

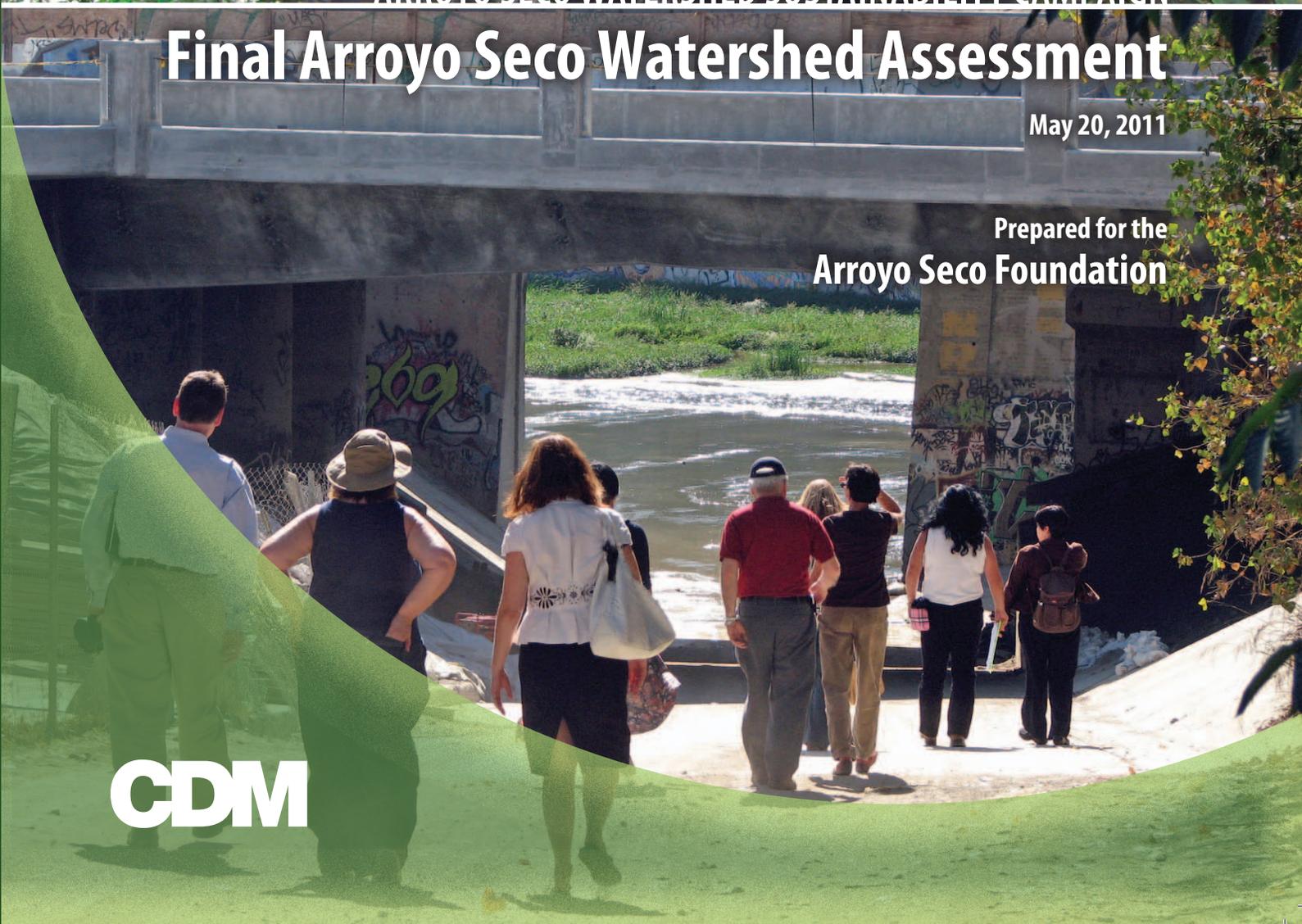


ARROYO SECO WATERSHED SUSTAINABILITY CAMPAIGN

Final Arroyo Seco Watershed Assessment

May 20, 2011

Prepared for the
Arroyo Seco Foundation



CDM

FINAL
Arroyo Seco Watershed Assessment
Arroyo Seco Watershed
Sustainability Campaign

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Acknowledgments

The Arroyo Seco Foundation (ASF) wishes to thank the State of California Department of Water Resources for their support and funding for this Watershed Assessment. ASF also acknowledges those stakeholders who have passionately embodied the vision of a restored Arroyo Seco for many years. These supporters include the Council of Arroyo Seco Agencies, Council of Arroyo Seco Organizations, Arroyo Seco Stream Team, U.S. Army Corps of Engineers, City of Pasadena, City of Los Angeles, State Water Resources Control Board, Caltrans, County of Los Angeles, and North East Trees. ASF retained the services of Camp Dresser & McKee, Inc. (CDM) to prepare the Arroyo Seco Watershed Assessment (ASWA).

1. Introduction

1.1 Background

The Arroyo Seco is one of the most spectacular and diverse watersheds in California. The Arroyo combines elements of a rough mountain watershed with an urbanized streamzone surrounded by half a million diverse residents. Over its 22-mile course, the Arroyo Seco drops from an elevation of nearly 6,100-feet at its headworks in the San Gabriel Mountains to 320-feet at its confluence with the Los Angeles River. The Arroyo passes by and through some of the most important landmarks in the Los Angeles Basin. As the Arroyo leaves its relatively natural upper watershed and descends from the San Gabriel Mountains, it passes by NASA's Jet Propulsion Laboratory (JPL) and enters the 250-acre basin within Hahamongna Watershed Park until it reaches Devil's Gate Dam. Below the dam, the Arroyo is highly impacted by urbanization, and is channelized as it runs through Brookside Park and the Rose Bowl. From this point, the Arroyo meets the Arroyo Seco Historic Parkway (Pasadena Freeway), a Federal Scenic Byway and the first freeway in the west, as it continues by the Huntington Botanical Gardens to the Audubon Center at Debs Park and from the Lummis Home and Gardens to the Los Angeles State Historic Park. The Arroyo is an environmental, cultural, and recreational oasis for all of Southern California.



Upper Arroyo Seco Watershed (arroyoseco.org)

After three years of work, the Arroyo Seco was officially named to the National Register of Historic Places in December, 2008. Led by Pasadena Heritage, the listing process concluded about eight months after the Pasadena Arroyo Park and Recreation District was unanimously approved by the state Historic Resources Commission. Pasadena Heritage has been dedicated to working to protect the city's natural and historic sites for over 31 years.

The Arroyo's listing under the "cultural landscape" historic category on the National Register represents a milestone for the organizations and communities concerned with preserving the resource. Placement on the National Register adds another layer of protection to the arroyo; and, the "cultural landscape" category is a unique designation for the arroyo because it recognizes the natural character as well as the tremendous recreational opportunities. Indeed, Sue Mossman, Pasadena Heritage's Executive Director, said the category provides a new way of looking at and evaluating historic sites. It includes both the natural environment and its significance to the human population, and also the imprint of the human population on the place."



The Arroyo Seco passing through the Colorado Street Bridge in Pasadena (arroyoseco.org)

The listing of the Arroyo is supported by varied stakeholders including the Arroyo Seco Foundation and the Rose Bowl. While there were some worries about balancing the Arroyo's historic designation with the commercial operations that take place at the Rose Bowl and the Brookside Golf Course, stakeholders now agree that these three historic resources can be protected in harmony with each other. Additionally, all parties recognize the importance of maintaining the flexibility that is also necessary in order to have thriving businesses such as the Rose Bowl and Brookside.

1.2 The Arroyo Seco Foundation

"The mission of the Arroyo Seco Foundation is to preserve and enhance the Arroyo Seco from the San Gabriel Mountains to the Los Angeles River, reforest our region and promote environmental and cultural awareness of one of Southern California's greatest natural resources." (arroyoseco.org/ASF.htm)

In 2002, ASF composed the following specific watershed restoration goals:

Restoration Goals

1. Restore the natural hydrological functioning of the watershed
2. Better manage, optimize, and conserve water resources while improving water quality
3. Restore, protect, and augment habitat quality, quantity, and connectivity

4. Improve recreational opportunities and enhance open space

The Arroyo Seco Watershed Sustainability Campaign (ASWSC), developed by ASF in partnership with the stakeholders in the Council of Arroyo Seco Agencies (CASA) and Council of Arroyo Seco Organizations (CASO), is a targeted program to improve the reliability and management of local water resources in the Arroyo Seco, a key tributary of the Los Angeles River. ASWSC efforts have included working with other agencies and organizations to plan and implement an ambitious watershed restoration and management program for the Arroyo Seco Watershed. Figure 1 outlines activities of the ASWSC and the function of this document within the ASWSC.

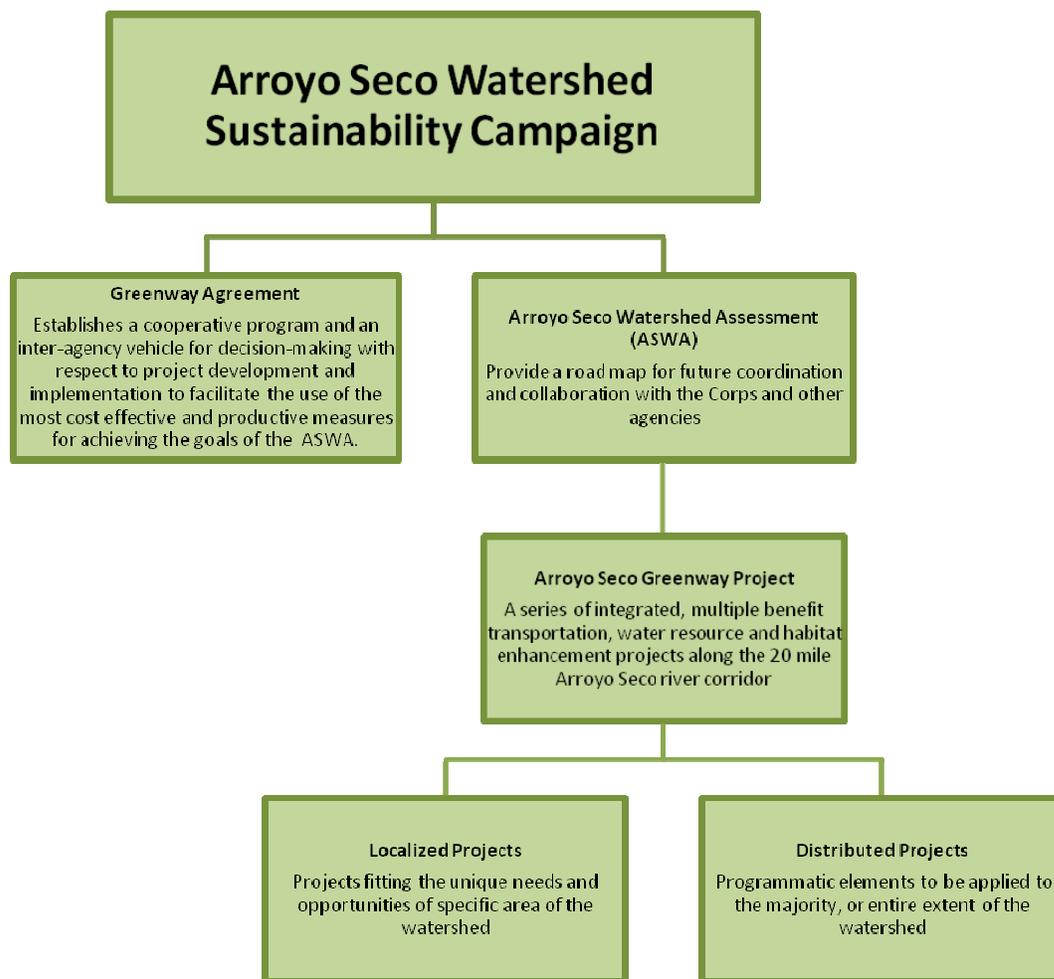


Figure 1: Structure of Arroyo Seco Watershed Sustainability Campaign

Products of the ASWSC work began with the Arroyo Seco Watershed Restoration Feasibility Study, Volume 1 Project Report developed by North East Trees and ASF in May 2002. This document provided recommendations and planning goals as well as a framework for restoration projects. Also, the document enables stakeholders to move to the next phases of planning and implementation of the Arroyo Seco Watershed Restoration Feasibility Study recommendations. In 2006, North East Trees developed the Arroyo Seco Watershed

Management and Restoration Plan, which expands on the AWRFS and details a list of watershed restoration projects. The Central Arroyo Stream Restoration/Brookside Park BMP Project, completed in 2007, implemented recommendations in the City of Pasadena Central Arroyo Master Plan and North East Trees Plan through a design-build approach. As a result, native arroyo chub, a California Species of Concern were re-introduced to the Arroyo Seco stream, trails, native plantings, signage, and stream improvements were completed. Full capture trash inserts were installed in 500 storm drains throughout the City of Pasadena and Rose Bowl Parking Lot I was enhanced with native plant islands for stormwater capture and treatment.

In addition, the US Army Corps of Engineers (Corps) has begun an Arroyo Seco Watershed Feasibility Study, a \$2.7 million study. ASF continues to coordinate closely with the Corps on the development of this study.

1.3 Purpose of the Arroyo Seco Watershed Assessment

The subject Watershed Assessment builds on the body of documents already developed as a part of the ASWSC. The purpose of the subject assessment is to:

- Outline projects which address the needs of the Arroyo Seco Watershed identified in this and other ASWSC documents.
- Provide a road map for future coordination and collaboration with the Corps and other agencies to implement Arroyo Seco Greenway projects by way of a governance structure—the Arroyo Seco Greenway Agreement.
- Provide a framework for future integration of transportation, energy, water resources, and restoration concerns in the development and rehabilitation of the Arroyo Seco Watershed.

In accordance with this stated purpose, the ASWA promotes and outlines key aspects of the Arroyo Seco Greenway, a series of integrated transportation, water resource and habitat enhancement projects along the 20 mile Arroyo Seco River corridor.

1.4 Document Organization

This document contains eight (8) sections, beginning with this introductory section. The second section describes the history of planning and management activities within the Arroyo Seco as well as the stakeholder outreach efforts which inform this document and continue to inform watershed planning. Section 3 describes the existing hydraulics, hydrology, water quality and water supply conditions, as well as biological resources within the watershed. Section 4 provides the approach to evaluating and ranking watershed restoration projects and references watershed restoration projects or localized projects (included in Appendix B as a project matrix). Section 5 describes the Arroyo Seco Greenway, sets forth five (5) top tier restoration projects. The purpose, objectives, benefits, and key issues are described for each of these projects. Section 5 also includes distributed programmatic recommendations to be applied within all projects throughout the watershed. Finally, Section 6 describes data gaps, next steps, and describes a process for incorporating and evaluating new projects in future planning efforts. Section 7 identifies ASWA references and weblinks. Section 8 lists preparers and contributors to the ASWA.

2. Watershed Coordination and Collaboration

2.1 Watershed Management and Planning: Public Involvement through the Years

From its beginnings in the early 1890s, the Arroyo Seco Foundation (ASF) has operated in the watershed and in communities throughout Los Angeles County with an inclusive stakeholder process. Table 1 shows a summary of watershed planning milestones starting from the formation of ASF. The foundation and its stakeholders have focused on creating winding gardens and community green spaces in an effort to not only improve the habitat and ecology of the watershed, but also to provide clean water for municipal use and community benefit from natural recreation land.

Table 1: Arroyo Seco Watershed Planning Milestones

Date	Events
1890s	Charles Lummis forms the Arroyo Seco Foundation to preserve and protect the Arroyo Seco.
1894	South Pasadena newspaper editor George W. Glover suggests that cities bordering the Arroyo Seco join in making a park from Los Angeles to the mountains with winding roads, sparkling fountains and roses clinging on old snags.
1906	Highland Park residents from the Arroyo Seco Park Association. Adolphus Busch begins to transform the banks of the Arroyo Seco in southern Pasadena into a world-renowned botanical garden that thrives as a tourist destination until 1938.
1910	Pasadena voters reject bond to purchase Arroyo lands
1911	Women's Improvement Association of South Pasadena meets to discuss making the Arroyo Seco a great sunken garden. The Garvanza Improvement Association, the first organization of its kind in Los Angeles, is incorporated. Plans for the future include supporting the building of Arroyo Seco Branch Library. Past projects include tree planting, sewer system support, and advocacy of a park along the Arroyo. Women's Improvement Association has a well-publicized picnic at Sycamore Park to promote purchase of Arroyo land for park uses.
1912	J.B. Lippincott, LA Parks Commissioner lays out vision and plan for parkways in Los Angeles, including the Arroyo Seco in a June article in California Outlook. Parks for People editorial in <u>The Craftsman</u> , Vol 22, No. 5, Aug. '12 celebrates the great natural beauty of the Arroyo and calls for its preservation. In March representatives from Pasadena, South Pasadena, Los Angeles and Los Angeles County meet to form the Arroyo Seco Parkway Association. Members discussed plans for a graceful boulevard winding through an ever-changing park
1913	Major effort in LA to purchase parkland through an assessment district fails- 4/12/13 <u>CA Outlook</u> . Mrs. As. S. Lobingier of Highland Park and J. B. Lippincott address a rally in Sycamore Park to support the bond issue.
1914	Pasadena Mayor William Thum begins acquisition program of Arroyo lands for park purposes.

Table 1: Arroyo Seco Watershed Planning Milestones

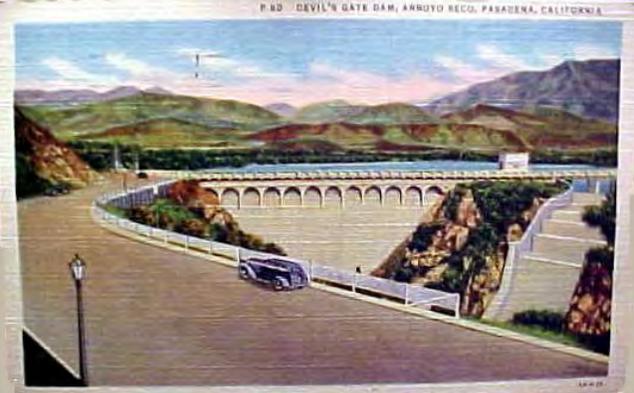
Date	Events
1915	45 acres of Arroyo lands above Devil's Gate are purchased for \$22,297 (Woods, 394) Los Angeles County Flood Control District releases first major flood plan for Southern California with a major emphasis on Arroyo Seco planning.
1917	Wood, J. W., <i>Pasadena, Historical and Personal</i> , 1917, pg. 389 (discusses Arroyo as a park – natural beauty and setting. Discusses Busch Gardens park.
	Renowned architect Myron Hunt develops an Arroyo Seco plan, which recommends that the Lower Arroyo be reserved for trails and bridle paths and planted only with native plants.
	<p>Devil's Gate Dam constructed, the first of the County's flood control dams</p>  <p>Historic Devil's Gate Dam Postcard (arroyoseco.org)</p>
	Rose Bowl Built
	South Pasadena voters pass a \$100,000 bond issue to buy 100 acres of the Arroyo Seco land lying within the city of South Pasadena
	Pasadena city Manager C. W. Koiner announces plans to make the Arroyo Seco a wild flower preserve using native plants and shrubs
	PSN May 21, 1925 City of Pasadena purchases two acres of land from Ms. Busch for path. Extension of road for equestrians is made possible by deal. Varies from 100=150 feet in width and is 1000 feet in length. Westerly boundary. "Under terms of purchase the city is to put up a 58" fence on top of the retaining wall along the frontage of the lower garden."
1934	Arroyo Seco is lined with rip-rap from below Devil's Gate to Linda Vista Bridge
1935-40	Arroyo Seco Parkway, first urban freeway in the West, is built in the Arroyo Seco channel.
	 <p>Historic Arroyo Seco Parkway Postcard (arroyoseco.org)</p>

Table 1: Arroyo Seco Watershed Planning Milestones

Date	Events
1938	Busch Gardens is closed as a public attraction
1941	US Forest Service undertakes the Los Angeles River Watershed Program to manage flood and water resources in the Angeles National Forest; their first project is the construction of Brown Mountain Debris Dam four miles above the mouth of Arroyo Seco
1947-48	Flood channel is constructed in Pasadena's Lower Arroyo
1964	Pasadena City Council adopts the Jencks Resolution calling for care and stewardship of the Arroyo Seco.
1971	City and county plan to channelize the Arroyo stream from Holly Street to Colorado Street Bridge is rejected by City Council. The Pasadena City Council renounced \$750,000 from the Los Angeles County Flood Control District and refused to grant the District an easement under the Holly Street Bridge to straighten and channelize the last natural part of the Arroyo. This untouched area shows us what the Lower Arroyo once was and can be again.
	Arroyo Seco Master Plan is presented to the Public Land Use Committee of Pasadena Planning Commission; chair: Ted Tyler. Ted Calleton offers a rebuttal opposing the construction of Rosemont Pavilion south of the Rose Bowl.
1972	Master Plan for Upper Arroyo Seco developed by Gruen Associates
1974	Arroyo Seco Parklands Preservation Law passed by the CA Legislature to prevent freeway encroachment in the Arroyo
1976	At the request of equestrians, hikers, and residents of Busch Gardens, the City prohibited cars from driving to the target archery field, now the AIDS Memorial Grove, and to the area further south to the South Pasadena Stables
1977	Pasadena declares the Lower Arroyo to be a City Cultural Landmark.
1979	Pasadena Star News reprints the Arroyo Craftsman article, "Parks for People", January 14, 1979
1980	Arroyo Seco Planning Study Committee presents the Pasadena Planning Commission with a draft ordinance, Nov. 12, 1980; Graeme Henderson, Chair
1982	Lower Arroyo Seco Master Plan is prepared by Takata & Associates for the City of Pasadena
1985	Pasadena Strategic Plan Committee identifies Devil's Gate as promising site for park and open space expansion; Devil's Gate Advisory Committee formed.
	Renowned environmental artists Newton and Helen Harrison present an eye-opening exhibit on Arroyo restoration at Baxter Gallery at Caltech
1987	Newton and Helen Harrison present "String of Pearls" exhibit on Arroyo restoration at the Armory Center for the Arts.
1988	"Master Plan for the Lower Arroyo Seco," graduate Program, Department of Landscape Architecture, Cal Poly, Pomona, June 1988; lays out a vision for Arroyo Seco restoration.
	Pasadena City Council adopts Arroyo Seco Ordinance, prepared by citizens committee led by Bill Thomson and Victor Ell; the ordinance limits Rose bowl use and directs funding from Arroyo events to Arroyo purposes
1989	Staff Report to Cultural Heritage Commission, Master Plan for Lower Arroyo , May 11, 1989, Ann Sheid, staff

