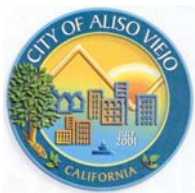

Wood Canyon Emergent Wetland Project



**City of Aliso Viejo
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Introduction

Wood Canyon is located within Aliso and Wood Canyon Regional Park in southwest Orange County, California (Figure 1, 2). The canyon is drained throughout its approximated 3.5-mile length by Wood Canyon Creek, a major tributary to Aliso Creek, which flows into the Pacific Ocean near Aliso Creek Beach.

The Wood Canyon portion of the Regional Park is a protected wilderness area, however; development along the canyon ridges has created conditions that threaten riparian vegetation and habitat along Wood Canyon Creek (Creek). The Creek is experiencing marked channel incision and degradation, which is attributable to the accelerated delivery storm-water runoff at the headwaters for Wood Canyon Creek. As a result, a number of major resource-related concerns including loss of riparian habitat, erosion, poor water quality, flooding, and declines in populations of native fauna and flora have occurred.¹ The U.S. Army Corps of Engineer's Aliso Creek Water Management Study² concluded that "20.5 of the 59 acres (35%) of the riverine habitat in Wood Canyon are highly degraded and of this total, 20 acres (34%) have been impacted to the point that they provide negligible or no measurable function."

The Creek begins at the north end of Wood Canyon. The City of Aliso Viejo (City) maintains a detention basin at the headwaters of the Creek, which receives runoff via the J02P08 storm drain system from primarily residential areas (298 acres). The detention basin has a storage capacity of 20 acre-feet. The detention basin is dominated by low-growing ruderal species that provide minimal floral and faunal habitat functions and values. Flow from the basin is discharged onto a concrete apron and directed into the Creek. The Creek is a natural channel with mature riparian vegetation, but showed sign of active degradation and bank erosion.

The purpose of this project is to create a wetland habitat using native riparian/wetland plant species within the detention basin, which would enhance water quality, flood control and channel protection at the beginning of the Creek (Figure 3). Since this Project is situated at the headwaters of the Wood Canyon Creek and has a long-lasting effect on the Creek as a whole, the Project will also increase and enhance the overall Wood Canyon Creek riparian corridor and its associated wildlife habitat.

Objectives

The objectives of the Wood Canyon Emergent Wetland Project were

- Create a wetland habitat using native riparian/wetland plant species that will effectively restore the pristine nature of the upper portion of Wood Canyon Creek to a pristine state.
- Augment the existing ruderal plan community with a mosaic of native species and multiple vegetation strata that would enhance the habitat-support functions and values within the detention basin.

¹ United States Army Corps of Engineers. 2002. Los Angeles District. Preliminary Plan Formulation Report for the Wood Canyon Ecosystem Restoration Study.

² United States Army Corps of Engineers. 2001a. Los Angeles District. Aliso Creek Watershed Management Study, Feasibility Report.

- Improve the hydrologic function of the riparian corridor by attenuating flood flows and dissipating energy by modifying the outlet structure to mitigate flooding and erosion downstream of the Creek.

Permit Compliances

In compliance with the varying regulatory bodies, the City has met the following permitting requirements:

- Resolution No. 2004-053: A resolution of the City Council of Aliso Viejo, California, Declaring a Categorical Exemption in Accordance with the California Environmental Quality Act and Filing of a Notice of Exemption for the Wood Canyon Emergent Wetland Project (November 3, 2004).
- Notice of Exemption for the Wood Canyon Emergent Wetland Project filed with the County of Orange Clerk on December 8, 2004.
- Clean Water Act Section 401, Water Quality Certification and Waiver of Waste Discharge Requirements for Discharge of Degraded and/or Fill Materials (RWQCB, San Diego Region, 401, Project No. 04C-151, January 25, 2005).
- Certification of Compliance with the Department of Army Nationwide Permit (Permit No. 200300588-SJH, February 2, 2005).
- Lake or Streambed Notification # 1600-2005-0045-R5 (California Department of Fish and Game, June 17, 2005)

Grant Funding

The following grants were awarded to the City to implement the Project:

- Habitat Conservation Program - \$83,000 through the California Department of Parks and Recreation.
- Partner for Fish and Wildlife Program - \$18,600 through the U.S. Fish and Wildlife Service.
- Clean Beach Initiative - \$43,000 through the State Water Resources Control Board

Conceptual Design and Construction

The emergent wetland site was constructed within the existing J02P08 detention basin. The construction process included the following activities:

