--	m	$$
6. Expansion of Program, Monitoring, and Evaluation of BMPs	--	L	A	A	L	D	--	A	A	--	h	V
7. Small Wetlands for Water Quality	L	L	A	A	D	D	--	--	--	--	m	$$$
8. Bank Stabilization Study - SOCWA Treatment Plant	L	A	A	--	--	D	--	--	--	--	h	$
9. English Canyon Erosion Control	L	D	A	A	D	D	--	--	--	--	h	$$
10. Floodproofing at Aliso Creek Inn	A	D	--	L	D	--	--	--	--	--	l	$$$
11. Watershed Education	--	L	--	--	L	D	D	D	D	D	h	V
12. Water Quality Monitoring Plan	--	L			L	D	D	D	D	D	h	V
13. Watershed-Wide Exotic Species Eradication	--	L	A	A	L	D	D	D	D	D	h	V