Table 1: Arroyo Seco Watershed Planning Milestones

Date	Events
1991	The Arroyo Seco AIDS Memorial Grove is dedicated in Pasadena's Lower Arroyo Devil's Gate Multi-Use Project (DGMUP) Joint Powers Planning Authority is formed, consisting of Pasadena, La Canada Flintridge and the Santa Monica Mountains Conservancy.
	Raymond Basin Groundwater Program is proposed as part of a comprehensive report on local groundwater prepared by the engineering firm, CH2M Hill.
1992	DGMUP JPPA prepares Preliminary Park Plan for Hahamongna Watershed Park; Pasadena City Council approves the plan; JPPA sunsets.
	Pasadena issues \$2 million in certificates of participation for Arroyo Seco improvements; funding later diverted to Rose Bowl uses.
	Engineering firm Brown & Caldwell prepares Preliminary Economic Assessment for the Devil's Gate Multi-Use Project .
	\$3.2 million for Arroyo improvements secured in County Parks A Bond election.
1993	The County relinquishes authority for Oak Grove Park and turns responsibility over to Pasadena; Hahamongna Watershed Park formally opened October 16
	The City of Pasadena adopts its current General Plan , containing OBJECTIVE 9, which emphasizes stewardship of the natural environment (Policy 9.5) and restoration of the natural area of the Arroyo Seco (Policy 9.2).
1994	Hahamongna Operating Company disbanded by Pasadena City Council; authority for park planning and operations is given to Public Works; additional \$1 million for HWP in County Parks Bond election.
1997	County of Los Angeles completes the rehabilitation of Devil's Gate Dam.
	City begins Arroyo Seco Master Environmental Impact Report to consider the three area master plans as well as the Rose Bowl use plan and design guidelines for the Arroyo.
	After extensive community process, the Draft Master Plan for the Lower Arroyo Seco is tentatively approved by the City Council. February, 1997
1999	The Historic American Engineering Record produces a detailed history of the development of the Arroyo Seco Parkway.
2000	Master Plan for Hahamongna Watershed Park tentatively approved by the City Council. February, 2000
	California State Polytechnic University 606 Studio graduate students prepare " The Arroyo Seco Parkway Corridor ." The document is a wonderful vision for the restoration of the Parkway to its future grandeur.
2001	Central Arroyo Master Plan tentatively approved by Pasadena City Council. January, 2001
	Arroyo Seco/LA River Confluence Park Plan (Mountains Resources and Conservation Authority) for the confluence region just north of downtown Los Angeles.
	Watershed Overview mapping study and survey of the LA and SG watersheds including the Arroyo Seco performed by the LA County Department of Public Works/USACE. March, 2001
2002	Arroyo Seco Watershed Reconnaissance Study (USACE) determines a need and opportunity for restoration within the Arroyo Seco.

Table 1: Arroyo Seco Watershed Planning Milestones

Date	Events
	Pasadena releases Arroyo Master Plan and Environmental Impact Report ; Arroyo Seco Foundation and North East Trees release Arroyo Seco Watershed Restoration Feasibility Study. May, 2002
	Arroyo Seco Watershed Restoration Feasibility Study (NE Trees and ASF) provides a blueprint for restoration and better management of the watershed. The study contains a series of valuable technical reports on the hydrology, biology, water resources and recreational uses. Funded by the CCC and Santa Monica Mountains Conservancy. Participation and technical review by twelve governmental agencies with management responsibilities in the Arroyo Seco, including the US Forest Service, the three cities the Arroyo runs through and Los Angeles County Department of Public Works. The Project Team organized a Stakeholder Committee and an agency Technical Review Committee to help facilitate the process.
	Arroyo Seco Parkway designated a federal scenic byway, only the second in California.
2003	Pasadena City Council approves Arroyo Seco Environmental Impact Report in April. This identifies a comprehensive series of projects and improvements for the five mile (8 km) stretch of the Arroyo Seco within Pasadena.
2004	Arroyo Seco Corridor Management Plan (CALTRANS) – Comprehensive master plan to restore the historic character (signage, esc) of the Arroyo Seco Parkway. <i>This plan has not been formally adopted.</i>
2004-Present	Arroyo Seco Watershed Coordination Program (ASF) to build the capacity of local groups to cooperate and collaborate in watershed management. Parkway Management Plan prepared for Caltrans by the National Scenic Byways Center, Federal Highways, the National Trust for Historic Preservation and the Center for Preservation Education and Planning
2005	Angeles National Forest Master Plan (USFS) defines the plan for management of the upper mountain watershed of the Arroyo Seco.
2006	Arroyo Seco Watershed Management and Restoration Study (NE Trees) reviews water quality and habitat restoration data and prioritizes projects for water quality improvements.
2008	Fish Restoration in the Arroyo Seco (Camm Swift, Ph.D., ENTRIX) evaluates the potential for fish restoration in the stream and makes recommendations about needed improvements.
2007-2008	Central Arroyo Stream Restoration Program has improved stream conditions and water quality in the Arroyo Seco stream by habitat restoration, parking lot and trail improvements and trash capture services. As a result, the Arroyo chub, a native fish that once thrived in the stream but was wiped out by flood control measures, has now been reintroduced to the stream.
2007-2010	Arroyo Seco Watershed Sustainability Program intends to improve conservation, watershed management and governance in the watershed.

Source: Arroyo Seco Foundation

Within this historical framework of balancing community and environmental needs in the watershed, the preservation and enhancement of the Arroyo has taken many diverse paths. In the early 1900s, the banks of the Arroyo in southern Pasadena were transformed into a botanical garden, attracting tourists for almost 40 years. Activity in the watershed during the early to

mid-1900s included a mixture of private association restoration and enhancement projects as well as actions by local government entities. Efforts to enhance the Arroyo and surrounding lands were undertaken by such groups as the Women's Improvement Association and the Garvanza Improvement Association (both in 1911). Also in 1911, J.B. Lippincott, Los Angeles Parks Commissioner, laid out a vision and plan for city parkways including the Arroyo Seco. By 1914 and 1917, communities in the watershed began to see the realization of these goals with the acquisition of lands along the Arroyo. The 1930s and 1940s brought many changes to the area with the construction of the Arroyo Seco Parkway, Brown Mountain Debris Dam, and the flood channel in Pasadena's lower Arroyo.

The first master planning efforts in the watershed were undertaken in the early 1970s with the completion of the Arroyo Seco Master Plan and the Master Plan for the Upper Arroyo Seco. These were followed by numerous strategic planning efforts for the arroyo and the watershed including:

- City of Los Angeles approval of the Draft Master Plan for the Lower Arroyo Seco (in 1997);
- Watershed-wide mapping (in 2001);
- The Arroyo Seco Watershed Reconnaissance Study and Arroyo Master Plan and Environmental Impact Report (in 2002); and,
- The Arroyo Seco Watershed Restoration Feasibility Study (North East Trees and ASF partnership, in 2002).

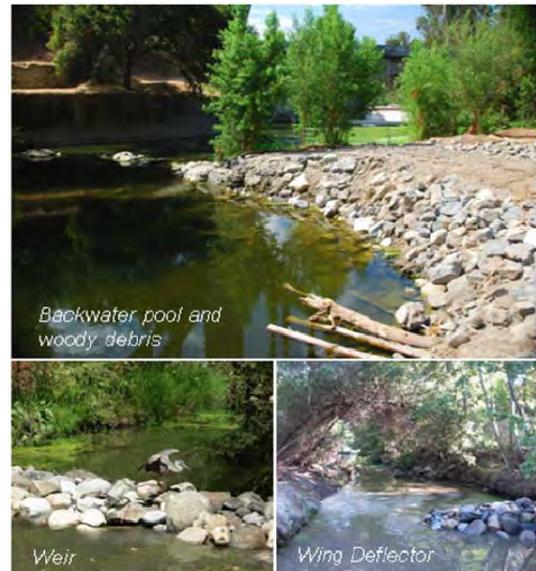
The Restoration Feasibility Study resulted in extensive public outreach and agency support in order to comprehensively assess watershed conditions and recommend a series of programs and projects to improve the health and management of the watershed (Arroyo Seco Foundation, 2010). This study is where Council of Arroyo Seco Organizations (CASO) and the Council of Arroyo Seco Agencies (CASA) were first recommended as organizational vehicles to achieve watershed management goals. Each of these planning efforts brought together diverse stakeholders ranging from the cities and citizen groups in the watershed to the United States Army Corps of Engineers and agencies within Los Angeles County (Table 2 summarizes stakeholders in the watershed planning process).

Current planning and organizational efforts continue to be focused on goal-setting and public outreach and collaboration within the watershed. Important restoration and habitat planning work has recently been accomplished through the Arroyo Seco Watershed Coordination Program. Started in 2004, this program is focused on building the capacity of local groups to collaborate in watershed management. The program is part of a statewide effort of the California Department of Conservation funded by the CALFED Bay Delta Authority and has the key goals of promoting: water conservation, improved water quality, and community and institutional partnerships. CASO and CASA meet regularly to discuss, plan, and collaborate on common goals and programs. The ASF provides support to both of these watershed-wide managing organizations. In addition to the work of stakeholder organizations and agencies, ASF formed the Arroyo Seco Stream Team to engage citizen volunteers who want to contribute to restoration efforts. This public outreach program also provides targeted educational

programs to promote source water awareness and protection, conservation and environmental stewardship.

Through the work involved in the ASWSC, ASF and key stakeholders have developed future plans to develop a formal agreement. The overarching goal of ASWSC is to facilitate watershed improvement efforts in the "wildland/urban interface" of the Arroyo Seco Watershed. The effort is focused on furthering the collaborative approach to planning and management that has developed through the years starting with the formation of ASF. In order to accomplish these goals, the ASWSC will continue ASF's focus on outreach by bringing together agencies, organizations, and residents around protection, enhancement, and enjoyment of their shared watershed resources. Specifically, the key tasks and objectives of the ASWSC include (Arroyo Seco Foundation, 2010):

- **Source Water Awareness** - Educate local residents about the value of local water resources and their relationship to the Bay Delta Ecosystem through a Source Water Awareness program;
- **CASO/CASA Greenway Agreement** - Support, expand and empower CASO and CASA through program development, staffing support and implementation of a Greenway Agreement that incorporates watershed management goals;
- **Watershed Assessment** - Working cooperatively with the US Army Corps of Engineers' Arroyo Seco Watershed Feasibility Study, develop a comprehensive, balanced approach to water resources, flood and stream management and habitat restoration;
- **Local Supply Reliability** - Help improve the reliability of local water resources through public education and outreach regarding key groundwater management issues, including contamination, storage and management; broad public outreach regarding the potential of water recycling will be conducted;
- **Conservation Campaign** - Reduce per capita consumption of water through coordinated conservation programs involving water agencies and the public featuring a California Friendly Landscaping Campaign and an educational native plant nursery.



Central Arroyo Stream Restoration habitat improvements (CDM 2007)

The goals and programs planned for the ASWSC illustrate ASF's and stakeholder groups' continued commitment to a collaborative and integrated approach to watershed restoration.

As a result of the development of excellent planning documents and feasibility studies, the partnership of these various organizations and agencies within the ASWSC and ASF has also resulted in the completion of a major restoration project in 2008. The Central Arroyo Stream Restoration/Brookside Park Best Management Practices Program has improved stream

conditions and water quality in the Arroyo Seco stream through habitat restoration, parking lot and trail improvements and trash capture services. In addition to the water quality and aesthetic benefits of this project, the Arroyo Chub, a native fish that once thrived in the stream but was wiped out by flood control development projects, has now been reintroduced to the stream. This project has increased public awareness of ASF's restoration activities, and the tangible results stemming from partnerships within the ASWSC.

Table 2: Stakeholder Organizations

Stakeholder Organizations
Federal
National Park Service - Rivers & Trails Conservation Assistance Program
US Army Corps of Engineers
US Forest Service - Angeles National Forest
State Agencies
California Coastal Conservancy
California Department of Fish & Game
California Department of Transportation
Santa Monica Mountains Conservancy
Regional Agencies
Metropolitan Water District of Southern California
Local Agencies
Los Angeles County Department of Public Works, Watershed Management Division
City of Los Angeles, Public Works Sanitation-Stormwater and Parks and Recreation
City of Pasadena, Water and Power Department and Public Works & Transportation
City of South Pasadena
Council of Arroyo Seco Organizations (CASO)
First meeting: May 2004
Altadena Foothills Conservancy
Arroyo Seco Gardens
Arroyo Seco Journal
Arroyo Seco Neighborhood Council
Audubon Center at Debs Park
California Cycleways
Equestrian Trails, Inc.
Foothill Bicycle Initiative
Franklin High School Transportation Academy
Friends of Debs Park
Friends of Echo Park
Friends of the Los Angeles River
Friends of the Southwest Museum
Goodwill Industries
Heritage Square Museum
Highland Park Heritage Trust
Historic Highland Park Neighborhood Council
Kidspace Children's Museum

Table 2: Stakeholder Organizations

Stakeholder Organizations
La Canada Flintridge Trails Council
Latino Urban Forum
National Park Service, Rivers and Trails Conservation Assistance
Northeast Democrats
Northeast LA Open Space Coalition
Occidental College, Urban and Environmental Policy Institute
October Surprise
Pasadena Arts Council
Pasadena Audubon Society
Pasadena Heritage
Pasadena Museum of Natural History
Pasadena Roving Archers
Rock Rose Gallery
Rose Bowl Riders
Sequoia School
Sierra Club
Trust for Public Lands
West Pasadena Residents Association
Council of Arroyo Seco Agencies (CASA)
First meeting: 2001
Members
California Coastal Conservancy
California Department of Fish and Game
California Department of Transportation
California State Assembly District 44
City of La Canada Flintridge
City of Los Angeles (Bureau of Sanitation, Dept. of Recreation and Parks)
City of Pasadena (Parks and Natural Resources Division, DPW, DWP)
City of South Pasadena
County of Los Angeles DPW
Los Angeles/San Gabriel Rivers Watershed Council
Foothill Municipal Water District
Los Angeles Regional Water Quality Control Board
Metropolitan Transportation Authority
Metropolitan Water District of Southern California
National Parks Service
Raymond Basin Management Board
Santa Monica Mountains Conservancy
US Army Corps of Engineers
US Forest Service, Angeles National Forest
National Park Service, Rivers and Trails Conservation Assistance Program
North East Trees
Audubon California

Table 2: Stakeholder Organizations

Stakeholder Organizations
Arroyo Seco Foundation
Rice Bowl Operating Company
University of Southern California
Arroyo Seco Stream Team: Volunteer group organized by the Arroyo Seco Foundation

Source: Arroyo Seco Foundation, 2010; Arroyo Seco Foundation, 2006.

2.2 Arroyo Seco Watershed Assessment (ASWA) Outreach:

Coordination and public involvement events (Refer to Appendix D for meeting notes) included:

Site Tour Meetings for the ASWA

Three site tours of the arroyo were led by ASF in late 2008 with participants including the U.S. Army Corps of Engineers, Los Angeles County Department of Public Works (DPW), Pasadena Water and Power, and the City of Los Angeles. The tours consisted of a visit to Hahamongna, Rose Bowl site, the JPL Superfund site/spreading basin, Devil's Gate Dam/Flint Wash Bridge, the Lower Channel, South Pasadena and the lower arroyo, Sycamore Grove Park, and the confluence with the Los Angeles River. The tours allowed the participants to discuss their organizational focus, priorities, and constraints.

Scoping Meeting for the ASWA

A scoping meeting on the ASWA was held in the beginning of 2009 with CDM and ASF. The scoping meeting was another influential step to providing a path forward that will identify, prioritize, and pursue funding for restoration and multiple benefit projects that meet or exceed the restoration goals identified by the group. Additionally, the meeting attendees agreed on the need for the development of an initial Arroyo Seco Greenway paper to describe an overall vision for the Arroyo as well as the key elements of the Arroyo Seco Greenway Program. Some of the most useful products of this meeting included discussions of responding to calls for projects, important project partnerships (including the U.S. Army Corps of Engineers on ecosystem restoration work and Caltrans on road interface with the Arroyo Seco Confluence and Arroyo Seco Greenway), and schedule considerations (i.e. timing with stimulus package). Additionally, this meeting resulted in specific action items for the completion of the Greenway components.

Public Workshops

Public workshops such as the one held on April 20, 2009 at the CASO meeting represent critical avenues for exchanging information about the ASWA. The workshop in 2009 highlighted the purpose of the assessment, which includes prioritizing funding opportunities, creating a "roadmap" for agencies working on arroyo restoration projects, enhancing cooperation among stakeholders, and implementing a restoration vision. The meeting allowed for members of the public to voice questions, concerns, and ideas related to prioritization of funding and the restoration approach.

Focused Stakeholder Meetings

Following the completion of the Central Arroyo Seco Stream Restoration/Brookside Park Best Management Practices Program, ASF continued to work with the City of Pasadena to pursue funding for other restoration projects along the Arroyo. These include the confluence of the Arroyo with the Los Angeles River and the Arroyo Seco headwaters. Focused meetings with the City of Pasadena, Pasadena Water and Power, City of Los Angeles, Caltrans, County of Los Angeles, Corps of Engineers, Rose Bowl Operating Committee, and other key stakeholders were facilitated by ASF to coordinate and collaborate on specific restoration opportunities in the Arroyo Seco watershed.

Website for ASWSC

In order to facilitate other forms of public involvement in this next phase of arroyo planning and restoration, a webpage has been established for the ASWSC at www.arroyoseco.org/watershedsustainability.htm. This webpage will be updated with ASWA documents and blogs to facilitate continued stakeholder input and discussion regarding implementation of the ASWA.

2.3 Arroyo Seco Greenway Agreement

Many agencies and organizations have responsibility for planning and management activities in the Arroyo Seco watershed. One of the key ASWSC Tasks and Objectives is to establish the Arroyo Seco Greenway Agreement that sets forth a framework for these entities to:

- Pursue collaborative projects to achieve the goals of the ASWA;
- Formulate project implementing agreements for the various elements of the ASWA; and
- Evaluate and assess progress toward implementing the ASWA.

An Arroyo Seco Greenway Agreement is included in Appendix A and would be adopted by the County of Los Angeles, the cities of Los Angeles, South Pasadena, La Canada Flintridge, the Santa Monica Mountains Conservancy, and the California Department of Transportation, the US Department of Agriculture, the US Army Corps of Engineers and various non-governmental agencies.

The Greenway Agreement establishes a cooperative program and an inter-agency vehicle for decision-making with respect to project development and implementation to facilitate the use of the most cost effective and productive measures for achieving the goals of the ASWA. Agencies retain their responsibility and authority to plan and manage their respective jurisdictions through general planning tools, ordinances, and other governmental mechanisms. Under the Greenway Agreement, an Executive Committee would be established, consisting of a member of each party, to review and report to the parties as to whether adequate and reasonable progress is being made in the implementation of the ASWA and of the watershed management program.

The Greenway Agreement will enable development of collaborative Project Implementation Agreements while recognizing that implementation of some elements of the ASWA would be accomplished through the independent action of party agencies. Project Implementation Agreements would designate a lead agency and provide for funding, with emphasis of grant

funding, for the costs of planning, construction and maintenance costs. The participants in these Project Implementation Agreements can include parties to the Greenway Agreement as well as other parties within or outside the watershed.