- To ensure an adequate capacity is maintained in the detention basin for flood control, about 18 inches of sedimentation has been removed and transported offsite.
- Six cascading ponds have been constructed below the flow line of the basin to ensure that the flood control function of the basin is not reduced. The flow is guided to meander and provide the wetland ponds sufficient retention time. Erosion control fabric and cobbles has been used on pond overflows (Figures 3a and 3b).
- Several large rocks have been transported on the Project site and placed several feet downstream to act as energy dissipaters.
- A variety of native species were planted along the east, north, and west sides of the upstream detention basin to create viable, self-sustaining, wetland habitat. Two plant communities were created along the side (east and west) and back (north) slopes, including southern willow scrub closer to the toe and oak woodland farther up the slope to its crest or to the beginning of the access road. Southern willow scrub has been established from the toe to 6.5 feet to 8 feet above, and the oak woodland would be established from 6.5 to 8 meters from the toe up the face of slopes. The design included a short-term irrigation system to augment the existing hydrologic conditions and to aid in the establishment of self-sustaining plant communities.
- All roads affected by construction activities have been repaired to its pre-project conditions.
- The construction of this wetland site was initiated in September 2005 and completed on December 2005. Figures 3, 4 provide views of the wetland site on pre-construction and current conditions.
- An educational and public awareness describing the importance of a wetlands ecosystem and habitat restoration are now available at the project site (KIOSK) and on the City of Aliso Viejo official website (<http://www.cityofalisoviejo.com>).

Mitigation Monitoring Plan

In order to evaluate performance standards and the success of this project, the City has developed and implemented a mitigation monitoring and management plan. The time period involved for monitoring will be between three to five years, starting at the end of the construction period. The range in the monitoring time period is dependent on the results of the following measured parameters.

- Hydrology - frequency of inflows, duration of inundation, depth of inundation, outflows, duration of dry periods.

- Fauna - macro invertebrates, water birds, frogs, species diversity, species abundance, species distribution, important species, breeding events.
- Vegetation - species diversity, species abundance, species distribution, growth, health and important species.
- Water quality – Temperature, pH, turbidity, nutrients and indicator bacteria.
- Aquatic habitat - habitat diversity and bank stability

The monitoring plan is shown in Appendix A.

Monitoring Results

The Mitigation Monitoring Plan was developed and implemented immediately after the completion of the construction phase in December 2005. The plan included water quality sampling, and field measurements to assure the progress in the restoration of site hydrological status and the growth of the fauna and vegetations.

Field Observations

The City of Aliso Viejo continued the implementation of the Mitigation Monitoring Plan during FY 2006-07. City staff inspected the sites on a monthly basis and documented all field observations.

The following is a summary of the field observations during FY 2006-07:

- No erosion was observed at the site during and after the rainy season.
- Water was flowing through the wetland ponds at projected rates.
- All natural and planted vegetations were growing at normal rate (reproduction and density) compared to other natural habitats.
- Frogs, squirrels, birds, butterflies, mosquito fish and other wild species were present at the site.
- Educational brochures describing the importance of a wetlands ecosystem and habitat restoration were posted on a KIOSK at the wetland site. The KIOSK was designed and installed by Aliso Viejo's Boy Scout Troop 700.

Water Quality Analyses

Water quality samples were collected from the inlet and outlet of the wetland site during dry weather seasons in 2006 and 2007. Samples were collected and analyzed according to the Standard Methods for the Examination of Water and Wastewater (21st Edition, American Public Health Association and American Water Works Association).

Analytical data are listed in Table 1. For comparison purpose, the table includes Tolerance Interval values cited from the County of Orange Dry Weather Monitoring Report. These values were calculated as the 90 percentile of the data collected during 2006-07 dry weather from South Orange County storm drain outfalls and creeks.

As illustrated in Table 1, concentration of indicator bacteria in water samples collected from the inlet to the wetland ponds ranged from 11,000 CFU/100 mL to 120,000 CFU/100mL for total coliform, 1,700 CFU/100 mL to 18,000 CFU/100 mL for fecal coliform, and 8,600 CFU/100 mL to 72,000 CFU/100 mL for Enterococcus bacteria. These levels are lower than the dry weather Tolerance Intervals reported by the County of Orange in 2006-07 Dry Weather Monitoring Reports.

As the water passed through the wetland ponds, the concentration of indicator bacteria reduced significantly; 1 to 2-logs reduction. The average concentration of the indicator bacteria in the water samples taken from the wetland outlet averaged at 2,583 CFU/100 mL for total coliform, and 419 for Enterococcus bacteria. The level of fecal coliform bacteria dropped to an average of 154 CFU/100 mL, which is lower than REC-1 water quality objective of 200 cfu/100mL. No significant changes in the level of other constituents were observed as the water passes through the wetland.

In general, 2006 and 2007 dry weather monitoring data indicate that the quality of J02P08 runoff improved as it passed through the wetland. No significant changes were observed in other measured water quality parameters (Table 2, ammonia, nitrate and orthophosphate).

Figure 1: Location Map



Figure 2: Project Area Map

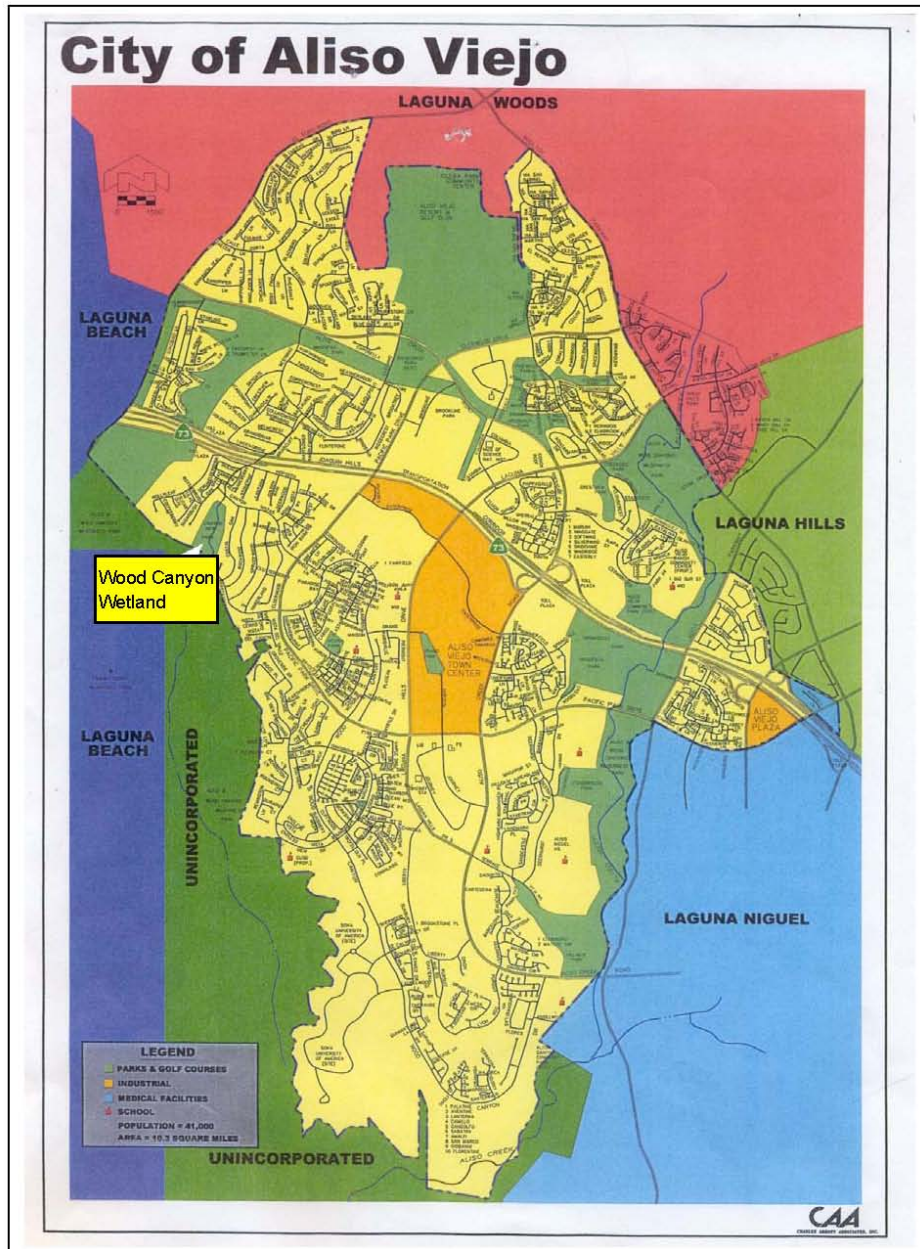


Figure 3a: Riparian Restoration and Enhancement Diagram 1

FIGURE 1

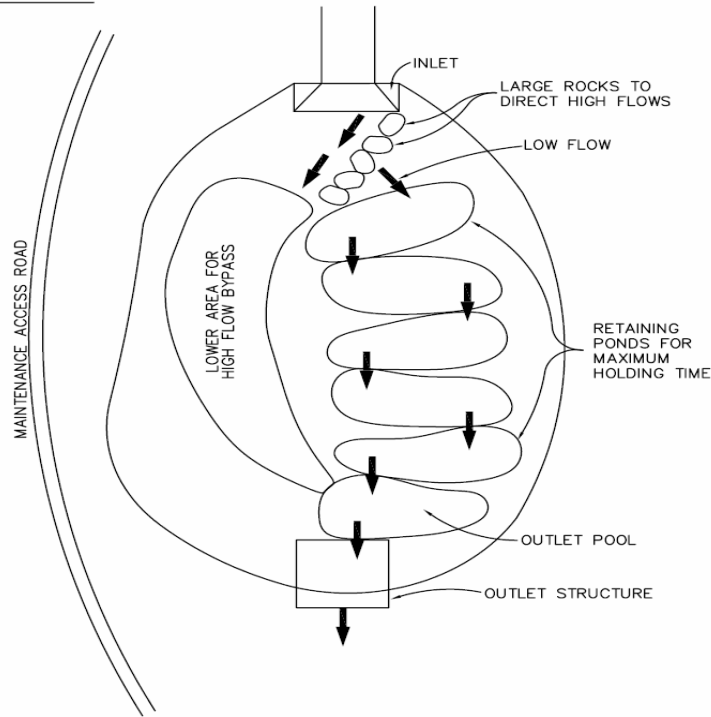


Figure 3b: Riparian Restoration and Enhancement Diagram 2

FIGURE 2

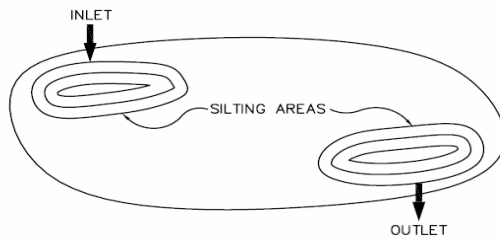


FIGURE 3

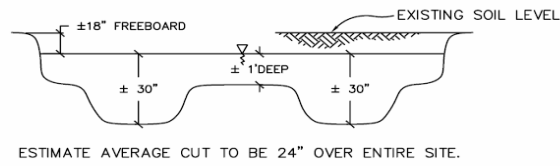


Figure 4: The Wood Canyon Creek at J02P08 – Pre-construction View



Figure 5: The Wood Canyon Creek at J02P08 – Post-construction View of the Ponds



Figure 6: The Wood Canyon Creek at J02P08 – Wetland Inlet



Figure 7: Kiosk at the Wood Canyon Emergent Wetland Project site – Summer 2007



Figure 8: The Wood Canyon Creek at J02P08 – Wetland Site View – Summer 2006



Figure 9: The Wood Canyon Creek at J02P08 – Wetland Site View – Summer 2007



Table 1: Analytical Parameters

Sample Location	Parameter	5/31/2006	6/14/2006	7/12/2006	8/23/2006	3/19/2007	5/21/2007	6/13/2007	7/11/2007	8/13/2007	Dry Weather Tolerance Intervals	
		Value										
Wetland Inlet	Total Coliform CFU/100 mL	120,000	27,000	53,000	19,000	75,000	17,000	11,000	78,000	58,000	330,000	