3. Assessment of Habitat Features in Relation to Watershed Function

Habitat areas within the Arroyo Seco stream and its associated riparian corridor are influenced by the function and overall health of the watershed. Major drivers influencing habitat viability in the Arroyo Seco watershed were reviewed and include:

- Hydrology, Hydraulics, and Sediment Management
- Biological Resources
- Water Quality
- Water Supply

3.1 Hydrology, Hydraulics, and Sediment Management

The current state of knowledge regarding hydrology, hydraulics, and sediment management for the Arroyo Seco is discussed in three main documents:

- *Hydrology, Hydraulics, and Geomorphology Engineering Information and Studies* prepared by Montgomery Watson Herza on May 24, 2001 as a technical report for the *Arroyo Seco Watershed Restoration Feasibility Study (ASWRFS) Phase II* (MWH study)
- *Flood Hazard, Sediment Management, and Water Features Analysis, Hahamongna Watershed Park, Pasadena* prepared by Philip Williams and Takata Associates, dated January 20, 2000 (PWA Study)
- *Arroyo Seco Watershed, Watershed Management Study, Feasibility Phase, Project Management Plan* prepared by the US Army Corps of Engineers in May 2005



View of San Gabriel Mountains from Mt. Washington.
Photo by Jennifer Jones

3.1.1 Watershed Characterization

The Arroyo Seco is a first-order tributary to the Los Angeles River extending for 22 miles from its headwaters in the Angeles National Forest, within the San Gabriel Mountains. The San Gabriel Mountain range is regarded to have one of the highest erosion rates in the world. Arroyo Seco feeds the local groundwater aquifer system comprising the Raymond Basin and is

a major source of water for surrounding communities. Located partially within the Los Angeles River coastal watershed, the Arroyo Seco watershed can generally be divided into three distinct segments: the Hahamongna subwatershed beginning at the headwaters and terminating at Devil's Gate Dam; the Central Arroyo Seco subwatershed beginning immediately below Devil's Gate Dam and terminating at approximately the Colorado Street Bridge crossing; and the Lower Arroyo Seco subwatershed below the Colorado Street Bridge and continuing to its confluence with the Los Angeles River.

The Hahamongna subwatershed, or upper watershed, is mostly undeveloped and partially lies within the Angeles National Forest. This area is managed for multiple purposes, including recreation, watershed protection, and wildlife conservation. In the upper watershed stream flow is present even in dry years indicating groundwater contributes to sustaining flows.

The combination of geologic, climatic and topographic characteristics of the Arroyo Seco headwaters results in flood hydrographs that have steep ascending and descending limbs and high peak flows. This type of hydrograph is characterized as "flashy." In addition, flood flows are also characterized by high concentrations of sediment and debris.

As the Arroyo Seco channels exits the San Gabriels, its gradient decreases, and conveyance area increases, resulting in decreased velocity and sediment transport capacity. This reduction on sediment transport capacity causes arroyo flows to deposit excess sediment and debris, creating a geomorphic feature called an alluvial fan. The Hahamongna Watershed Park is located on such a feature, albeit one that has been modified by the presence of the Devil's Gate Dam. Alluvial fans are generally known to be highly dynamic areas where the active channel is constantly migrates across the fan as deposited sediment eliminates channel capacity causing flow to overflow perched banks and establish a new channel in a lower, adjacent location. The combination of flashy hydrology and high volumes of sediment creates a highly dynamic flow situation that can cause extensive damage to development located in flood inundation zones.

Devil's Gate Dam is intended to prevent flood inundation downstream by retaining excess sediment and flow. This flood control and sediment management strategy requires stringent operational procedures to maintain flood storage capacity that can be diminished by trapped sediment. The LACDWP maintains the operational capability of the dam through the excavation of excess sediment and debris and controlled releases of stored floodwaters and base flow intended to sluice sediment downstream, a procedure referred to in the PWA study as "flow-assisted sediment transport."

Devil's Gate Dam has a Capital Storm peak at the dam of 20,026 cfs, as determined in the Devil's Gate Dam Rehabilitation Study conducted by Harza in 1994, indicating a 170-year flood design exceeding the 100-year standard adopted by the Federal Emergency Management Agency (FEMA). Varying peak discharge rate for the Capital Storm below the dam are provided with LACDPW indicating a rate of 13,800 cfs and the rehabilitation study indicating a rate of 14,400 cfs.

Discharge frequencies based on various locations beneath the dam and different storm events types were interpolated from existing data and are applicable to planning purposes until the LACDPW Watershed Modeling System (WMS) is updated. WMS uses either HEC-1 data or

LACDPW's modified rational method linked to GIS data to determine peak flows necessary for planning naturalized channel and floodplains.

Devil's Gate Dam has been operated following rules established in 1977 to allow LACDPW to conduct its flow-assisted sediment transport program. The lowest gate remains open until water levels rise to elevation 1,010 feet allowing maximization of sediment transport through the dam without reducing flood control capacity. When the water level exceeds an elevation of 1,010 feet the lower gate is closed and the other gates are opened. After water levels exceed the crest of the primary spillway, 1,040.5 feet, all gates are closed and releases occur through ports in the spillway. During extreme wet-weather events the second ogee spillway with a crest of 1,067 feet serves as the final outlet structure. Operations of the dam reduce the peak outflow and shift peak flows later in time. Dam operations reduce the Capital Storm peak discharge by 30%, the 100-year peak by 40%, and the 10-year peak discharge by 75%.

Dam operations result in limited bedload and suspended sediments in discharge waters during storm events. In the naturalized sections of the arroyo, this has the ability to cause significant erosion if channels are not stabilized or if previously released sediments are not present.

Downstream of the San Gabriels, Arroyo Seco is a highly manipulated drainageway that not only includes the spreading grounds and Devil's Gate Dam, but also long reaches of concrete-lined trapezoidal or rectangular channels needed to efficiently move large volumes of water downstream to the LA River and its coastal outfall. Below the dam in the Central and Lower Arroyo Seco subwatersheds, most of the stream has been channelized to the confluence with the Los Angeles River. Prior to channelization, stands of alder, willow, and sycamore lined a perennial, trout-filled stream. The result of this manipulation has included loss of floodplain and habitat throughout the drainageway, necessary due to encroachment of urban development that in many areas extends up to the edge of the channel. Spread throughout the highly urbanized areas are multiple regional and local parks and preserve areas to retain natural habitat and open space.



Central Arroyo Seco near Brookside Park. (CDM, 2007)

Below Devil's Gate Dam, the majority of runoff occurs during wet-weather events typically between November and December. The DPW Gage 277R, located directly below Devil's Gate Dam, indicates there is no sustained base flow at the gage, and there is limited or no flow in the channel 50% of the time, and there is a flow of less than 10 cfs 95% of the time. Continuous contact between the channel and the water table does not occur. Minimal to no flowing water is present for the majority of the time due to operations of the Dam. However, below the narrows

base flows are thought to be influenced by resurfacing groundwater in the vicinity of the Colorado Street Bridge.

Hydraulics

LACDPW acknowledges and has a list of areas between the dam and the confluence with the Los Angeles River that do not have sufficient capacity to carry the Capital Storm discharge. Additionally, floodplain maps have not been prepared by FEMA for the Arroyo Seco. Approximate 100-year, Capital Storm, and geologic floodplains were developed as part of the MWH Study. Review of these maps indicates that there are limited areas impacted by a 100-year event. If a standard freeboard allowance was applied to the channels capacity problems would increase. The Capital Storm impacts a larger area including residential areas. The majority of this area is within open space and developed park areas.

The slope profile for the Arroyo Seco from the Los Angeles River to the headwaters indicates channel slopes downstream of the dam vary from 0.016 vertical feet/horizontal feet beneath the dam to 0.011 feet at the Los Angeles River. For the most part, the slope of the channel matches the slope of the surrounding valley. Realignment of the channel is limited as a result of natural conditions and manmade conditions reducing opportunities for increasing stream length adding meandering sections.

In the absence of a hydrologic/hydraulic model potential floodplain storage benefits were estimated by comparing storage volume in the floodplain to storage volumes in the Devil's Gate Reservoir and the volume of flood hydrographs. It is noted that assumptions summarized here should be refined when a detailed hydraulic model is developed for the Arroyo Seco. Estimates were developed for cumulative floodplain storage volumes for multiple cross-sections using multiple flow depths. The analysis concludes that if the floodplain was used to contain 5,000 acre-feet of storage similar to the reservoir during the peak of a Capital Storm (elevation of 1,067 feet) then the corresponding floodplain depth would be an additional ten feet for the length of the arroyo downstream of the dam to the Los Angeles River causing extensive flooding in urban areas. Confining the floodplain area to Brookside and Lower Arroyo Park areas would result in flooding depths of 15 feet to reach the 5,000 acre-feet storage capacity. Flooding of 17 feet deep would be required to match the storage capacity of the reservoir at its crest. Removal of the dam would cause substantial damage and public safety concerns. With the dam intact, restoration of the floodplain could reduce Capital Storm peak flows by 10 percent.

Geomorphology

Arroyo Seco downstream of the Devil's Gate Dam is an alluvial fan system where sediment loads are deposited. The arroyo downstream of the dam is a lower gradient and less confined as compared to the upstream segment. If the arroyo was left in a natural state the downstream portion of the stream would exhibit braiding and meandering and channel shifting during wet weather events. However, the arroyo is currently confined by multiple manmade structures, including concrete channels, the Rose Bowl, bridges and parking areas, for the majority of the segment below the dam and the Los Angeles River.

Sediment enters the Arroyo Seco system upstream of the dam as a result of erosional processes in the upper natural portions of the watershed. The upper watershed is characterized as natural with crystalline base rocks in a mountainous region with steep slopes covered with native chaparral and pines. Variable sediment loading occurs as a result of the steep slopes, periodic intense rainfall, and occasional wildfires that remove vegetation.

Historical data is available regarding the volume of sediment deposited in the reservoir, sediment removal operations, and conveyance downstream. An average of 90 acre feet of sediment is deposited in the reservoir based on a 76 year period. It is estimated that dam removes 33% of the sediment from the upper Arroyo Seco. Multiple options are presented for reducing sediment deposition in the reservoir. Planning considerations for naturalization of the lower stream are provided with a summary of additional data needs.



Lower Arroyo Seco concrete channel (arroyoseco.org)

3.1.2 Recommendations

MWH Study

Multiple recommendations and design considerations are presented in the MWH study. Additional studies are recommended to gain an improved understanding of the Arroyo Seco system for consideration during the design of restoration projects.

The Arroyo Seco below Devil's Gate Dam experiences flows consistent with a typical semi-arid Mediterranean climate, with wet winters and very dry summers. As such, this reach is normally dry, though it responds to rainfall events indicating a flashy stream system. Additionally, there is no continuous contact between the stream channel and the underlying groundwater aquifer. The presence of limited flows in the system during the majority of the year is problematic for restoration of the Central Arroyo area unless water management practices in the Hahamongna Basin are changed. The MWH Study recommends a naturalized channel below Devil's Gate Dam should take into account that there will be zero flows 50 percent of the time and flows of less than 10 cfs 95 percent of the time. However, flows may increase below the narrows area, due to groundwater interaction with the streambed. Any restoration activities must be designed to embrace these conditions, including selection of vegetation communities, habitat types, and recreational opportunities. Additionally, groundwater upwelling areas should be determined.

Increased naturalization of the area below the dam requires designing for peak flows from the dam, storm drain discharges, and direct pervious area. Capital Storm peak flows from major tributaries have been developed by LACDPW. Direct pervious areas have been calculated and are taken into account in the WMS model. Data indicates a reduction in peak inflows from urban areas using best management practices would be an important part of restoring the

watershed to allow for channel naturalization. Reduction of peak inflows would increase the feasibility of channel naturalization on the Lower Arroyo. In order to retain flood storage capacity of the Arroyo Seco, removal of Devil's Gate Dam would potentially require floodplain depths of 10-15 feet between the dam and the confluence with the Los Angeles River. This alteration would represent a flood risk in the event of a Capital Storm.

Additional recommendations for the Arroyo Seco watershed described in the MWH Study and listed in the Arroyo Seco Watershed Management & Restoration Plan prepared by Northeast Trees are:

- Develop an understanding of the existing and future sediment loading and transport regimes by completing a sediment management plan
- Conduct a geologic and hydraulic study (detailed model) of the channel and floodplain
- Identify parcels at risk from flooding associated with a Capital Storm if the channel were naturalized
- Determine peak flow discharges
- Conduct additional studies regarding sluicing activities and their impacts downstream of the Devil's Gate Dam
- Account for potential and existing confinements, both natural and manmade, throughout the extent of the Arroyo Seco
- Determine the extent to which the Arroyo Seco will undergo channel movement by conducting a geomorphic analysis to determine channel sinuosity and channel geometry
- Monitor changes in channel geometry and sediment transport as restoration projects are completed.

PWA Study

Recommendations are provided in the PWA Study to address flood hazards, sediment management, and water features in the Hahamonga Watershed Park region of the Arroyo Seco. Highlighted recommendations are presented here:

- Locate facilities within the Watershed Park outside of the designated flood and debris inundation zones or construct to withstand inundation
- Sediment management should be limited to two areas in the park that are currently active Arroyo Seco sediment and debris inundation zones. Sediment in both areas should be excavated using a strategy that is based on maximum elevations of deposition and not a regular schedule.
- Maintain the primary function of the Devil's Gate Dam to control flood volumes and peak flows to minimize downstream property damage, but analyze dam operations to maximize groundwater recharge and "flow-assisted" sediment discharge.
- Restore a natural Arroyo Seco riparian zone within the park, including an intermittent open water feature, through restoration of a natural flow regime.
- If the percolation ponds are to be maintained in the park, the ponds 12 and 13 should be eliminated and replaced with ponds to the west of the active Arroyo Channel, removing

groundwater recharge facilities from the most active part of the upstream depositional area, described in the PWA report as Area 2.

- Consider pumping water contained in the water feature up to the spreading ground. However, the study hesitates to recommend such a pump-back system due to its cost and location in the flood and debris inundation zones.

Further recommendations building upon the PWA Study are provided in a memorandum from CDM to Tim Brick of the Arroyo Seco Foundation dated March 31, 2010. Please refer to Appendix C. The Hahamongna Water Park can be developed into a multi-use facility that supports a number functions that include habitat and recreation in addition to flood control, sediment management and water supply augmentation. However, as is readily apparent from the analyses presented in the PWA Study, careful consideration must be given to siting facilities and enhancements. The current configuration has provided flood control, reduced sediment impacts and groundwater augmentation, but at the expense of habitat and potential recreational opportunities. An approach that integrates all functions into a coherent design rather than the current condition that includes separate facilities for each function could maximize use of the parkland to the benefit of all.

Specific site characteristics that should be considered when planning and designing for a multi-use facilities in the Hahamongna Watershed Park include:

- Suspended sediment in flood flows will be deposited within the flood prone area of the park below the JPL bridge. Depending on the size of the flow and headwater catchment area conditions, such deposition can be considerable, inundating and damaging improvements in the flood prone area. Ideally, this area should be left unimproved, evolving naturally as sediment moves through the system. However, the need to provide water supply augmentation means that the system will have to be manipulated by mechanical removal of deposited sediment to maintain infiltration rates.
- The potential exists to expand the spreading grounds throughout the flood prone area behind the dam; however, this approach will require active sediment management that could disrupt habitat and recreational facilities. Design analysis should be undertaken to develop a sediment depositional zone in the location identified in the PWA study as Area 2, adjacent to the existing spreading ground ponds and downstream of the JPL bridge. This area currently supports what appears to be a braided channel morphology, and, as identified in the PWA report, a significant area of coastal sage scrub, an ecosystem that has the potential for high levels of species diversity. The coastal sage scrub is considered an endangered ecosystem that contains a number of endangered species and is listed as an Endemic Bird Area. In particular, the California gnatcatcher (*Poliioptila californica*) is currently being used as an umbrella species to protect the endemic flora and fauna of this region from urban development. The coastal sage scrub eco-region is associated with riparian lands and oak wood lands, both of which are included in the park. Located on highly valued coastal real estate and threatened by human development, the coastal sage scrub ecoregion represents the struggle between preservation and human development and, therefore, this zone should be preserved in the park. Needless to say, a challenge exists between preserving valuable existing

habitats and properly managing sediment deposition in such a way that ecological and environmental disruptions are minimized.

- Areas subjected to high rates of sediment deposition will also experience high rates of disruption as vegetation is inundated and covered. This process can be viewed as one that naturally occurs in alluvial fan environments. Therefore, an appropriate approach to sediment management is to set aside Area 2 as a depositional zone, alluvial fan remnant with the expectation that it will be regularly inundated and experience periodic depositional episodes. This area should be adequately sized as a sediment trap forebay to the dam pool. This means that spreading ground ponds may have to be relocated or eliminated. This is suggested in the PWA study for ponds 12 and 13, although may also extend to additional upstream ponds.
- Coastal sage scrub communities should be preserved and encouraged around flood and sediment inundation zones as well as in the riparian corridor between Areas 1 and 2 as identified in the PWA study. These communities should be interspersed or associated with oak woodlands communities. An oak grove currently exists on the terrace above the flood prone area. Oak should be encouraged in areas of low recurrence interval flooding (50-year and capital flood inundation zones); perhaps oak groves or savannahs interspersed amongst sage scrub.
- The PWA study identifies an intermittent water feature near the dam, in, or also near, sediment Area 1. This feature is intermittent because it will fill in response to runoff events, drying up between events. Typically, one would expect the feature to contain water during the wet season (October through May) and dry during the summer months, depending on the weather. This feature can be expected to fill with sediment and debris over time that will require mechanical removal. PWA has recommended that the removal be based on a designated fill elevation as opposed to regularly scheduled excavation. This approach is reasonable and could result in fewer removal episodes with a lower impact on surrounding vegetation and habitat. However, during wet cycles, it may also result in more excavation episodes, which would probably be necessary anyway. A review of 2007 GoogleEarth™ aerial imagery indicates the presence of an open water body near the dam, adjacent to Oak Grove Drive. This location is near that described in the PWA report and could be improved to provide recreational and habitat benefits.

3.2 Biological Resources

Arroyo Seco Watershed

Above Devil's Gate Dam in the Hahamongna subwatershed, the riparian habitat is relatively undisturbed and supports a diversity of plant and wildlife species. The upper watershed is largely undeveloped and primarily managed for recreation, watershed protection, and wildlife conservation by the Angeles National Forest. Devil's Gate Dam and Reservoir are operated and managed by Los Angeles County Department of Public Works (LACDPW) to control flow and sediment transport downstream.

Downstream of the Devil's Gate Dam, the Arroyo Seco flows through a short canyon section of natural channel and then emerges at the Brookside Golf Course where it enters a concrete flood

channel. As the Arroyo Seco continues south to the confluence of the Los Angeles River, the concrete channel size increases to accommodate the inflow from storm drains. Prior to channelization, stands of alder, willow, and sycamore lined a perennial, trout-filled stream. A series of regional and local parks preserve areas of native habitat and open space in the central and lower arroyo; however, the removal of riparian vegetation has significantly impacted wildlife and plant diversity.



Lower Arroyo Seco concrete channel (arroyoseco.org)

Urban development and exotic plant species have replaced the native vegetation below the dam. The riparian habitat within the watershed has been significantly reduced in the upper reaches due to encroachment of chaparral and in the lower reaches due to urbanization.

Biological Resources

Information on biological resources in the Arroyo Seco watershed was obtained from previous studies conducted by Northeast Trees and Verna Jigour Associates (Jigour et al., 2001), and Camm Swift (AMEC, 2001). Information on the distribution of vegetation communities was gathered from the City of Pasadena Arroyo Seco Master Plans (City of Pasadena, 2003). In addition, a biological assessment and wetland delineation of the central Arroyo Seco was conducted by CDM for the Brookside Park Best Management Practices (BMP) Project (CDM, 2007).

Special-status plant and wildlife species with the potential to occur in the watershed were identified through a search of the Department of Fish and Game California Natural Diversity Database (CNDDDB) for the Pasadena U.S. Geological Survey (USGS) 7.5-minute quadrangle.

Vegetation Communities

The Arroyo Seco watershed spans a diversity of habitat types and conditions that range from relatively undisturbed habitats within Angeles National Forest to highly degraded and fragmented habitats in urban areas of the lower watershed. The Army Corps of Engineers Watershed Management Study (2005) identified the vegetation communities of the upper watershed as Bigcone Spruce-Canyon Oak Forest, Southern Sycamore-Alder Riparian Woodlands, and Southern Mixed Chaparral, while the alluvial fan deposits upstream of Hahamongna Dam support ecologically significant Alluvial Sage Scrub habitat (USACE, 2005).

Near the confluence with the Los Angeles River, the Arroyo Seco traverses the communities of Mount Washington and the Montecito Hills, which still support Southern California Black

Walnut Woodlands. Relatively large parks and areas of open space, including Debs Park and Elyria Canyon, preserve native vegetation (USACE, 2005).

The City of Pasadena Arroyo Seco Master Plans (2003) identify other vegetation communities that occur in the watershed: Coast Live Oak Woodland, Southern Willow Scrub, Mule Fat Scrub, Sage Scrub, Landscaped and Ruderal Vegetation.

Each of the vegetation communities that have been identified within the Arroyo Seco watershed are described in the paragraphs below.

Bigcone Spruce-Canyon Oak Forest

Bigcone spruce-canyon oak forest is dominated big cone spruce (*Psuedotsuga macrocarpa*) with a shorter, dense sub-canopy of canyon oak (*Quercus chrysolepis*) and a very sparsely vegetated herbaceous layer. This forest type can be found between 1,000 and 8,000 feet above mean sea level (Holland, 1986).

According to a habitat assessment conducted by Jigour et al. (2001) bigcone Douglas-fir (also known as bigcone spruce) occurs primarily in the upper riparian zones at mid-elevations of the montane watershed, particularly within the Bear Canyon forest. The more common vegetation community within the watershed is dominated by canyon oak. It represents the Canyon Live Oak Forest type described by Holland (1986). Other common species in this vegetation community include California bay (*Umbellularia californica*) and bigleaf maple (*Acer macrophyllum*).