	Fecal Coliform CFU/100 mL	14,000	4,800	5,100	9,200	18,000	1,700	8,000	3,000	2,300	95,000	
	Enterococcus CFU/100 mL	72,000	8,600	19,000	24,000	64,000	12,000	20,000	12,000	14,000	53,000	
	Ammonia MG/L	0.5	0.39	0.19	NA	NA	NA	NA	NA	NA	1.45	
	Nitrate MG/L	2.8	3.7	2.6	4	4.3	4.5	3.1	5	3.2	5.6	
	Orthophosphate MG/L	0.38	0.28	0.36	0.85	0.46	0.62	0.44	0.72	0.41	2.95	
	Total chlorine MG/L	ND	mg/L	NA	0.1	ND	ND	ND	ND	ND	ND	0.12
	Dissolved Oxygen MG/L	6.52	mg/L	NA	6.1	NA	7.28	6.95	5.2	6.15	4.68	
	TSS MG/L	36	mg/L	NA	78	NA	17	13	74	6	47.55	
	TOC MG/L	7.5	mg/L	NA	NA	NA	8	7.1	11	11	NA	
Specific Conductivity	NA	NA	NA	NA	606	871	1,010	1160	834	6000		
Wetland Outlet	Total Coliform CFU/100 mL	1,600	1,300	9,000	9,000	4,000	700	200	6,000	450	330,000	
	Fecal Coliform CFU/100 mL	120	120	10	10	1,000	10	10	100	<10	95,000	
	Enterococcus CFU/100 mL	650	920	300	300	140	450	800	200	<10	53,000	
	Ammonia MG/L	1.32	0.42	1.2	NA	NA	NA	NA	NA	NA	1.45	
	Nitrate MG/L	3.5	3.9	1.9	2.1	4.4	4.7	3.5	2.7	1.6	5.6	
	Orthophosphate MG/L	0.36	0.35	0.74	0.35	0.91	0.59	0.73	0.78	0.59	2.95	
	Total chlorine MG/L	ND	mg/L	NA	0.1	ND	ND	ND	ND	ND	ND	0.12
	Dissolved Oxygen MG/L	6.78	mg/L	NA	6.1	NA	7.48	6.5	4.86	6.32	4.68	
	TSS MG/L	22	mg/L	NA	78	NA	14	27	12	12	47.55	
	TOC MG/L	8.4	mg/L	NA	NA	NA	9.9	7.9	39	7.7	NA	
Specific Conductivity	NA	NA	NA	NA	680	1,060	906	1,300	881	6,000		