Coast Live Oak Woodland

Coast live oak woodland is typically located on north-facing slopes and shaded ravines in southern California. In Hahamongna Watershed Park (HWP) it occurs on the more level terrain of old terraces of alluvial fans where it integrates with southern willow scrub, mule fat scrub, and the ruderal vegetation in the central riparian corridor of the Arroyo Seco. On the drier,



Oak Woodland in Central Arroyo Seco (CDM, 2007)

west-facing and south-facing sidewalls and slopes of the Arroyo Seco drainage to the east, coast live oak woodland patchily merges with sage scrub and ruderal communities. In the central Arroyo Seco, coast live oak woodland intergrades with sage scrub, southern sycamore riparian woodland, southern willow scrub, and ruderal vegetation. In the Lower Arroyo Seco, coast live oak woodland occurs in discontinuous areas on side slopes where it intergrades with sage scrub and ruderal vegetation (City of Pasadena, 2003).

Coast live oaks reach heights as great as 100 feet (30 meters), and the canopy may be continuous, intermittent, or open. Commonly associated shrub understory species in this plant community include black sage (*Salvia mellifera*), California blackberry (*Rubus ursinus*), California bay, California redberry (*Rhamnus californica*), California sagebrush (*Artemisia californica*), chamise (*Adenostoma fasciculatum*), laurel sumac (*Malosma laurina*), western poison oak (*Toxicodendron diversilobum*), scrub oak (*Quercus berberidifolia*), toyon (*Heteromeles arbutifolia*), Mexican elderberry (*Sambucus mexicana*), bigleaf maple (*Acer macrophyllum*), box elder (*Acer negundo*), hairy ceanothus (*Ceanothus oliganthus*), Engelmann oak (*Quercus engelmannii*), bush monkeyflower (*Mimulus aurantiacus*), and various currant or gooseberry species (*Ribes* spp.). The herbaceous layer component is often continuous and dominated by ripgut (*Bromus diandrus*) and other introduced species such as common chickweed (*Stellaria media*) (City of Pasadena, 2003).

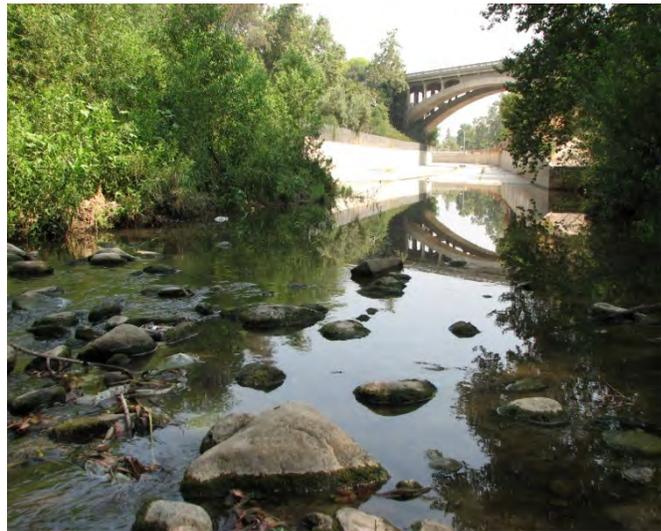
Southern Sycamore-Alder Riparian Woodlands

Southern sycamore-alder riparian woodland is a tall, open canopy, broadleaved, winter-deciduous streamside woodland dominated by western sycamore (*Platanus racemosa*) and often white alder (*Alnus rhombifolia*). This vegetation community typically occurs in very rocky streambeds subject to seasonal high-intensity flooding. The dominance of white alder in these woodlands increases in abundance on more perennial streams, while western sycamore favors more intermittent streams (Holland, 1986).

Within HWP and the central Arroyo Seco, southern sycamore riparian woodland is limited to areas along the natural stream channel just south of Devil's Gate Dam and the 210 Freeway. This vegetation community is absent from the lower Arroyo Seco (City of Pasadena, 2003).

Southern Willow Scrub

Southern willow scrub dominates the riparian areas along the more natural reaches of the upper and central Arroyo Seco. In HWP, it merges with coast live oak woodland, mule fat scrub, sage scrub, and ruderal vegetation. In the central Arroyo, southern willow scrub merges with sage scrub, ruderal vegetation, coast live oak woodland, landscaped vegetation of the adjacent residences and introduced and naturalized tree species, such as eucalyptus (*Eucalyptus* spp.), date and fan palms (*Phoenix canariensis* and *Washingtonia robusta*), and pines (*Pinus* spp.) among others. This community does not exist within the concrete channel of the lower Arroyo Seco (City of Pasadena, 2003).



Riparian willows in Central Arroyo Seco (CDM 2007)

Southern willow scrub is an early seral or successional type that requires repeated flooding to prevent succession to southern cottonwood-sycamore riparian forest. This plant community is comprised of dense, broad-leaved, winter-deciduous riparian thickets dominated by several

willow species including arroyo willow (*Salix lasiolepis*), black willow (*S. gooddingii*), red willow (*S. larvigata*), shining willow (*S. lucida* ssp. *lasiandra*), and narrow-leaved willow (*S. exigua*). Southern willow scrub typically occupies sites on flood plains, or in low gradient depositions along streams. Shrubs and trees in this community may reach between 33 to 100 feet in height, and the canopy may be continuous. Most stands often are so dense that the understory vegetation layer of grasses and forbs may vary from sparse to abundant (Holland, 1986).

Also associated with this riparian scrub community are scattered emergent species of Fremont cottonwood (*Populus fremontii* ssp. *Fremontii*), black cottonwood (*P. balsamifera* ssp. *trichocarpa*), and western sycamore (*Platanus racemosa*). Other commonly associated species include mule fat (*Baccharis salicifolia*), coyote brush (*B. pilularis*), mugwort (*Artemisia douglasiana*), Mexican elderberry, and bigleaf maple (City of Pasadena, 2003).

Mule Fat Scrub

Mule fat scrub often occurs as relatively pure stands and is common in areas along the riparian stream corridor in HWP. In the central Arroyo, mule fat scrub is very limited and this community is not present in the lower Arroyo.

Holland (1986) notes that mule fat scrub is an early seral community that is maintained by frequent flooding. Mule fat scrub is typically characterized by tall, herbaceous riparian scrub species dominated by *Baccharis salicifolia*. Mule fat is usually the sole or dominant shrub in the canopy, along with narrow-leaved willow, and the plants may attain heights of 13 feet. The canopy often is continuous and the ground layer of vegetation is sparse. This terrestrial natural community is located along intermittent stream channels with fairly coarse substrate and moderate depth to the water table. Habitats within this community are also seasonally flooded and the ground is saturated. Other commonly associated species in mule fat scrub include arroyo willow, narrow-leaved willow, hoary nettle (*Urtica dioica* ssp. *holosericea*), Mexican elderberry, and sedges (*Carex* spp.).

Sage Scrub

Sage scrub is found on slopes and sidewalls of the Arroyo Seco drainage in HWP and the central and lower Arroyo Seco. Sage scrub is a mixture of fire-adapted, sclerophyllous (hard-leaved), woody chaparral species, and drought-deciduous sage scrub species. This plant community appears to be post-fire successional and is found on dry, rocky, often steep, south-facing slopes and ridges with shallow or poorly differentiated soils (Holland, 1986). Sage scrub is very similar to mixed chaparral communities identified by USACE (2005) as being present in the Arroyo Seco watershed. Chaparral is dominated by shrubs with thick, stiff evergreen leaves that form a dense, often nearly impenetrable vegetation community with a canopy ranging from 1 to 4 meters tall (Holland, 1986).

Generally, shrubs in coastal sage-chaparral scrub are no more than six to ten feet in height, with a continuous or intermittent canopy, and sparse or absent ground layer is sparse or absent. Understory cover of forbs and grasses is often variable depending upon the fire history of a particular site. Dominant species in this terrestrial natural community include California sagebrush, California buckwheat (*Eriogonum fasciculatum* var. *foliolosum*), chamise, black sage, white sage (*Salvia apiana*), laurel sumac, lemonadeberry (*Rhus integrifolia*), sugar bush (*R. ovata*), Mexican elderberry, toyon, southern California black walnut, scrub oak, birch-leaf mountain

mahogany (*Cercocarpus betuloides* var. *betuloides*), holly-leaf cherry (*Prunus ilicifolia* ssp. *ilicifolia*), hoaryleaf ceanothus (*Ceanothus crassifolius*), other ceanothus or California-lilac species (*Ceanothus* spp.), chaparral mallow (*Malacothamnus fasciculatus*), chaparral yucca (*Yucca whipplei*), bush monkeyflower, deerweed (*Lotus scoparius*), golden yarrow (*Eriophyllum confertiflorum*), poison oak, hairy yerba santa (*Eriodictyon crassifolium*), rockrose (*Helianthemum scoparium*), prickly pears (*Opuntia* spp.), bladderpod (*Isomeris arborea*), California encelia (*Encelia californica*), four-wing saltbush (*Atriplex canescens*), brome grasses (*Bromus* spp.), Brazilian pepper (*Schinus terebinthifolius*), and Peruvian pepper (*S. molle*) (City of Pasadena, 2003).

Alluvial Sage Scrub

This community is also known as Riversidian alluvial fan sage scrub and is found on alluvial fan terraces along the Arroyo Seco drainage and bordering the western edges of most of the spreading basins in HWP. The existing spreading basins are largely situated upon what were originally Riversidian alluvial fan sage scrub habitats. This community developed from the flow of water and sediment deposition during flooding as the Arroyo Seco stream emptied into the HWP flood basin from the narrow canyon mouth of the Arroyo Seco north of the JPL Bridge. Today, only remnants of this community remain in HWP. Historically, without the presence of the dam, alluvial fan terraces would have spread across most of the terrain that is now parkland, and gradually merged with upland areas covered with coast live oak woodland or coastal sage-chaparral scrub (City of Pasadena, 2003).

Holland (1986) states that this terrestrial natural community is very xeric (dry) with coarse soils and some finer soils that are slow to release stored moisture. Shrubs in this vegetation type are generally low in height at five feet (one and one-half meters) and adapted to nutrient poor soils. Drought-deciduous, soft-leaved shrubs typically predominate, but evergreen shrubs, riparian species, and upland annual plants may all be present. Scalebroom (*Lepidospartum squamatum*) is considered an indicator species for this vegetation type.

Southern California Black Walnut Woodland

Southern California black walnut woodlands are found only in the low hills of the Los Angeles Basin. This community consists primarily of southern California black walnut (*Juglans californica* var. *californica*), flowering ash (*Fraxinus dipetala*), Mexican elderberry, and coast live oak. Typical understory consists of non-native grassland. Fires appear to promote the expansion of walnut woodlands. This community exists in the lower Arroyo in preserved open spaces and parks including Debs Park and Elyria Canyon (City of Los Angeles, 2000).

Landscaped Vegetation

Landscaped vegetation dominates much of the vegetated areas of the central and lower Arroyo Seco and is largely composed of cultivated ornamental, horticultural plants that may be native or nonnative tree, shrub, forb, and grass species. Landscaped plant species are usually aesthetically appealing and require irrigation and management. In the Arroyo Seco, landscaped vegetation occurs near buildings,



Landscaped vegetation near residences in Central Arroyo Seco (CDM, 2007)

roads, parking areas, walls, and developed parklands. Representative landscape plants include species of eucalyptus, pine, oak, acacia, fig, olive, pittosporum, cherry, pepper tree, maple, liquidambar, ash, juniper, cypress, pyracantha, walnut, hibiscus, oleander, privet, redwood, elm, palm, coral tree, periwinkle, lantana, ivy, plumbago, poplar, tree of heaven, agave, and many others (City of Pasadena, 2003).

Ruderal Vegetation

Ruderal (or weedy) vegetation dominates parts of HWP and the central and lower Arroyo in the terrace areas and along the boundaries on side slopes and near bases of the side slopes. Ruderal vegetation also occurs within developed and landscaped areas. Ruderal (or weedy) vegetation is typically associated with site disturbance conditions such as grading, clearing, burning, and even flooding, and may occur on fine-textured, usually clay soils that are moist or waterlogged during the winter rainy season and become very dry during the summer and fall. Sites favored by this plant community are found on gentle slopes or on more level terrain where finer soil particles have a chance to collect favoring the growth of annual species of grasses and showy-flowered forbs or wildflowers. Areas with frequent, repeat occurrences of fire or other disturbances tend to lose the dominant shrub community and allow ruderal vegetation that includes very aggressive nonnative species to become established and persist (City of Pasadena, 2003).

Nonnative, introduced, annual grass and forb species tend to dominate the understory and some forbs may reach heights as great as three feet (one meter) depending on the amount of rainfall received. They germinate with late fall and winter rains; and grow, flower, and set seed during the winter through spring months. Holland (1986) notes that, with a few exceptions, these weedy plant species are dead but persist as seeds through the summer and fall dry seasons. Shrub and tree species are usually absent or are very sparse, and the ground layer of vegetation is continuous or open. The eradication of ruderal vegetation species is difficult to achieve since it is composed of introduced, invasive, and very aggressive species such as annual grasses and forbs.

Commonly observed species in ruderal vegetation and/or nonnative grassland community include slender wild oats, common wild oats, ripgut, red brome (*Bromus madritensis* ssp. *rubens*), soft chess (*B. hordeaceus*), black mustard (*Brassica nigra*), turnip or field mustard (*B. rapa*), shortpod mustard (*Hirschfeldia incana*), red-stem filaree (*Erodium cicutarium*), filaree (*E. botrys*), California poppy (*Eschscholzia californica*), gilies (*Gilia* spp.), tarweed (*Hemizonia fasciculata*), Italian ryegrass (*Lolium multiflorum*), lupines (*Lupinus* spp.), peppergrass (*Lepidium nitidum*), burclover (*Medicago polymorpha*), phacelias (*Phacelia* spp.), Mediterranean grass (*Schismus barbatus*), star-thistles (*Centaurea* spp.), and vulpias or annual fescues (*Vulpia* spp.) (City of Pasadena, 2003).

Special-Status Plant Species

Special-status plants that have potential to occur in the Arroyo Seco watershed include Parish's gooseberry (*Ribes divaricatum* var. *parishii*), Plummer's mariposa lily (*Calochortus plummerae*), and Nevin's barberry (*Berberis nevinii*) (CNDDDB, 2010). Table 3 identifies special-status plant species with the potential to occur, based on a CNDDDB search of the Pasadena USGS 7.5-minute quadrangle (CNDDDB, 2010). Figure 2 illustrates the location of current and historic observations of special-status plant species in the Arroyo Seco watershed. The CNDDDB considers historical

sightings as evidence that species still exist. However, the majority of the observations of special-status plant species shown on Figure 2 are based on historical sightings dating back to as early as 1917 (CNDDDB, 2010). Given the highly developed and degraded nature of the habitat, particularly within the central and lower Arroyo Seco watershed, many of these species are not expected to currently occur within the watershed.

Wildlife

The Arroyo Seco supports as many as 180 species of birds that utilize the variety of habitats (ASF Website). Common birds that occur in oak woodlands include the acorn woodpecker (*Melanerpes formicivorus*) and oak titmouse (*Baeolophus inornatus*). Shrub and grassland habitats along the Arroyo Seco support birds including spotted towhee (*Pipilo maculatus*), Bewick's wren (*Thryomanes bewickii*), Western scrub jay (*Aphelocoma californica*), California thrasher (*Toxostoma redivivum*), and California quail (*Callipepla californica*). Riparian specialists, including the yellow warbler (*Dedroica petechia*), common yellowthroat (*Geothlypis trichas*), and red-shouldered hawk (*Buteo lineatus*) also occur in the watershed, as do aquatic birds including mallard American coot (*Fulica americana*) and green heron (*Butorides virescens*).



Green heron in Central Arroyo Seco (CDM 2007)

Riparian areas support other wildlife species including arboreal salamander (*Aneides lugubris*) and Pacific tree frog (*Pseudacris regilla*). Other common wildlife species inhabiting chaparral and scrub communities in the watershed include California ground squirrel (*Spermophilus beecheyi*) and Western fence lizard (*Sceloporus occidentalis*).

The upper Arroyo Seco watershed also supports large mammals including coyote (*Canis latrans*), bobcat (*Lynx rufus*), gray fox (*Urocyon cinereoargenteus*), mule deer (*Odocoileus hemionus*), and mountain lion (*Puma concolor*). Wildlife in the central and lower Arroyo are limited to those adapted to living in urbanized environments and include the coyote, striped skunk (*Mephitis mephitis*), raccoon (*Procyon lotor*), opossum (*Didelphis virginiana*), and eastern fox squirrel (*Sciurus niger*).

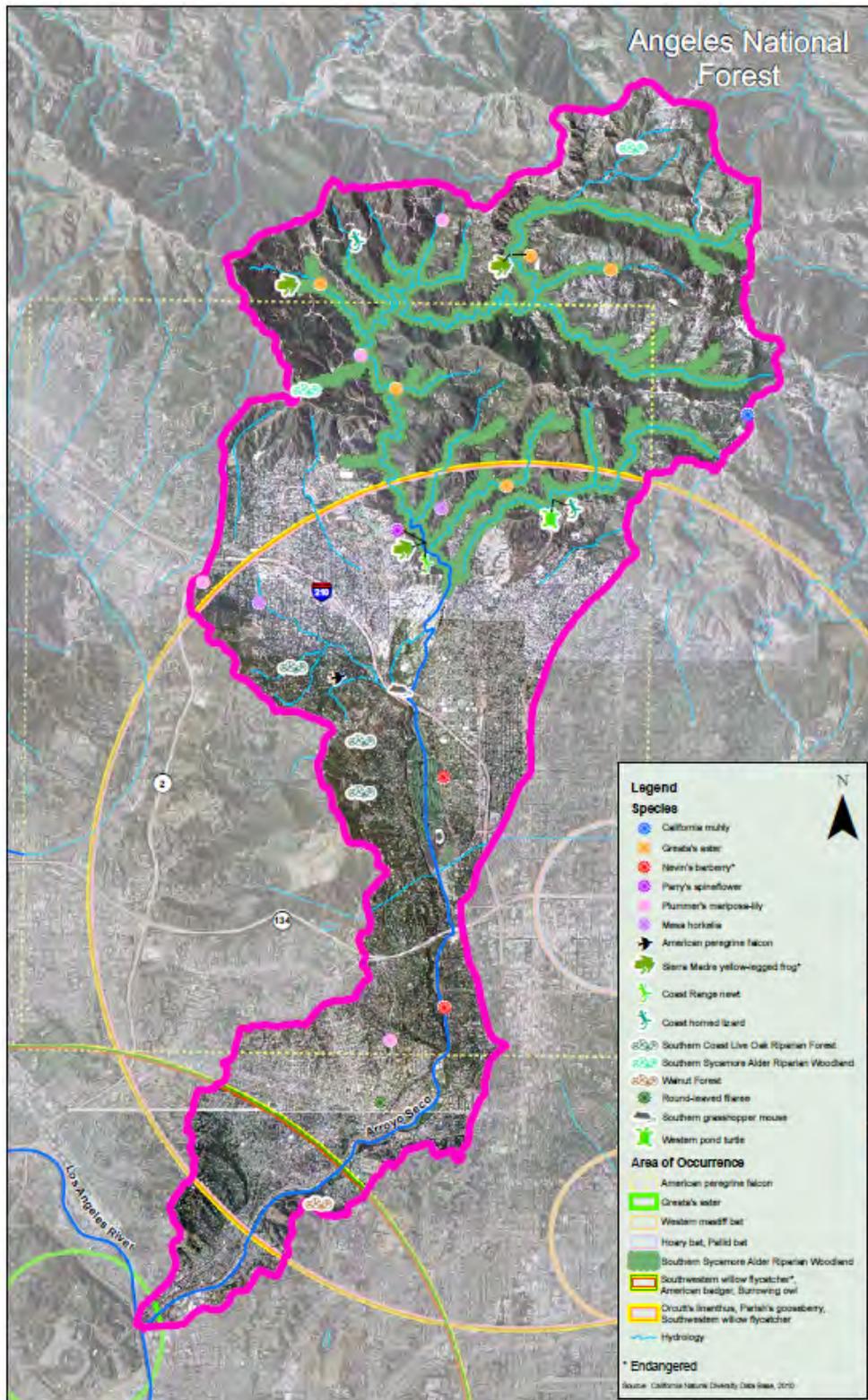


Figure 2: The location of current and historic observations of special-status plant and animal species in the Arroyo Seco watershed.

Special-Status Wildlife Species

Historic populations of native fish that occurred in the Arroyo Seco and greater Los Angeles River have largely been extirpated. These species include the unarmored threespine stickleback (*Gasterosteus aculeatus williamsoni*), a state and federally listed endangered species that is thought to have been extirpated from the watershed in the 1940's. Native rainbow trout (*Oncorhynchus mykiss*) may still occur, although there may be substantial introgression with stocked rainbow trout of different strains (Personal communication with John O'Brien, CDFG).

The southern steelhead (*Oncorhynchus mykiss irideus*) is a federally endangered, anadromous form of the rainbow trout that once inhabited the Arroyo Seco.



Arroyo chub (CDM, 2007)

Other native fish species that once inhabited the Arroyo Seco include pacific lamprey (*Lampetra tridentata*), pacific brook lamprey (*Lampetra pacifica*), Santa Ana sucker (*Catostomus santaanae*), Santa Ana speckled dace (*Rhinichthys osculus*), and arroyo chub (*Gila orcutti*). Surveys conducted by Camm Swift in 2001 found no native fish species in the Arroyo Seco (AMEC, 2001). Native species such as the arroyo chub and southern steelhead have not been collected in the Arroyo Seco since flood control

projects channelized portions of the stream in the 1940's (Jigour et. al., 2001; AMEC, 2001). Recent restoration efforts have included creation of habitat for the arroyo chub in the central Arroyo Seco. Three hundred individual arroyo chub were released into these restored areas in 2008 following completion of the Central Arroyo Seco/Brookside Park BMP Project (CDM, 2008). Juvenile arroyo chub were identified in a backwater pool in the lower Arroyo Seco restoration area – evidence that the arroyo chub were reproducing and rearing (Swift, 2009).

The southwestern pond turtle (*Clemmys marmorata pallida*), a California Species of Special Concern, historically inhabited the Arroyo Seco. Suitable habitat for the pond turtle, consisting of pools of perennial, slower moving streams, may exist in tributaries in the upper watershed. Critical habitat for the federally endangered southwestern arroyo toad (*Bufo microscaphus californicus*) was designated in a six mile reach of the Arroyo Seco extending from Hahamongna reservoir to Long Canyon in 2001; however, this listing was subsequently removed (Personal communication with Stacy Love, CDFG).

Other special-status species that may occur in the Arroyo Seco watershed include the coast horned lizard (*Phrynosoma coronatum blainvillei*), which inhabits native alluvial fan scrub, coastal sage scrub, and chaparral. Table 2 lists the special-status wildlife species with the potential to occur in the watershed based on a CNDDDB search of the Pasadena USGS 7.5-minute quadrangle (CNDDDB, 2010). Figure 2 illustrates the location of current and historic observations of special-

status plant species in the Arroyo Seco watershed. The CNDDDB includes species presumed extant (still in existence) based on historical sightings until evidence is provided to the contrary. Thus, the majority of the observations of special-status animal species shown on Figure 2 are based on historical sightings dating back to as early as the late 1800s (CNDDDB, 2010). Given the highly developed and degraded nature of the habitat, particularly within the central and lower Arroyo Seco watershed, many of these species are not expected to occur.

In addition to the species shown in Table 3 and Figure 2, four other sensitive animal species, coastal western whiptail (*Cnemidophorus tigris multiscutatus*), sharp-shinned hawk (*Accipiter striatus*), Cooper's hawk (*A. cooperii*), and loggerhead shrike (*Lanius ludovicianus*) have been observed during biological surveys at HWP but do not appear on the CNDDDB list (City of Pasadena, 2003).

Table 3: Special-Status Species with Potential to Occur in the Arroyo Seco Watershed

Common Name	Scientific Name	Status	General Habitat
Plants			
Round-leaved filaree	<i>California macrophylla</i>	1B.1	Woodlands and grasslands
Plummer's mariposa-lily	<i>Calochortus plummerae</i>	1B.2	Woodlands, scrub, and grasslands
Southern tarplant	<i>Centromadia parryi ssp. Australis</i>	1B.1	Marshes and grasslands
Parry's spineflower	<i>Chorizanthe parryi var. parryi</i>	1B.1	Sage scrub
Slender-horned spineflower	<i>Dodecahema leptoceras</i>	FE/SE/1B.1	Sage scrub and alluvial fan sage scrub
Los Angeles sunflower	<i>Helianthus nuttallii ssp. Parishii</i>	1A	Marshes (historical)
Mesa horkelia	<i>Horkelia cuneata ssp. Puberula</i>	1B.1	Sage scrub
Orcutt's linanthus	<i>Linanthus orcuttii</i>	1B.3	Woodlands and sage scrub
White rabbit-tobacco	<i>Pseudognaphalium leucocephalum</i>	2.2	Woodlands and sage scrub
Parish's gooseberry	<i>Ribes divaricatum var. parishii</i>	1A	Riparian woodlands
Greata's aster	<i>Symphotrichum greatae</i>	1B.3	Woodlands and sage scrub
Birds			
Western burrowing owl	<i>Athene cunicularia hypugea</i>	CSC	Grasslands and open scrub
Southwestern willow flycatcher	<i>Empidonax traillii extimus</i>	FE/SE	Riparian woodlands
American peregrine falcon	<i>Falco peregrinus anatum</i>	FD	Near wetlands, lakes, rivers, or other water. On cliffs and human-made structures
Amphibians			
Sierra Madre yellow-legged frog	<i>Rana muscosa</i>	FE/CSC	Near water
Coast Range newt	<i>Taricha torosa torosa</i>	CSC	Slow moving streams and reservoirs

Table 3: Special-Status Species with Potential to Occur in the Arroyo Seco Watershed

Common Name	Scientific Name	Status	General Habitat
Reptiles			
Western pond turtle	<i>Actinemys marmorata</i>	CSC	Requires permanent water with aquatic vegetation
Coast horned lizard	<i>Phrynosoma blainvillii</i>	CSC	Sandy shrublands and sage scrub
Mammals			
Pallid bat	<i>Antrozous pallidus</i>	CSC	Woodlands, grasslands, shrublands with open rocky areas
Western mastiff bat	<i>Eumops perotis californicus</i>	CSC	Woodlands, grasslands, scrub
Silver-haired bat	<i>Lasiurus noctivagans</i>	None	Woodlands near water
Hoary bat	<i>Lasiurus cinereus</i>	None	Open woodland edges
Western yellow bat	<i>Lasiurus xanthinus</i>	CSC	Riparian woodlands
Southern grasshopper mouse	<i>Onychomys torridus Ramona</i>	CSC	Shrublands
American badger	<i>Taxidea taxus</i>	CSC	Shrublands

Notes:

- 1A = Presumed Extinct in California (California Native Plant Society, CNPS)
- 1B = Endangered, Threatened or Rare in California (CNPS)
- 2.2 = Endangered, Threatened or Rare in California but more common elsewhere (CNPS)
- CSC = California Species of Concern (California Department of Fish and Game, CDFG)
- FD = Federally Delisted (U.S. Fish and Wildlife Service, USFWS)
- FE = Federally Endangered (USFWS)
- FT = Federally Threatened (USFWS)
- SE = State Endangered (CDFG)
- ST = State Threatened (CDFG)

Effects of the Station Fire in Upper Arroyo Seco Watershed

The Station Fire occurred from August until October 2009 and burned over 160,000 acres (251 square miles) of the San Gabriel Mountains, including the upper Arroyo Seco Watershed.

The U.S. Forest Service (USFS) has established a Station Fire Recovery Area which encompasses nearly 300,000 acres of the Angeles National Forest. The Recovery Area is closed to the public until September 30, 2010. Based on



Photo by Karen Bugge. Used with permission.

hydrophobic soils, steep terrain and the extent of burn damage to the vegetative cover, USFS determined there was a high potential for significant debris flows in drainages within and downstream of burned areas (USFS, 2009).

Debris flows and sedimentation within aquatic habitats due to the Station Fire could have significant impacts to water quality, water temperature, riparian and aquatic vegetation and streambed/pool habitat. Thus, populations of aquatic species, including sensitive species, could be locally extirpated. In addition, non-native aquatic species may spread into previously unoccupied habitats (USFS, 2009).

As recovery of native vegetation after the fire will be slow, there is increased risk from invasive weed introduction and population expansion. Areas of ground disturbance and the presence of equipment and crews during fire suppression operations created a risk of invasive weed introduction, establishment and proliferation. Proliferation of non-native vegetation could affect the structure and function of native plant communities, soil stability, and native wildlife habitat within the upper Arroyo Seco Watershed (USFS, 2009).

For both wildlife and vegetation, there is also concern that until enough vegetative recovery has occurred to deter illegal off-road vehicle travel, habitat degradation will continue. Increased access and visibility due to lack of vegetative cover will result in habitat degradation, disturbance of species, and increased risk of collection for some species, including turtles and fish (USFS, 2009).

Aquatic and Riparian Habitat

Aquatic and riparian habitat degradation has occurred in the Arroyo Seco due to alteration of natural stream hydrology and sediment transport in the watershed, primarily due to Devil's Gate Dam and channelization of the lower sections of the watershed. Urbanization and development of the watershed has resulted in removal of riparian and upland vegetation and impairment of water quality. Non-native and invasive plant species have significantly impacted wildlife and plant diversity.

Aquatic vegetation does occur within the streambed in areas that are not regularly disturbed by annual flooding and scouring from seasonal rainfall runoff. Examples of streambed vegetation may include dominant or less abundant plant species found in southern willow scrub, riversidian alluvial fan sage scrub, mule fat scrub, and southern sycamore riparian woodland. Other species examples may include sedges (*Carex* spp.), rushes (*Juncus* spp.), cattails (*Typha* spp.), spikerushes (*Eleocharis* spp.), bulrushes (*Scripus* spp.), willow weed (*Polygonum lapathifolium*), and willow herbs (*Epilobium* spp.) (City of Pasadena, 2003).



Arundo donax (Giant reed) in Central Arroyo Seco (CDM, 2007)

Invasive Species

The Central and Lower Arroyo Seco are substantially impacted by non-native and invasive plant species, many of which are typical throughout southern California, including *Arundo* or giant reed (*Arundo donax*). Other invasive plant species that are cause for concern in the watershed include Mexican fan palm (*Washingtonia robusta*), eucalyptus (*Eucalyptus* spp.), and tree of heaven (*Ailanthus altissima*).

Wildlife Corridors and Significant Ecological Areas

The Arroyo Seco is a potential corridor for wildlife passage, which could connect the San Gabriel Mountains to large habitat patches including the San Rafael Open Space in the central Arroyo and the Monterey Hills, Montecito Hills, Debs Park, and Elysian Park in the southwest. However, several major barriers to aquatic and terrestrial habitat connectivity exist between the upper and lower watershed, most notably the Devil's Gate Dam and the 210 freeway (Jigour et al., 2001). Along with Devil's Gate Dam, the Brown Canyon Debris Dam in the upper watershed serves as a second major barrier to aquatic habitat connectivity, as is the concrete channel that lines most of the lower Arroyo Seco from Devil's Gate Dam to the confluence with the Los Angeles River.

The Los Angeles County General Plan designated several Significant Ecological Areas (SEAs) defined as "ecologically important or fragile land and water areas, valuable as plant and animal communities" and classified as one or more of the following: 1) habitats for rare and endangered species of plants and animals; 2) restricted natural communities - ecological areas which are scarce on a regional basis; 3) habitat restricted in distribution in the county; 4) breeding or nesting grounds; 5) unusual biotic communities; 6) sites with critical wildlife and fish value; and 7) relatively undisturbed habitat (County of Los Angeles, 1993).

While development within a SEA is not prohibited, the General Plan does require development to be limited and controlled in order to avoid impacting valuable biological resources. Public and semi-public uses essential to the maintenance of public health, safety and welfare would be permitted within an SEA only "where no alternative site or alignment is feasible" (County of Los Angeles, 1993). Further, an extensive analysis of biological impacts would be required for projects located within an SEA.

SEAs have been identified for both the City and County of Los Angeles, and both types of SEA are shown as map layers on the City of Los Angeles Bureau of Engineering, Department of Public Works Navigate L.A. website (City of Los Angeles, 2010). According to the Navigate L.A. database, a portion of the upper Arroyo Seco watershed in the Angeles National Forest is

located within a City SEA, and several County SEAs, including the Verdugo Mountains and Tujunga Valley/Hansen Dam are located nearby.

Wetlands

Wetlands occur in the Arroyo Seco watershed where hydric soils, saturation or inundation, and wetland vegetation criteria are met. These wetlands occur along stream reaches in riparian vegetation communities, including southern willow scrub and mule fat scrub, which support riparian as well as some wetland indicator species that may also be found in wetland habitats (City of Pasadena, 2003). Species including black, red, and narrow-leaved willows are obligate wetland species (those that occur only in wetlands). Thus, areas where these species are found in the Arroyo Seco watershed are likely to be classified as wetlands. For example, a wetland delineation conducted for the Brookside Park BMP Project in 2007 identified several small wetlands along the natural stream reaches in the central Arroyo Seco (CDM, 2007).

Environmental Restoration

Since the 1890's when Charles Lummis formed the Arroyo Seco Foundation, ASF has been leading environmental restoration efforts for the watershed. . More recently, the Arroyo Seco Watershed Management Feasibility Study was completed in 2002 and an Arroyo Seco Watershed Management and Restoration Plan in 2006. The latter Plan built upon the findings of the Feasibility Study to develop a plan to manage and restore water quality and habitat in the Arroyo Seco watershed. These studies reviewed many essential elements of restoring the Arroyo Seco, including hydrology, water quality, water resources, habitat, and recreation/open space, and listed broad projects that could improve these elements in the watershed.



Construction of aquatic habitat improvements for the Brookside Park BMP Project (CDM, 2007)

In 2003, the City of Pasadena adopted their Arroyo Seco Master Plans, including the Hahamongna Watershed Park Master Plan (HWP), Lower Arroyo Master Plan (LAMP), and Central Arroyo Master Plan (CAMP). They also developed the Adopted Final Design Guidelines for the Arroyo Seco (City of Pasadena, 2003). During community outreach efforts for the Master Plans, an overarching goal expressed by the community was to keep HWP natural and restrict recreational areas (soccer fields, etc.) to preserve and enhance native habitats. For the central Arroyo Seco, recommendations included enhancing slopes and park areas with a designated native plant palette, identifying areas for native plant restoration including the Brookside Golf Course, and developing a native tree-planting program. For the lower Arroyo Seco, goals are to restore the banks of the Arroyo Seco, while recognizing the limitations of existing concrete channel, through the following methods: Providing for a wildlife corridor,

stabilizing the banks and controlling erosion, and actively restoring and conserving the native plant communities (City of Pasadena, 2003). The Army Corps of Engineers Watershed Management Study (2005) identified the following opportunities for ecosystem restoration in the watershed:

- Develop a plan to link existing habitat fragments along the Arroyo Seco and tributaries to preserve the integrity of natural communities/ecosystems and provide a wildlife corridor.
- Improve habitat for multiple species including steelhead trout and arroyo toad.
- Implement best management practices (BMPs) throughout the watershed.
- Create wetlands using existing water sources following the example of the Browning Ferris Industries (BFI) Low Flow Diversion Project.
- Identify methods to preserve and manage Flint Canyon, which could provide a connection between Verdugo Hills and the San Gabriel Mountains.
- Develop a basin-wide sediment management plan to protect and improve the health of the watershed and its ecosystems, focusing on the functionality of crib structures and operation of Devil's Gate Dam including the hydrologic flows, geomorphology, sedimentation, and potential areas of stream and floodplain restoration.
- Identify restoration areas for sediment erosion control that will provide opportunities for restoration of impacted native plant and wildlife species.
- Investigate the potential for expanding existing floodways to allow creation of wildlife habitat along both the natural and improved channels.



Yellow warbler (iStockphoto)

In 2004, the City of Pasadena restored portions of the central Arroyo Seco under the Arroyo Seco Stream Restoration Project, which involved the identification and removal of invasive vegetative species (Jigour et al., 2001). The project focused on restoration for indicator species in the watershed, as listed in Table 3. Species types included Umbrella species that have habitat area and quality requirements that encapsulate the needs of an array of other species; Flagship species that are charismatic species that can attract the attention and imagination of the general public, and Indicator species. Three types of Indicator species were included: Ecosystem

Health Indicator species, those that are sensitive to and indicative of anthropogenic (human-caused) disturbances to ecological functions; Population Health Indicator species, those that are

predator species whose own population health provides a measure of the health of their assemblage of prey species and a multitude of associated ecological relationships, and Keystone Species, those that exert disproportionately large influences on the ecosystem relative to their abundance and loss of these species can lead to unraveling of the ecological fabric (Jigour et al., 2001).

Table 4: Focal Species for the Arroyo Seco Restoration Project

Common Name	Type of Species	Comments
Steelhead	Flagship/Umbrella	Encompasses requirements for Pacific lamprey, as well as for lower elevation focal fish species
Unarmored threespine stickleback	Umbrella	Encompasses requirements for lower elevation Arroyo chub, Santa Ana sucker and Santa Ana speckled dace
Arroyo toad	Ecosystem Health Indicator	Indicator of "fluctuating hydrological, geological, and ecological processes operating in riparian ecosystems and adjacent uplands" (USFWS 1999)
Southwestern pond turtle	Ecosystem Health Indicator	Indicator for upper watershed tributaries
Yellow warbler	Umbrella	High quality riparian habitat, shaped by natural fluvial processes
Arboreal salamander	Umbrella	High quality oak, walnut and sycamore woodland habitats, including connectivity to riparian areas
Oak titmouse	Umbrella	Woodlands that may be somewhat fragmented, but still offer significant habitat value for species less effected by loss of terrestrial connectivity
Coast horned lizard	Ecosystem Health Indicator	Indicator for certain aspects of alluvial fan and coastal sage scrubs
Lesser nighthawk	Umbrella	Certain aspects of alluvial fan sage scrub, especially area requirements
Plummer's Mariposa Lily	Ecosystem Health Indicator/Flagship	Alluvial fan sage scrub and chaparral
Cactus wren	Flagship	Alluvial fan and coastal sage scrub – stands of <i>Opuntia</i> species
Greater roadrunner	Flagship	Coastal and alluvial fan sage scrub and grassland habitat connectivity
California gnatcatcher	Umbrella	Restoration of coastal sage scrub quantity, quality and habitat connectivity
Grasshopper sparrow	Umbrella	Grassland habitats
California quail	Flagship	Upland habitat connectivity
Bobcat	Population Health Indicator/Umbrella	Viability of prey species and their ecological relationships; landscape-scale connectivity and may serve some of the functions of Mountain Lions, the likely Keystone species, which is essentially excluded from the urbanized portions of the watershed
Gray fox	Population Health Indicator	Viability of prey species and their ecological relationships, as well as indicator of habitat connectivity at possibly finer scales than Bobcat

Along with identifying focal species for ecosystem restoration efforts, Jigour et al. (2001) set forth the following restoration themes for the watershed:

- Restoration of native vegetation types such as the replacement of non-native annual grasslands with perennial native grasslands;
- Reforestation using native species to restore upper watershed function;
- Construct bioinfiltration projects such as the daylighting of creeks to improve water quality and restore aquatic habitat;
- Restore slivers of native chaparral, coastal scrub, and in woodland habitats along the slopes bordering public use areas to provide linear habitat connectivity;
- Restore habitat connectivity of riparian and associated upland plant associations; and
- Restore native fisheries through creation and enhancement of aquatic habitat and addressing fish passage barriers.

Jigour et al. (2001) also identified site-specific and watershed-scale projects as well as studies needed to undertake them. They noted that future development of site-specific restoration projects should include prioritization of habitat restoration initiatives relative to focal species.

Following on these restoration efforts, the Arroyo Seco Foundation, in cooperation with the City of Pasadena and other agency partners, constructed the Brookside Park BMP Project in 2008 in the Central Arroyo Seco. The Project consisted of aquatic, riparian, and upland habitat restoration and construction of parking lot improvements to address water quality concerns. The Project also included improvements to recreational trails and interpretive signage.

The primary goal of aquatic and riparian restoration was to create habitat conditions suitable to sustaining the native arroyo chub within natural areas of the Central Arroyo Seco. In-stream structures, including snags, weirs, and backwater pools, were installed to provide a diversity of habitats for resting and spawning, shelter from predators and refugia during high flow events. Eroding banks and trails were stabilized with natural materials including boulders and log anchors. Riparian and upland restoration included removal of non-native, invasive plants and native plantings following plant palettes from the Master Plans (City of Pasadena, 2003). Restoration consisted of approximately 0.5 acres of aquatic habitat, 1.5 acres of riparian habitat, 2.5 acres of upland habitat, and 1,000 feet of stream bank and trail stabilization.

Fish biologist Camm Swift conducted fish surveys in the Arroyo Seco in 2001 and provided an evaluation of the Brookside Park BMP Project aquatic habitat restoration plan in 2008.

According to Swift (2008), aquatic habitat restoration such as that constructed for the Brookside Park BMP Project has the potential to create significant habitat for arroyo chub, which rely on backwater pools and shelter areas. Increased flow speed and riffle creation with installation of instream weirs and boulder clusters also improve oxygenation. Snags and other structures can increase localized scour, which exposes gravel important for spawning of the other native fishes originally present in the watershed, including speckled dace, Santa Ana sucker, and rainbow trout.

Swift (2008) notes that restoration efforts must be coupled with management of non-native aquatic species such as green sunfish (*Lepomis cyanellus*), bullhead (*Ameiurus* spp.), largemouth

bass (*Micropterus salmoides*), red swamp crayfish (*Procambarus clarki*), and bullfrog (*Rana Catesbiana*).

3.3 Water Quality

The state of water quality in the Arroyo Seco is discussed in the following documents:

- *Arroyo Seco Watershed Management and Restoration Plan*, prepared by North East Trees (NET) for the California State Water Resources Control Board, dated March 1, 2006;
- *Draft Los Angeles River Reach 2 Study Area Characterization*, prepared by CDM, dated November 9, 2009; and,
- *Draft California 2010 Integrated Report (CWA Section 303(d) List / 305(b) Report)*.