Figure 10: Concentration of Total Coliform

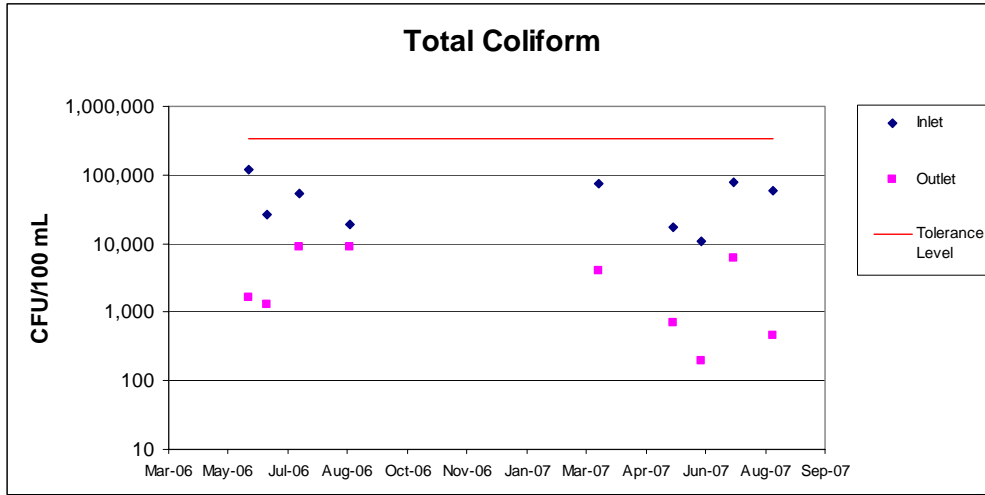


Figure 11: Concentration of Fecal Coliform

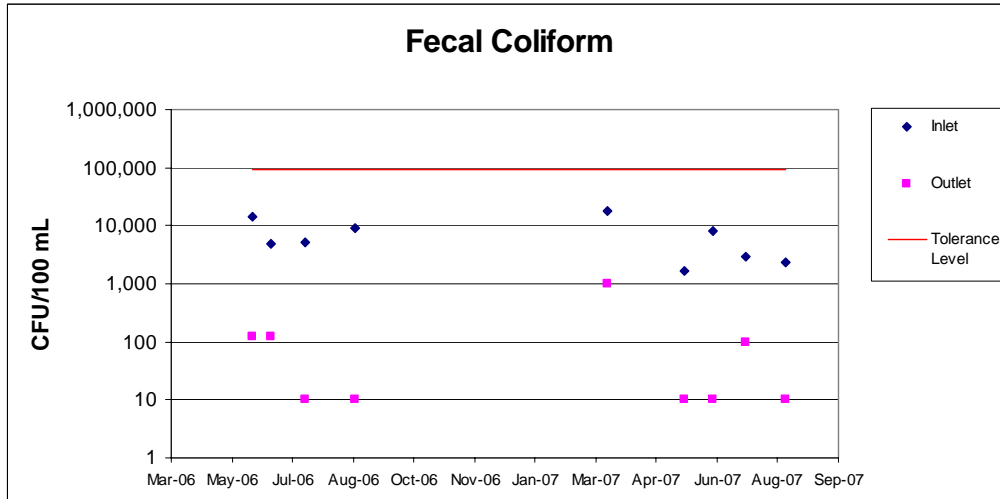


Figure 12. Concentration of Enterococcus Bacteria