Water quality in the Arroyo Seco is heavily impacted by surrounding urban areas. Trash, bacteria, metals, and various chemicals from urbanized areas are conveyed into the Arroyo Seco via municipal storm sewer systems. Additionally, the non-natural segments of the Arroyo Seco itself also contribute to the general deterioration of water quality.



Trash in Lower Arroyo Seco (arroyoseco.org)

The 1972 Clean Water Act (CWA) sets limits on point sources of pollution in each watershed. Point sources typically are facilities that introduce pollutants into rivers and waterways, such as oil refineries,

chemical plants, or wastewater treatment plants. However, these limits alone are often not enough to improve water quality to targeted levels. This is more relevant in heavily urbanized areas where the majority of pollution are not from point sources, but instead from nonpoint sources. Although the CWA does not specify limits on nonpoint sources of pollution, it requires that each state identify what water bodies within its boundaries cannot comply with water quality limits for specific contaminants strictly by regulating point sources alone. These areas are listed by each state on a list called the CWA Section 303(d) list. Each state must then develop limits on how much pollution is allowed to enter the waterway from nonpoint sources. The limit for this nonpoint source pollution combined with the output of all point sources is called a Total Maximum Daily Load (TMDL).

The Arroyo Seco has appeared on the California 303(d) list for several contaminants. They are coliform bacteria, nutrients/algae, and trash. Nutrients, which promote algae growth, come from fertilizer and other chemicals that are washed from people's lawns and from agricultural areas into the Arroyo Seco. Sources of bacteria include human and animal wastes, leaky septic tanks or sewer lines, and from the decay of organic trash deposited in the water. Trash and other debris enter the Arroyo from the municipal storm sewer systems that convey storm runoff from surrounding cities and neighborhoods into the Arroyo Seco.



Collecting water quality samples in Central Arroyo Seco (CDM, 2007)

Over the past 30 years, many different agencies and organizations have field-collected water quality data in the Arroyo Seco. The NET report was able to identify nearly 2,000 different sample results (representing 80 discrete sampling events) collected by seven different agencies in the Arroyo Seco since 1976. Overall, 200 different water quality parameters were tested for across the nearly 2,000 different samples. Table 5 is a summary of the dataset that NET assembled in the report.

Table 5: Qualitative Description of Data Sources (NET)

Agency	Date Range	Locations	Parameters	# Events	# Samples
RWQCB (2004b)	1986 – 1997	Devil's Gate, mid-Arroyo, confluence	Comprehensive ⁽¹⁾	17	1,100
LA County DPW (2003)	2002 – 2003	Mid-Arroyo (Debs Park)	Comprehensive ⁽¹⁾	6	132
City of Los Angeles (2004)	2002 – 2004	Confluence	Bacteria	36	111
SCCWRP (2004)	2000 – 2002	Confluence	Comprehensive ⁽¹⁾	3	75
City of Pasadena (2004)	1976 – 1989	Upper Hahamonga	Comprehensive ⁽¹⁾	15	169
Jet Propulsion Laboratory (2002)	1993 – 2002	JPL site storm drains	Conventional ⁽¹⁾ and metals	5	384
Friends of the Los Angeles River (Wang, 2004)	2003 – 2004	Lower Arroyo	Conventional / Field ⁽¹⁾⁽²⁾	-	-
Total				82+	1,971+

Footnotes:

- 1) Comprehensive contaminant suite consists of basic water quality indicators (pH, conductivity, etc), priority pollutants, organics, and other analyses needed to fully characterize water quality. Conventional / field suite consists of field-based measurements such as pH and conductivity, and basic laboratory measurements such as various nutrients and common metals.
- 2) The number of events and samples is unknown.

Since 1976, a total of 74 different parameters have been detected in Arroyo Seco waters. There are twelve main parameters that have exceeded relevant water quality objectives at least one time over the last 30 years and these are summarized in Table 6.

Table 6: Water Quality Sample Comparisons (NET)

Parameter	# Samples	Average Concentration	Water Quality Objective	Source	# Samples Over WQ Objective	% Samples Over WQ Objective
Enterococcus	46	21,500	104	Basin Plan	42	91
Fecal Coliform	18	46,100	400	Basin Plan	14	78
E.coli	38	9,600	235	Basin Plan	29	76
Total Coliform	57	102,400	10,000	Basin Plan	40	70
Diazinon	6	0.00059	0.00008	CA DF&G	2	33
Copper – Total	16	0.0178	0.022 (D) 0.017 (W)	LAR TMDL	4	25
Aluminum	6	1.75	1	Basin Plan	1	17
Lead	19	0.0103	0.011 (D) 0.062 (W)	LAR TMDL	2	11
Cyanide	9	0.004	0.0052	CTR	1	11
Zinc – Total	17	0.0783	0.16 (W)	LAR TMDL	1	6
Nitrite	19	0.209	1	Basin Plan	1	5
Chloride	20	88.7	150	Basin Plan	1	5

Notes:

- Units of MPN / 100mL for bacteria, all other units mg/L
- CA DF&G – California Department of Fish and Game
- LAR TMDL – Los Angeles River Total Maximum Daily Load

Based on the results, the following historical water quality observations can be made:

- Indicator bacteria counts are the most significant water quality impairment. Average concentrations of the key indicators for fresh water systems, fecal coliform and e.coli, both exceeded water quality objectives in over 75% of samples collected. Average concentrations across all samples for fecal coliform and e.coli were much higher in comparison to the relevant water quality objectives.
- Concentrations of metals occasionally and marginally exceed regulatory limits.
- Several other parameters occasionally show concentrations above regulatory limits, but are not as significant as bacterial or metals exceedences.
- Limited data suggests that the Arroyo Seco harbors a relatively impaired macroinvertebrate community. The data alone do not suggest whether this is due to habitat impairment, poor water quality, or both. Future sampling is needed to determine the source of this impairment.

For the Los Angeles Reach 2 Study Area Characterization, water quality samples from the lower Arroyo Seco were evaluated. Table 7 summarizes these results, which reinforce that bacteria and metals are significant contributors to water quality impairment.

**Table 7: LA River Reach 2 Study Area Grab Sample Comparisons
Lower Arroyo Seco @ San Fernando Road**

Constituent	Hydrologic Day Type	# Samples	# Samples Over WQ Objective	% Samples Over WQ Objective
Fecal Coliform	Wet	24	22	92
E. Coli	Dry	75	51	68
Lead Total	Dry	26	8	31
Lead, Dissolved	Dry	16	2	13
Copper, Total	Dry	38	1	3
Copper, Dissolved	Dry	34	0	0

Notes:

- Units of MPN / 100mL for bacteria, all other units mg/L
- Based on TMDL limits from Total Maximum Daily Loads for Metals Los Angeles River and Tributaries, U.S. Environmental Protection Agency Region 9 and the California Quality Control Board Los Angeles Region, June 2, 2005.

In addition to trash and coliform bacteria, Category 5 of the 2010 California 303(d) list of water quality limited segments recently includes benthic macroinvertebrate bioassessments for Arroyo Seco Reach 1, which is between the Los Angeles River and West Holly Avenue. Category 5 describes a water segment where standards are not met and a TMDL is required, but not yet completed, for at least one of the pollutants being listed for this segment. A trash TMDL has been developed for the Los Angeles Watershed; as of this writing, a bacteria TMDL is still in development.

As a future water quality concern, benthic macroinvertebrate bioassessments are being considered for the section 303(d) list. Under section 3.9 of the Listing Policy, a water body is listed when a bioassessment shows diminished numbers of species or other metrics (in comparison to a reference site) and it is associated with another pollutant. Benthic macroinvertebrates as measured by Southern California IBI (Index of Biological Integrity) in Arroyo Seco Reach 1 were very poor in October of 2003 and very poor in October of 2004 indicating impairment of benthic community structure. The State Water Board reviewed the line of evidence prepared by the Los Angeles Regional Water Quality Control Board (LARWQCB) and additional bioassessment data. The water quality chemistry and bioassessment data provide a substantial basis that benthic macroinvertebrate populations are impacted by a wide range of anthropogenic stressors.

3.3.1 Water Quality Improvements

The water quality in the Arroyo Seco could be improved with a variety of structural and non-structural Best Management Practices (BMPs) installed to treat runoff prior to discharge into the Arroyo Seco stream. As discussed, bacteria, metals, and trash are the significant pollutants of concern. BMPs such as permeable paving and vegetated treatment systems could be installed to address bacteria and metals, whereas trash capture devices (distributed or end-of-pipe) could

be increased in municipal storm sewer systems in order to reduce the amount of trash discharged into the Arroyo Seco.

3.3.1.1 Permeable Paving

Porous pavements are special types of material that allow water to pass through yet are strong enough to structurally support vehicular or pedestrian traffic. Most of the systems are supported by a stone base that has large pore spaces. This base acts both as pavement support and as a reservoir to store water, which promotes infiltration into the ground to improve water quality and reduce the heat island effect created by large impervious areas through evaporative cooling. Some of the most commonly used available permeable pavement types include:

- Pervious concrete, asphalt, or paving blocks; and
- Grass or gravel pavers.



Permeable paving installed in Rose Bowl parking lot for the Brookside Park BMP Project (CDM, 2007)

Porous pavement has been constructed successfully in the Central Arroyo Seco/Brookside Park BMP Project, where such pavers have increased the permeable area in the parking lot without removing parking spaces. A total of 20 parking spaces were converted to permeable areas in that project.

3.3.1.2 Vegetated Treatment Systems

Vegetated treatment systems are effective, cost efficient treatment approaches for pollutants in dry and wet-weather runoff. Treatment occurs through sedimentation, filtration, and adsorption to organic matter, and vegetative uptake. Additionally, vegetated treatment systems can help to reduce runoff volumes through soil soaking, infiltration, and evapotranspiration. Examples of vegetated treatment systems include swales, filter strips, and bio-retention areas (also called rain gardens).

- Vegetated swales (or bioswales) are engineered vegetation-lined channels that provide water quality benefits in addition to conveying stormwater runoff. Swales provide pollutant removal through settling and filtration in the vegetation (often grass) lining the channels and also provide the opportunity for volume reductions through infiltration and evapotranspiration.
- Vegetated filter strips are densely vegetated, uniformly graded areas that intercept sheet runoff from impervious surfaces such as parking lots, highways and rooftops. Filter strips can either accept sheet flow directly from impervious surfaces, or concentrated flow can be distributed along the width of the strip using a gravel trench or other level

spreader. Filter strips are designed to trap sediments, to partially infiltrate this runoff and to reduce the velocity of the runoff. Filter strips can also be used in combination with riparian buffers in treating sheet flows and in stabilizing drainage channel banks and stream banks.

- Bio-retention is a site design BMP that makes use of soils and plants to remove pollutants from runoff. Runoff is typically directed over a grass buffer strip to a shallow vegetated depression that contains porous soils and groundwater table greater than one to 3 feet below the swale invert. These depressions are designed to incorporate many of the pollutant removal mechanisms that operate in forested ecosystems, including absorption, filtration, plant uptake, microbial activity, decomposition, sedimentation and volatilization. Bio-retention provides volume reduction through infiltration, soil soaking and evapotranspiration.

In the Central Arroyo Seco Project, pollutants such as oil and grease entering the Arroyo Seco stream from Parking Lot I were addressed with landscape islands designed to capture and naturally treat a portion of the stormwater runoff previously conveyed to the stream through the existing storm drain system. Landscape islands were landscaped with native vegetation. In addition to potential water quality improvements, this landscaping enhances habitat and adds aesthetic value to Parking Lot I, conforms to the aesthetic requirements of the City of Pasadena Central Arroyo Seco Masterplan requirements for the central area, and blends with the adjacent Brookside Park.

3.3.1.3 Trash Capture Devices

The City of Pasadena has installed approximately 500 full-trash capture inserts in every storm drain where conditions permitted installation as part of its in-kind contribution to the Central Arroyo Stream Restoration/Brookside Park Best Management Practices Project. Full-trash capture inserts are designed to capture 100% of all debris with a diameter greater than 5 millimeters, utilizing a combination of a brush and an aluminum screen. Prior to installation of the inserts in 2007, 12.71 tons of trash were removed from City of Pasadena catch basins and 16.38 tons from County of Los Angeles catch basins within the City. The City of Pasadena is a partner in a four-cities program that developed the full capture system that has been certified by the LARWQCB as complying with the Los Angeles River Trash TMDL requirements. It is expected that installation of the devices within other cities that drain into the Arroyo Seco will prevent large quantities of trash from being conveyed to the stream via municipal storm sewer systems.



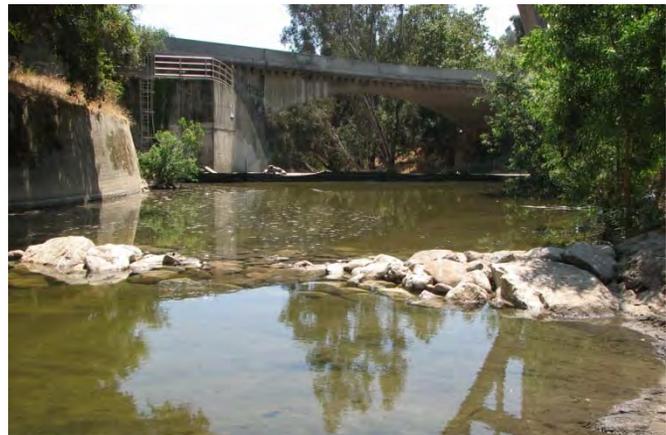
Trash capture device installed in Rose Bowl parking lot for the Brookside Park BMP Project (CDM, 2007)

3.3.1.4 Water Quality BMP Opportunity Areas

The lower reaches of the Arroyo Seco, especially near where it meets the LA River, include some of the densest, industrialized areas of the watershed. There is little natural habitat and the water quality in the Arroyo Seco is impacted heavily by dense urban land uses. Some of these areas include the intersection of Interstate 5 and 110 and Sycamore Grove Park, where large storm drains conveying runoff from highly impervious industrial/commercial areas contaminate the Arroyo Seco. Several opportunities in these areas include daylighting terminal segments of storm drains in order to naturalize stream beds or install treatment BMPs such as infiltration galleries and subsurface treatment flow wetlands prior to discharge into the Arroyo Seco.

3.3.2 Aquatic Habitat Improvements

To enhance aquatic habitat within the Arroyo Seco stream, several improvements could be considered, including wetlands, riparian woodlands, backwater pools, weirs, snags, other in-stream shelter areas, and bank stabilization structures. For example, the Central Arroyo Seco Project aimed to restore the Arroyo Seco to create habitat conditions suitable to sustaining the native arroyo chub (*Gila orcutti*), a California Species of Concern. These improvements included:



Downstream weir constructed in Central Arroyo Seco for Brookside Park BMP Project (CDM, 2007)

- A series of snags and wing deflectors with an upstream and downstream weir were used to define the extent of improvements and direct flow into and out of the improvement reach. These improvements provided refuge, resting areas, and spawning areas.
- Two backwater pools were constructed to provide resting areas during high flow events. Weirs were constructed to direct flow to the appropriate part of the channel as needed during low flow conditions to maintain water levels in the backwater pools. Snags were also installed to provide refuge, resting areas and spawning areas.

3.3.3 Native Riparian Vegetation Improvements

To restore native riparian vegetation, invasive plant species were removed followed by revegetation with native plant species. Revegetation efforts included removal of vegetation ranging from shrubs to mature eucalyptus trees. Restoration of riparian habitat included planting (and associated irrigation) of canopy, shrub, and herbaceous understory vegetation. In areas disturbed by construction activities in the vicinity of the stream willow stakes have been planted. For example, the Central Arroyo Seco Project saw a total of 1.5 acres of riparian habitat was restored, where revegetation occurred with native plant palettes adapted from the City of Pasadena Central Arroyo Seco Master Plan.

Native riparian habitat improvements should aim at increasing the native plant diversity as well as restore the vertical complexity of canopy and understory vegetation. Once mature, the vegetation planted during restoration efforts will provide both foraging and nesting habitats for riparian bird species and other wildlife. Ongoing monitoring should be instated to determine the percentage of native plants surviving and the reoccurrence of non-native vegetation. Removal of non-native vegetation will require ongoing efforts to prevent recolonization.



Native plant restoration for the Brookside Park BMP Project (CDM, 2007)

3.3.4 Stream Bank and Trail Stabilization

Stream banks could be stabilized by the construction of boulder walls, energy dissipaters, turf reinforcement mats, gabions, and other structures. Similarly, fencing, water bars, and other structures could be installed to stabilize trails. For example, the Central Arroyo Seco Project constructed sediment and erosion control improvements in several specific locations to stabilize stream banks and trails and to reduce uncontrolled stormwater runoff:

- Construction of bank stabilization structures using logs with deadman anchors along the east and west channel banks;
- Placement of boulders to construct a trail crossing Arroyo Seco;
- Improvement of stability and erosion protection below the existing trail through placement of rock slope protection to armor the slope beneath an existing storm drain outfall in this location; and,
- Installation of trail grade structures to provide preferential pathways for runoff and stabilize trail.

3.3.5 Public Outreach Efforts

Activities that could be implemented to provide for on-going enhancement of visitor experience and public interest in the Arroyo Seco restoration areas include:

- Disseminate restoration information to key stakeholders and the community;
- Provide educational signage that describes riparian habitat present in the Arroyo Seco, summarize the restoration efforts, and provide an area map indicating the locations of improvements;
- Conduct tours and presentations of the restoration areas to student groups;
- Provide public tours of the restoration areas; and,
- Develop media projects (videos, websites, magazine/news articles, etc.) that highlight the environmental concerns and restoration efforts within the Arroyo Seco.

3.4 Water Supply

3.4.1 Existing Surface Water Supply

The existing use of surface water from the Arroyo Seco by Pasadena Water and Power (PWP) is discussed in the following documents:

- *Water Master Plan* prepared by Montgomery Watson Harza in 2003
- *Pasadena Water Supply Report* prepared by RMC in October 2008
- *Devil's Gate, Richardson and Wilson Tunnel Water Analysis and Conceptual Design* prepared by RMC on April 2, 2008
- *Baseline Groundwater Assessment of the Raymond Basin* prepared by Geoscience for the Raymond Basin Management Board, dated February 2, 2004

3.4.1.1 Arroyo Seco Water

The principal surface water sources in the PWP service area include the Arroyo Seco, Eaton Wash, and the Santa Anita Wash. Historically, the majority (approximately 60%) of PWP's demand has been supplied with imported water; the remaining demand is met by groundwater and surface water supplies.

According to the Raymond Basin Judgment (1955), PWP is entitled to divert an instantaneous capacity of up to 25 cfs (18,100 afy) of surface water in the Arroyo Seco (including Millard Canyon). Historically, surface water diversions from the Arroyo Seco have been used in two ways: (1) treated for direct supply into PWP's distribution system, and (2) diverted to spreading grounds, formerly owned by the Los Angeles County Department of Public Works (LACDPW) and currently owned by Pasadena, in exchange for groundwater pumping credits.



Central Arroyo Seco natural channel (CDM, 2007)

Until June 1993, a portion of the PWP diverted surface water from the Arroyo Seco was treated at the Behner Water Treatment Plant (WTP), while the remainder of the diverted water was sent to spreading grounds. Since the Behner WTP was shut down in 1993, all PWP diverted water in the Arroyo Seco has been sent to the spreading grounds for groundwater recharge, which has resulted in PWP groundwater pumping credits. Between 1994 and 2004, PWP has received an average of 4,128 afy of spreading credits from groundwater recharge.

The Arroyo Seco spreading basins consist of a total of 14 basins, one of which is not in operation at the present time. The total area of the basins is approximately 24 acres with a wetted area of approximately 13 acres. The total basin storage capacity is approximately 30 acre-ft. PWP diverts water from the Arroyo Seco stream and routes it to the said spreading grounds, located upstream of Devil's Gate Dam. Currently, PWP diverts the maximum diversion right of 25 cfs;

however, the spreading basins can accommodate no more than 18 cfs. Excess water is diverted to one of the non-operational basins, which acts as an overflow, and is returned into the Arroyo Seco channel. Currently, it is estimated that PWP is receiving 60% of its spreading credit despite the right to receive up to 80% of the diverted water that is spread and infiltrated into Raymond Basin.

3.4.1.2 Tunnel Water

Before 1934, water from the Devil's Gate Tunnels was a major source of domestic water supply for Pasadena. After the fires and the flood in 1930's, the water quality became poor and its use was discontinued. By 1969, Devil's Gate Tunnel water quality had improved enough to meet irrigation quality standards. PWP began to utilize the water for irrigation at Brookside Golf Club since it was conveniently located near the tunnel water supply. Devil's Gate Tunnel water was also used to fill two of four then newly constructed ponds on the golf course. Although only nine acre-feet of water was used around 1969, a project was initiated to have Devil's Gate Tunnel water pumped into the golf course irrigation system.

In 1971, the Brookside Booster Pump Station was constructed. The Devil's Gate Tunnel water was used for Brookside Golf Club irrigation until 1999 when PWP shut down the pump station because high delivery pressure was damaging on-site irrigation piping. Currently, Brookside Booster Pump Station remains out of service, but the golf course irrigation system lateral piping and 25% of the main lines have been replaced with stronger materials.

Currently, PWP has water rights to surface water from the Devil's Gate Tunnel, which is set at 238 afy. However, Devil's Gate Tunnel water flows are inconsistent and fluctuate widely based on precipitation and groundwater elevation. Significant repairs to the tunnels are needed. PWP is considering improvements to the tunnel water pumping and storage system as an option to provide irrigation water to the Brookside Golf Club.

4. Approach to Evaluation and Ranking of Current and Future Restoration Projects

This section describes an approach to evaluation and ranking of current and future restoration projects within the Arroyo Seco watershed. Multiple funding sources, including federal, state, and local funders, use specific criteria for ranking and awarding funds to project proponents. For this reason, the ASWA includes an approach to ranking that includes criteria that are typically used in grant solicitations. Restoration project criteria include:

- Consistency with ASWA restoration goals, extent of footprint (e.g., stream miles and acres restored),
- Readiness to proceed based on status of CEQA/permitting, and
- Percent of match secured

These ranking criteria can be revised to reflect specific funding pursuits and opportunities. Newly proposed projects can be added to the list of projects in accordance with the Arroyo Seco Greenway Agreement.

4.1 Restoration Project Criteria

In order to identify and prioritize watershed restoration projects, evaluation criteria were developed to objectively rank the projects. The criteria attempt to quantify how well each project addresses the four Arroyo Seco watershed restoration goals.

Four key criteria were identified for the ranking and analysis of the restoration projects. Scores for each criterion are normalized. The criteria themselves, ranked by importance, carry different weightings. The normalized scores multiplied by the criteria weighting yield the criteria scores, which in term are combined for the total score for each project. For example, the following table summarizes the criteria, their weightings, and the method of calculating a sample project's total score:

Table 8: Arroyo Seco Restoration "Sample Project" Qualitative Ranking Approach

Criteria	Watershed Restoration Goals Addressed	Project Footprint Miles Acres		CEQA/ Permitting Completed?	% of Match Secured	Total Score
Sample Criteria Ranking	1	2	2	3	4	
Sample Criteria Weighting	50%	25%	25%	13%	13%	
Sample Project Scores	2, 3, 4	0.33 mi	15 ac	Y	75%	
Sample Normalization Criteria	3 of 4 goals	Tier 2	Tier 3	1	75%	
Sample Normalization Value	0.75	0.67		1	75%	
Sample Criteria Score	0.38	0.17	0.00	0.13	0.09	0.76

The first criterion considers which of the watershed restoration goals were addressed by each project. The projects that fulfill more of the goals will rank higher. The watershed restoration goals include:

- Goal 1: Restore the natural hydrological functioning of the watershed
- Goal 2: Better manage, optimize, and conserve water resources while improving water quality
- Goal 3: Restore, protect, and augment habitat quality, quantity, and connectivity
- Goal 4: Improve recreational opportunities and enhance open space

The second criterion looks at the footprint of the projects. Footprint size can either be measured as the stream distance or land area affected by the project. After all projects have been identified, their footprint sizes will be organized into tiers based on the range of project footprint sizes. The projects will be ranked based on these tiers.

The third criterion ranks project based on the level of completion of the CEQA or permitting process. Projects that have completed CEQA or their permitting process receive a score of 1. Projects whose permitting is in progress receive a score of 0.5. If a project has not begun its permitting process or has made no progress, it will be given a score of 0.

The final criterion looks at funding for the projects. The ranking will be determined by the percentages of the total funds needed to complete the project that have been secured.

4.2 Evaluation of Restoration Projects

Details about each of the restoration projects were collected from documents from various agencies. The following is a list of the relevant documents and stakeholder input opportunities:

- Arroyo Seco Watershed Management and Restoration Plan
- Cornfields Arroyo Seco Specific Plan Draft
- Los Angeles River Improvement Overlay Draft
- Greater Los Angeles County Integrated Regional Water Management Plan
- Central Arroyo Seco Master Plan
- Hahamonga Watershed Park Master Plan
- CASA and CASO Stakeholder Meetings
- Focused stakeholder meetings

4.3 Restoration Project Ranking

Refer to Appendix B, Arroyo Seco Watershed Projects, for a list of projects. These projects are sorted into Upper and Lower watershed categories according to Figure 3.

Restoration projects listed in the matrix are being integrated into larger top tier restoration projects described in Section 5, where possible. These groupings of projects will be further reviewed by watershed stakeholders to arrive at a revised list of projects. Data gaps in the matrix will be filled by stakeholders. The revised list of projects will be ranked using a ranking method similar to the one described in Section 4.1 and/or in conjunction with appropriate funding criteria (e.g., Proposition 84, Proposition 1E, and other future grant opportunities or funding initiatives).

5. Recommendations

As stated in Section 2 of the ASWA, the Arroyo Seco Greenway is a series of integrated transportation, water resource, and habitat enhancement projects along the 20 mile Arroyo Seco river corridor that will improve public safety, transportation, economic vitality, recreation, water quality, and ecosystem health in neighborhoods throughout Los Angeles, La Canada Flintridge, South Pasadena, Pasadena, and Altadena. Extending from Los Angeles to the San Gabriel Mountains, this project is a result of years of grassroots planning efforts focusing on the spine of the Arroyo Seco Watershed – the Arroyo Seco and the Arroyo Seco Parkway – and in an effort to connect watershed anchors like the Lummi Home and Gardens, the Audubon Center at Debs Park, Huntington Botanical Gardens, the Rose Bowl area, and Hahamongna Watershed Park.

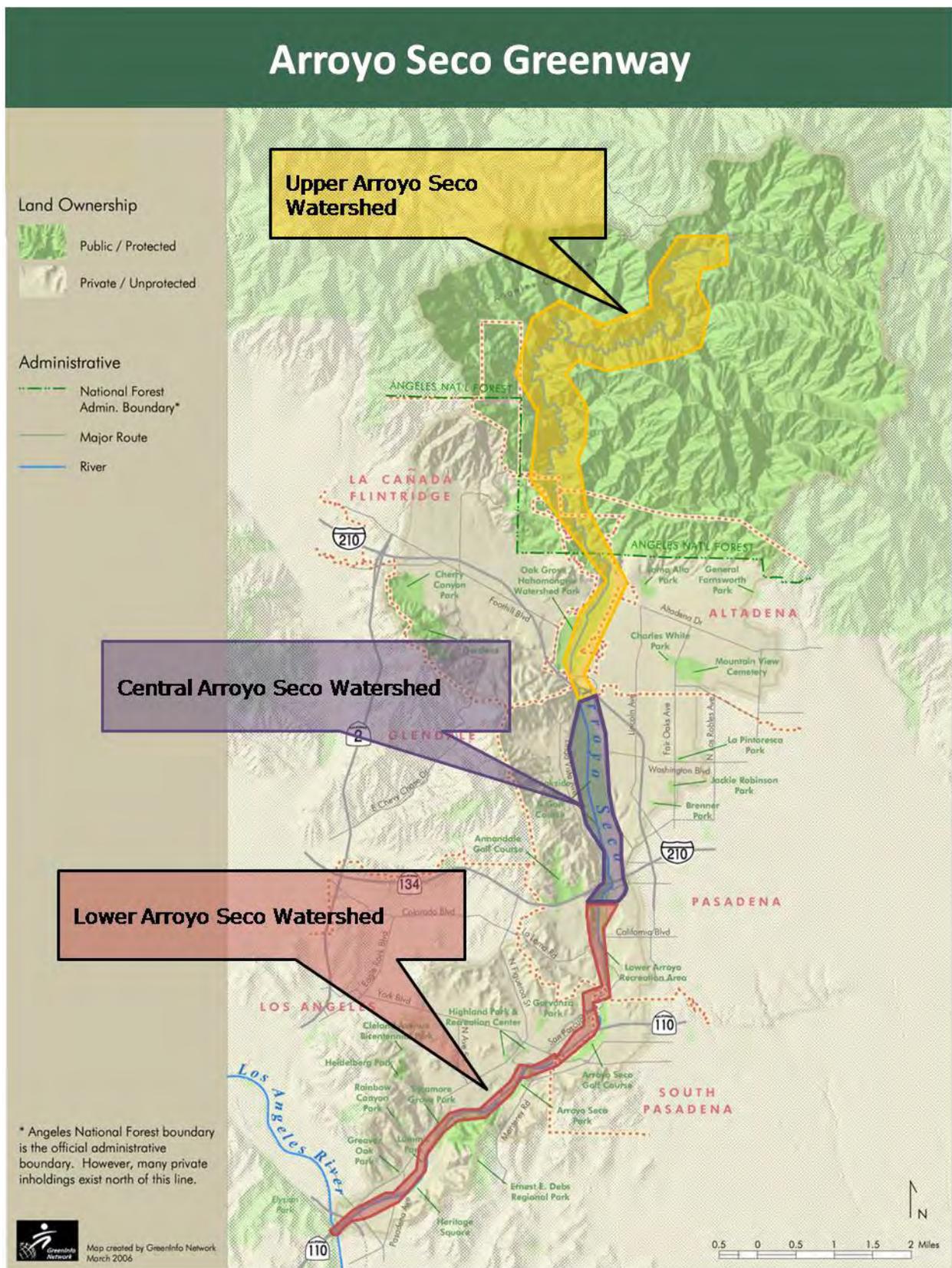


Figure 3: Delineation of Upper, Central and Lower Arroyo Seco Watershed

In addition to achieving the four ASWA goals, components are designed to (1) create greenways in and around culturally diverse and historic neighborhoods, (2) upgrade Works Progress Administration infrastructure, (3) develop habitat corridors, and (4) improve water quality in a highly urban as well as natural areas all while restoring the neglected ecosystem of the river environment.

This Section provides recommendations for watershed-wide restoration in two categories: 1) Large scale, top tier projects focused on various segments of the watershed, and 2) distributed project themes, which should be applied watershed-wide to large scale projects and smaller localized projects.

5.1 Top Tier Restoration Projects

Based on adopted plans, stakeholder input, and evaluation of watershed needs and priorities in relation to the four ASWA restoration goals, top tier restoration projects were identified. These projects are described in a sequence that starts at the top of the watershed (e.g., Hahamongna or Upper Arroyo Seco watershed), extending down through the central Arroyo Seco, and finally to the confluence of Arroyo Seco and Los Angeles River. The phasing of these projects follows this top to bottom approach given opportunities to implement "quick-hit" projects in the upper watershed where readiness to proceed is high and restoration needs are also high due to Station Fire impacts to native vegetation and wildlife and water resource management needs in the Raymond Basin. Watershed improvements, following a top down approach yield better long term return on investment as upstream improvements can benefit downstream conditions. The timing for these projects is dependent on funding availability. However, given the complexity of each project, progress should be encouraged on all fronts so that when funding does become available, project proponents can quickly mobilize and implement these projects.

Each sub-section provides a project description for each of the five top tier projects and describes the purpose and need, objectives, benefits, key issues, and conceptual costs. Figure 4 shows the approximate location of each of the five projects and the species that would benefit most from each project.

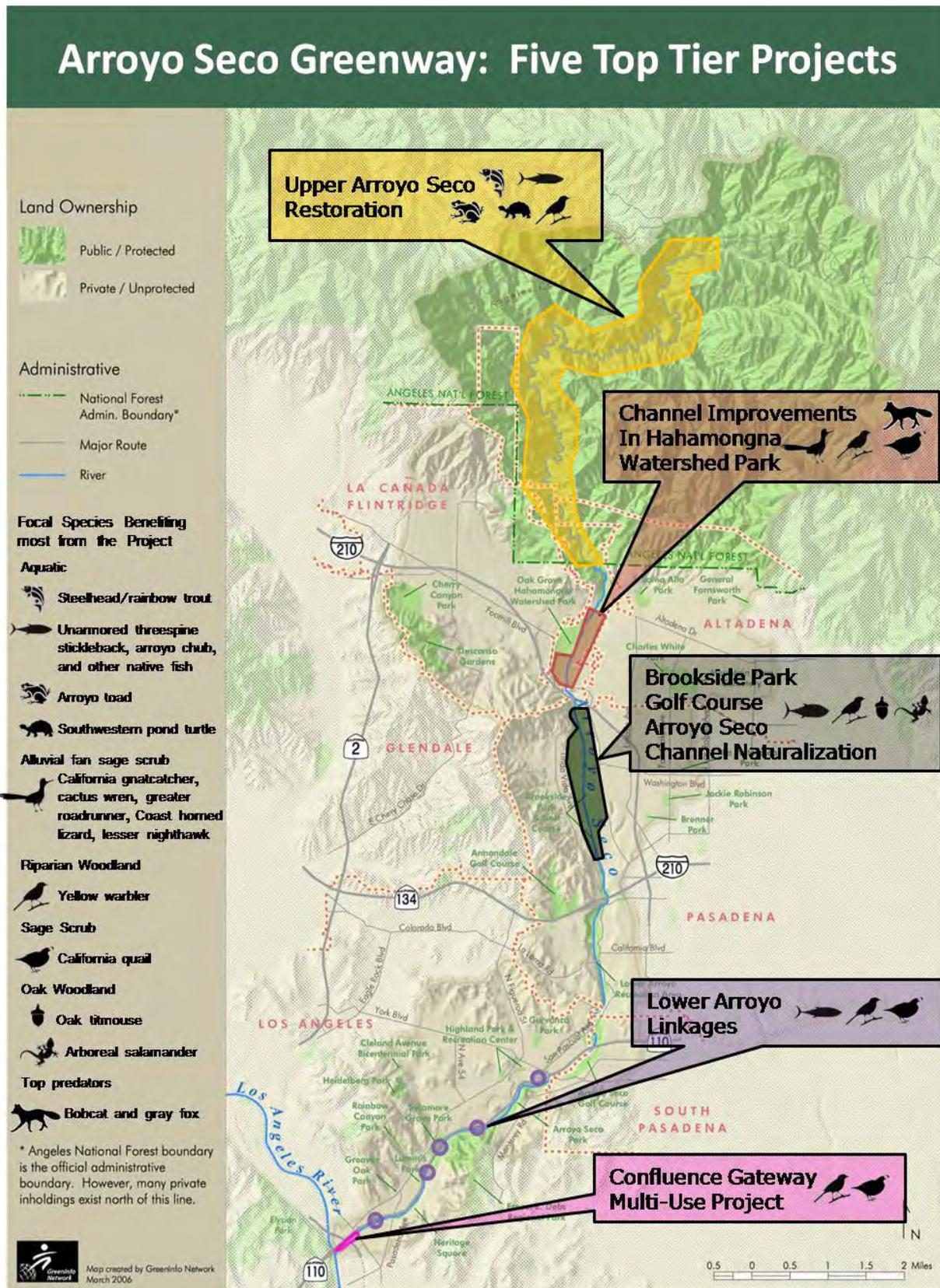


Figure 4: Arroyo Seco Greenway: Five Top Tier Projects (Source: NET, 2006, Figure 2-4 and CDM)

5.1.1 Project 1: Upper Arroyo Seco Restoration

Purpose and Need

The Upper Arroyo Seco Channel Restoration project is an integrated recreation, water resource, and habitat enhancement project that extends from the JPL bridge upstream to the headwaters in the San Gabriel Mountains that will improve water supply, recreation, water quality, and ecosystem health. The Upper Arroyo Seco Channel Restoration project is a culmination of years of grassroots planning efforts and analysis focusing on southern California ecosystems. Above the JPL bridge, the primary habitat disruptors are impediments to fish passage, forage, rearing and spawning including anthropogenic structures such as road crossings and water supply diversion and flood control dams. These impediments have adversely impacted aquatic and riparian habitats that are becoming increasingly endangered. In addition to creating fish passage barriers, anthropogenic features also can result in localized erosion that has an impact on stream channel stability and sediment deposition that adversely impacts streambed and riparian habitat. Non-anthropogenic causes of erosion, such as wildfires, also have an impact on channel stability, habitats and downstream flooding and sedimentation. An awareness needs to be developed of wildfire impacts on Arroyo Seco morphology and habitat. Although, such impacts from natural causes may be best left to evolve naturally.

Objectives

Project components are designed to:

- Improve flood water, sediment and debris conveyance and storage through reestablishment of a natural channel/floodplain system
- Improve water quality due to floodplain and groundwater/surface water interactions that remove sediment and filter flows
- Restore endangered aquatic and riparian ecosystem communities
- Reestablish fish passage through the elimination of migration barriers including the Brown Mountain Dam and Pasadena Water and Power (PWP) diversion structures, and an unspecified number of road crossings
- Provide active and passive recreational areas that are integrated into native ecosystem habitats
- Provide an awareness of the impacts of natural causes of hill slope erosion such as wildfires to develop a plan for bringing such impacts to a more natural state of dynamic equilibrium.

Project Description

Over the years a number of channel projects designed to control floods and divert water for municipal supply have been implemented above the JPL bridge. In addition, several road crossings occur over the Arroyo Seco channel in the San Gabriel Mountain headwaters that also may impede passage of native fish species. Hill slope erosion caused by infrastructure and wildfire has a destabilizing impact on the Arroyo Seco stream channel and riparian corridor. The intent of this project is to identify the extent of these impacts and develop mitigation plans that will result in unimpeded passage of aquatic species through the headwaters system in a dynamically stable channel morphology. Components of this project include:

- Field investigation and analysis to identify fish passage barriers and areas of unstable channel morphology resulting from erosion or deposition.
- Develop plans for elimination of barriers either through removal or structural modification (i.e., retrofit with fishway) and management of erosion and sedimentation zones.
- Remove Brown Mountain Dam and reestablish a dynamic channel morphology through the site that provides high quality aquatic habitat. Figure 5 provides views of the dam shortly after construction including upstream and downstream impacts.
- Retrofit PWP diversion structures to allow fish passage
- Prioritize other identified barriers and provide a plan for elimination or modification.
- Develop a plan for mitigation of highly eroded or sedimentation zones that can affect channel stability. Figure 6 provides an illustration of an eroding hillside resulting from the Station Fire that occurred in the Arroyo Seco headwaters in November, 2009.



Debris and sediment accumulation above Brown Mountain Dam shortly after completion, March 1943



Scour downstream of Brown Mountain Dam shortly after construction June, 1943

Figure 5: Short Term Impacts of Brown Mountain Dam



Figure 6: USGS Erosion Monitoring Site from Station Fire

Benefits

The three alternatives presented for this project provide different benefits in terms of achieving restoration goals, which are described below.

The Upper Arroyo Seco Restoration project achieves the Watershed Restoration Goals by:

Restoration Goal 1: Restore the natural hydrologic functioning of the watershed

Removal of fish passage barriers and restoration of unstable reaches of the Arroyo Seco channel will restore natural flow conditions in the headwaters area and provide a basis for dynamic stability that will benefit habitat.

Restoration Goal 2: Better manage, optimize, and conserve water resources while improving water quality

Modification of water diversion structures will include improving the ability of PWP to efficiently divert adjudicated flows. Eliminating destabilized reaches of the stream channel will reduce erosion and sedimentation potential and improve water quality.

Restoration Goal 3: Restore, protect, and augment habitat quality, quantity, and connectivity

This project will restore aquatic migration corridors within the upper watershed to their full extent.

Restoration Goal 4: Improve recreational opportunities and enhance open space

Improved aquatic habitat and stream channel stability will enhance recreational opportunities.

Key Issues

The Upper Arroyo Seco Restoration project will address the following issues:

Safety

- Removal of the Brown Mountain Dam will reduce the risk of catastrophic flooding due to structural failure.
- Improvement of the PWP diversions will reduce risk to City of Pasadena water supply.
- Management of wildfire risks will reduce loss of property and human health hazards.

Focal Species Benefiting most from the Project

- Steelhead/rainbow trout would move freely along Arroyo Seco channel and upper tributaries to reach optimal spawning and rearing habitats, allowing for increased genetic diversity compared to isolated populations.
- Unarmored threespine stickleback, arroyo chub, and other native fish would benefit from improved water quality and dissolved oxygen content.
- Arroyo toad habitat would be created through restoration of natural hydrology which preserves sandy streamside habitat with limited siltation.
- Southwestern pond turtle would benefit from diversity of habitats, including pools and exposed banks with abundant aquatic and riparian vegetation.
- Yellow warbler and other riparian specialists would benefit from restored fluvial processes that create riparian habitat in a state of secondary succession, where vegetation transitions from early to late seral stages.

Linkages, Circulation, and Open Space

- Fish migration corridors will be reestablished
- Open space will increase.

Water Quality Impacts

- Removal of stream channel impediments, naturalization of the affected channel and mitigation of erosion and sedimentation zones will have a direct positive impact on water quality

Aesthetics

- Native ecosystems will be reestablished, enhancing a natural aesthetic.

Costs

Item	Estimated Order of Magnitude Cost
Removal of Brown Mountain Dam	\$5,000,000
Modification of PWP diversion structures	\$2,000,000
Fish passage barrier reconnaissance and analysis	\$250,000
Design of fish barrier mitigation features	\$250,000
Implementation of fish barrier mitigation features	\$2,000,000
Mitigation of erosion and sedimentation zones	\$2,000,000
Total	\$11,500,000

5.1.2 Project 2: Arroyo Seco Channel Improvements in Hahamongna Watershed Park

Purpose and Need

The Arroyo Seco channel flows through the Hahamongna Watershed Park (HWP) between the Jet Propulsion Laboratory (JPL) bridge and Devil's Gate Dam. The HWP provides multiple benefits that include water supply augmentation; flood water, sediment and debris capture and storage; passive and active recreation and native ecosystem habitats. Unfortunately, the park has experienced degradation of habitats and infrastructure due to repeated impacts from sediment- and debris-laden floodwaters. The intent of this project is to reestablish a stable channel planform, open water feature, sediment and debris capture zones and aquifer recharge facilities within the riparian corridor of the HWP, in accordance with the HWP master plan.

Objectives

Project components are designed to:

- Improve flood water, sediment and debris storage through reestablishment of a natural alluvial channel/floodplain system
- Improve water quality due to floodplain and groundwater/surface water interactions that remove sediment and filter flows
- Restore endangered riverine and upland ecosystem communities including,
 - Riversidian Alluvial Fan Sage Scrub

- Southern Sycamore Riparian Woodland
- Streambed Riparian
- Mule Fat Scrub
- Southern Willow Scrub
- Coast Live Oak Woodland
- Grassland
- Reestablish wildlife migration corridors through restoration of HWP native ecosystems
- Provide active and passive recreational areas that are integrated into native ecosystem habitats

Project Description

The City of Pasadena developed a master plan for the Hahamongna Watershed Park in 2003. Major themes of the plan are:

- Water and natural resources education and utilization
- The preservation of native plants and habitat
- Native American culture
- Passive and active recreation

The plan recognizes six guiding principles for Arroyo Seco:

1. To encourage and promote the stewardship and enjoyment of the Arroyo Seco in Pasadena.
2. To balance and integrate the interrelated issues of water resources, recreation, natural resource preservation and restoration, and flood management in the Arroyo Seco.
3. To provide a safe, secure and accessible Arroyo Seco for public enjoyment.
4. To recognize the importance to Pasadena of the history, cultural resources and unique character of the Arroyo Seco, and to conserve and enhance these assets.
5. To preserve and acquire open space in or adjacent to the Arroyo Seco.
6. To recognize that the Arroyo Seco in Pasadena is comprised of distinct geographical areas that are interconnected by a number of resources and features including, but not limited to, water, habitat, geology, recreation, and culture; and that it is part of a larger watershed.

The master plan provides recommendations for enhancing riverine, riparian and upland habitats, managing flood waters and sediment and debris deposition behind the Devil's Gate Dam, conserve and augment City of Pasadena water supply through recharge of the Raymond Basin Aquifer, provide passive and active recreational opportunities, and enrich and promote unique historical and cultural opportunities.

The master plan recognizes that, "issues pertaining to flood management, water conservation, sediment deposition and removal, as well as habitat restoration, are inextricably related." Restoration related recommendations of the adopted master plan includes:

- The preservation and enhancement of native plants and habitat
- Development of a seasonal pool behind Devil's Gate Dam that will support high quality native habitat, increase the capacity behind the dam, and to allow for inflowing sediment accumulation. This feature will consist of a "flood management pool" that can better manage inflowing sediment and floating debris and a "water conservation pool" to allow the seasonal retention of floodwater to pump back to the upstream spreading basins.
- Widening the riparian stream channel directly upstream of the flood control/water conservation pool to reestablish the braided stream course and improve and expand the streambed riparian habitat.
- Realigned stream corridor, restore and establish habitat from just south of the Altadena Storm Drain outfall north to the JPL Bridge.
- Restore riversidial alluvial fan sage scrub remnants located south of the Altadena Storm Drain and the narrow mouth of the Arroyo Seco drainage as it opens into the basin.
- Establish sage scrub habitat at spreading basin.
- Establish riparian habitat at the perimeter of the seasonal flood management/water conservation pool.

Benefits

The riparian corridor improvements proposed in the HWP master plan provide a variety of benefits in terms of achieving restoration goals as described below:

Restoration Goal 1: Restore the natural hydrologic functioning of the watershed

The master plan proposes a number of riparian corridor improvements that will benefit the natural hydrologic function of the watershed including aquifer recharge, establishment of a seasonal open water pool, renaturalizing the Arroyo Seco planform and establishment of sediment and debris capture zones that are intended to function in a manner similar to an alluvial fan.

Restoration Goal 2: Better manage, optimize, and conserve water resources while improving water quality

Reestablishing a functional natural channel and floodplain containing native ecosystems will enhance water quality from vegetative filtration and groundwater/surface water interactions.

Restoration Goal 3: Restore, protect, and augment habitat quality, quantity, and connectivity

A primary intent of master plan improvements is to reestablish native ecosystem communities that have been lost and enhance communities that continue to exist in the riparian corridor of the park. The master plan proposes integrating habitats into flood management, recreational and water supply facilities.

Restoration Goal 4: Improve recreational opportunities and enhance open space

The master plan calls for the development of both passive (e.g., wildlife viewing) and active (e.g., disc golf) that will coincide with parts of the riparian corridor. However, the intent will be to limit active recreation in areas of high habitat quality.

Key Issues

The HWP master plan addresses the following issues:

Safety

- Overall downstream community safety will be increased through enhanced flood storage capability behind Devil's Gate Dam.
- Recontouring of the riparian corridor is intended to not only enhance park aesthetics, but also provide safer slopes for both park users as well as operations and maintenance crews.
- Appropriate signage and attention to safety regulations during periods of sediment and debris removal will be necessary to maintain safe multi-modal access for all park visitors.

Focal Species Benefiting most from the Project

- Coast horned lizard would benefit from restored alluvial fan sage scrub habitat with open, sandy soils.
- Lesser nighthawk would utilize larger patches of open alluvial fan sage scrub.
- California gnatcatcher, cactus wren, and greater roadrunner would benefit from restoration and enhancement of sage scrub habitat.
- Grasshopper sparrow habitat would be enhanced in large grassland and open scrub vegetation within spreading basins.
- Yellow warbler and other migratory birds would benefit from native plantings and enhanced riparian habitat.
- California quail habitat would increase through improved terrestrial connectivity to patches of sage scrub with dense vegetation.
- Top predators including bobcat and gray fox would benefit from increased prey availability and habitat connectivity.
- Plummer's mariposa lily habitat would be restored in spreading basins with open grassland/sage scrub vegetation communities.

Linkages, Circulation, and Open Space

- Wildlife migration corridors will be reestablished
- Pedestrian trails in the riparian corridor will be realigned to provide enhanced recreational benefits, increased safety and avoidance of high quality habitat areas.

Water Quality Impacts

- Renaturalization of the channel and reestablishment of a floodplain will have a direct positive impact on water quality.

Aesthetics

- Native ecosystems will be reestablished, enhancing a natural aesthetic.
- The Arroyo Seco channel will be re-formed to respond to flood and debris flows in a natural manner that also enhances the natural aesthetic.

Costs

Alternative 1 reestablishment of a natural channel and floodplain	
Item	Conceptual Cost
Spreading ground improvements.	\$3,000,000
Native ecosystem enhancements	\$1,000,000
Flood storage basin improvements	\$3,000,000
Riparian stream corridor improvements	\$2,000,000
Seasonal open water pool improvements	\$1,000,000
Total	\$10,000,000

5.1.3 Project 3: Brookside Park Golf Course Arroyo Seco Channel Naturalization

Purpose and Need

The Brookside Park Golf Course Arroyo Seco Channel Naturalization project is an integrated recreation, water resource, and habitat enhancement project within Brookside Park extending from the Devil's Gate Dam downstream to Colorado Boulevard that will improve public safety, recreation, flood control, sedimentation, water quality, and ecosystem health not only in the park, but also in downstream reaches extending to the Los Angeles River and beyond. This project culminates years of grassroots planning efforts and analysis focusing on southern California ecosystems that are becoming increasingly endangered and dynamic geomorphic processes that cannot be ignored.

Objectives

Project components are designed to:

- Improve flood water, sediment and debris storage through reestablishment of a natural channel/floodplain system
- Improve water quality due to floodplain and groundwater/surface water interactions that remove sediment and filter flows
- Restoring of endangered riverine and upland ecosystem communities including,
 - Riversidian Alluvial Fan Sage Scrub
 - Southern Sycamore Riparian Woodland
 - Streambed Riparian
 - Mule Fat Scrub
 - Southern Willow Scrub
 - Coast Live Oak Woodland
- Reestablish wildlife migration corridors,
- Provide active and passive recreational areas that are integrated into native ecosystem habitats, and
- Upgrade Works Progress Administration infrastructure.

Project Description

The Arroyo Seco channel through Brookside Park Golf Course consists of a trapezoidal, concrete-lined channel sized to convey flows up to 15,400 cfs. This configuration results in a highly efficient flow that conveys flood waters heavily-laden with sediment and debris to downstream reaches with no storage or attenuation. While this channel has protected the golf course, the Rose Bowl and associated parking lots from inundation since it was built in 1948, it transfers large flows downstream where larger quantities of water, sediment and debris are deposited in neighborhoods and natural areas, resulting in greater amounts of damage to infrastructure and ecosystems, as well as greater maintenance requirements to keep the system operational. If the concrete channel didn't exist, the Brookside Golf Course, Rose Bowl and a good portion of the remainder of Brookside Park would, in all likelihood, take on the characteristics of an alluvial fan as floodwaters spread out across the arroyo floor and deposit sediment, a natural feature of areas like Brookside Park. Ideally, restoration of Arroyo Seco would include removal of the concrete-lined, trapezoidal channel and replacement with a natural channel and floodplain that would extend from the terrace along West Drive to the easterly terrace that begins at Rosemount Drive. The channel would probably laterally migrate through this floodplain, exhibiting a braided planform characteristic of depositional reaches. Obviously, this degree of restoration would conflict with the recreational land uses of Brookside Park. Figure 7 is a 1921 aerial photo of the Arroyo Seco channel through the Brookside Park area showing a braided planform.

An approach to restoration which has been used successfully downstream in the Lower Arroyo Park involves low to normal diversions of flow from the flood channel that is then conveyed through a natural channel that includes habitat features conducive to the propagation of native species. Such an approach is not necessarily a restoration of the pre-development channel, but provides aquatic and riparian habitats while maintaining the flood conveyance capability of the existing channel.

Two alternatives are available for a normal flow channel:

1. Maintain the existing alignment of the flood channel and aligning the normal flow channel around golf course greens, fairways and tee boxes.
2. Relocate the flood channel and locate the normal flow channel in the existing flood channel alignment.

Alternative 2 would be more expensive to implement than alternative 1. The benefit provided by alternative two is the aesthetic improvement of the golf course with the inclusion of a natural water feature rather than the imposing flood channel.

A possible alternative 1 normal flow channel alignment is contained in Figure 8. This channel is directed through areas of the golf course that avoids active playing areas the channel may require minor relocation of sand traps and trails, particularly in the northernmost extent of the course. This alternative is highly constrained by existing golf course features, dictating the size of the channel and the adjacent riparian corridor.

Alternative 2 alignments for the flood channel and normal flow channel are included in Figure 9. The flood channel has been relocated along the western side of the golf course, adjacent to

West Drive while the normal flow channel meanders through the existing alignment. This alternative does affect active playing areas of the golf course and would require extensive revisions to the course layout.

Renaturalization of the Arroyo Seco channel and floodplain include:

- Removal of the concrete-lined trapezoidal flood channel;
- Design and construction of a natural Arroyo Seco channel with floodplain;
- Redesign and construction of the Brookside Park Golf Course and Rose Bowl parking lots that accommodate the natural channel and floodplain and utilize native ecosystem communities;
- New bridges at West Washington Boulevard and Seco Street; and
- Establishment of native ecosystem communities on the floodplain terraces/hillslopes along West Drive and Rosemount Avenue in accordance with the NE Trees Arroyo Seco Master Plan.

Incorporation of a normal flow channel into the Brookside Golf course would include:

- Design and construction of a diversion structure at the upstream end of the concrete-lined flood channel;
- Design and construction of a natural channel and floodplain through the golf course utilizing an alignment that would avoid tee boxes, fairways and greens, including trail crossings and restoration of disturbed areas; and
- Design and construction of a normal flow channel outfall to the flood channel.

Realignment of the Arroyo Seco flood channel and development of a normal flow channel in the existing alignment would include:

- Demolition of the existing concrete-lined trapezoidal channel;
- Design and construction of a new flood channel parallel to West Drive and adjacent to the golf course;
- Design and construction of a normal flow channel in the location of the existing flood channel alignment;
- Design and construction of new bridges over the new flood channel at West Washington Boulevard and Seco Street; and
- Redesign and construction of portions of the golf course and Rose Bowl parking lots affected by the new channels.

Benefits

The three alternatives presented for this project provide different benefits in terms of achieving restoration goals which are described below

The Brookside Park Golf Course Arroyo Seco Naturalization Project achieves the Watershed Restoration Goals by:

Restoration Goal 1: Restore the natural hydrologic functioning of the watershed

The full restoration alternative best meets this goal by establishing a fully functioning channel and floodplain comprised of native ecosystem communities that allow natural geomorphic processes of flood, sediment and debris storage to occur. Continued use of a flood channel through the park will continue to result in conveying flood, sediment and debris flows to downstream communities, compounding damage to properties, ecosystems and public and private infrastructure.

Restoration Goal 2: Better manage, optimize, and conserve water resources while improving water quality

Reestablishing a functional natural channel and floodplain will allow aquifer recharge through infiltration while water quality will benefit from floodplain filtration and groundwater/surface water interactions. These benefits are minimal for the two alternatives that preserve the flood channel.

Restoration Goal 3: Restore, protect, and augment habitat quality, quantity, and connectivity

Although all three alternatives will restore native ecosystems, full restoration of a natural channel and floodplain will provide the greatest benefit for this goal.

Restoration Goal 4: Improve recreational opportunities and enhance open space

All alternatives can be developed to improve recreational opportunities and enhance open space.

Key Issues

The Brookside Park Golf Course Arroyo Seco Channel Renaturalization project will address the following issues:

Safety

- Reestablishment of a natural channel and floodplain will reduce the risk of catastrophic flooding due to structural failure of the concrete-lined flood channel;
- Reestablishment of flood, sediment and debris storage within Brookside Park will reduce risk of damage to downstream properties and public infrastructure; and
- Erosion of the hill slope terraces along West Drive and Rosemount Avenue will be minimized.

Focal Species Benefiting most from the Project

- Aquatic habitat for arroyo chub and other native species would be greatly increased through restoration of a natural channel in the central Arroyo Seco. Creation of pools, riffles, and in-stream refugia would support a diversity of native aquatic species. Water quality and temperature would improve from stabilizing banks with native trees and riparian vegetation.
- Removal of concrete channel or creation of a natural channel adjacent to the main channel would restore aquatic connectivity, allowing fish and other aquatic species to find refuge in slower-moving waters during high flow events.
- Arboreal salamander would benefit from restored connectivity between oak woodlands and riparian areas.

Final Watershed Assessment of the Arroyo Seco Watershed

- Oak titmouse and other oak woodland specialists would benefit from restored woodland habitat and control of invasive plant species.
- Yellow warbler and other riparian specialists would benefit from restored fluvial processes that create riparian habitat with vegetation transitioning from early to late seral stages.

Linkages, Circulation and Open Space

- Wildlife migration corridors will be reestablished;
- Open space will increase; and
- Pedestrian trails can be developed on the floodplain, removing pedestrians from the streets around the park that are currently used for trails.

Water Quality Impacts

- Renaturalization of the channel and reestablishment of a floodplain will have a direct positive impact on water quality.

Aesthetics

- Native ecosystems will be reestablished, enhancing a natural aesthetic.

Costs

Alternative 1 reestablishment of a natural channel and floodplain	
Item	Conceptual Cost
Flood channel demolition and disposal	\$5,000,000
Natural channel design and construction	\$12,000,000
Redesign and construction of Brookside Golf Course	\$10,000,000
Design and construction of Washington Ave and Seco Street Bridges	\$10,000,000
Hill slope terrace restoration	\$500,000
Total	\$37,500,000

Alternative 2 development of normal flow channel through golf course	
Item	Conceptual Cost
Design and construction of normal flow channel diversion structure	\$2,000,000
Design and construction of normal flow channel	\$5,000,000
Restoration of golf course	\$2,000,000
Design and construction of normal flow channel outfall to flood channel	\$1,000,000
Hill slope terrace restoration	\$500,000
Total	\$10,500,000

Alternative 3 Relocation of Flood Channel and Development of Normal Flow Channel	
Item	Conceptual Cost
Existing flood channel demolition and disposal	\$5,000,000
Design and construction of realigned flood channel	\$15,000,000
Design and construction of normal flow channel	\$5,000,000
Design and construction of golf course	\$10,000,000
Design and construction of bridges at Washington Avenue and Seco Street	\$10,000,000
Hill slope terrace restoration	\$500,000
Total	\$45,500,000

5.1.4 Project 4: Lower Arroyo Linkages

Purpose and Need

The Lower Arroyo Linkages project is a series of integrated transportation, water resource, and habitat enhancement projects along the lower Arroyo Seco river corridor that will improve public safety, transportation, economic vitality, recreation, water quality, and ecosystem health in neighborhoods in the City of Los Angeles, including Highland Park, Mt. Washington, Garvanza, Hermon, Montecito Heights, and Cypress Park. In the lower reaches of the watershed, this project is a culmination of years of grassroots planning efforts focusing on the spine of the Arroyo Seco Watershed: the Arroyo Seco and the Arroyo Seco Parkway (a National Scenic Byway Corridor).



Figure 7: Natural Arroyo Seco Channel (1921 Aerial Photo)



Figure 8: Normal Flow Channel Alignment

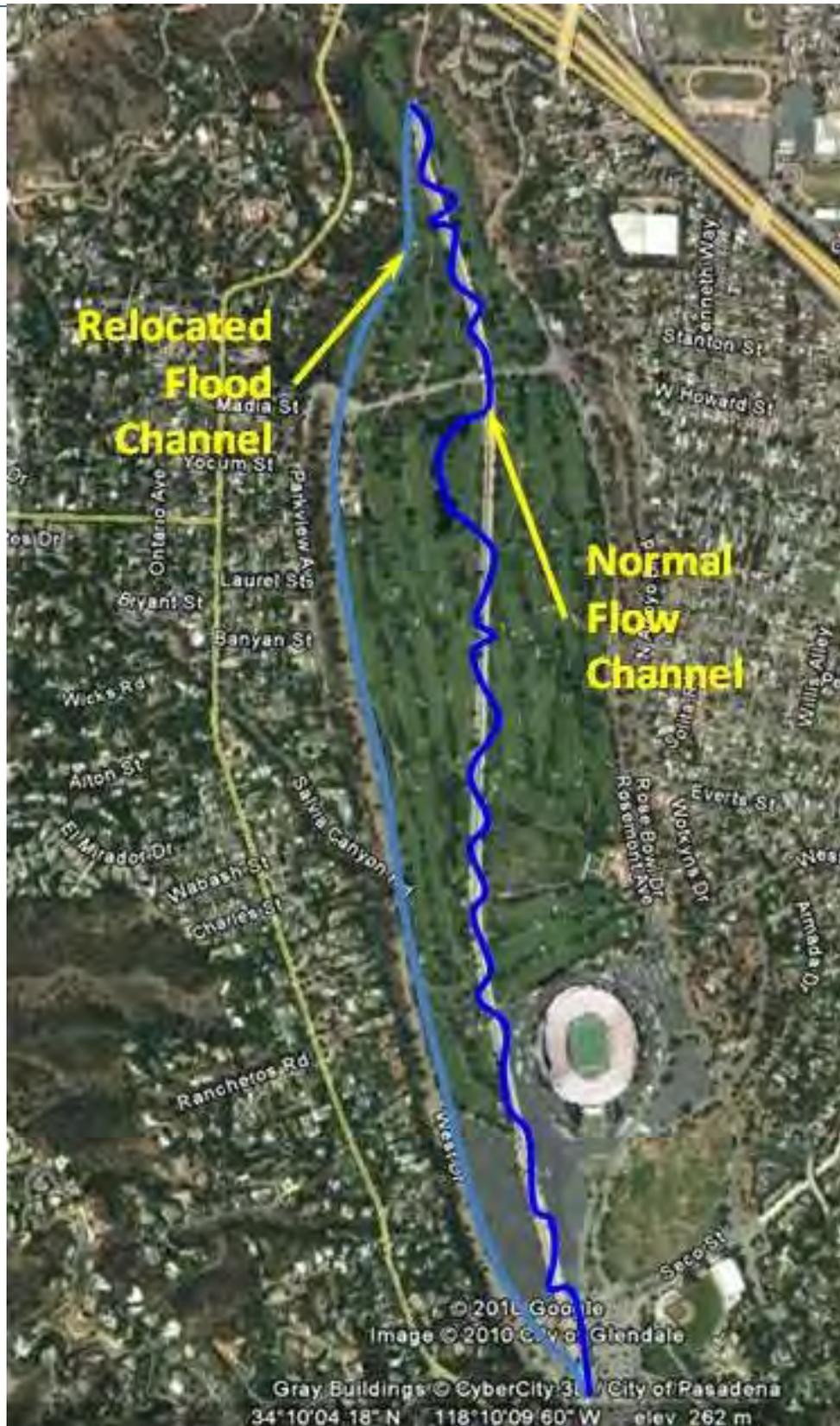


Figure 9: Realigned Arroyo Seco Flood Channel and Normal Flow Channel

Objectives

Project components are designed to:

- Improve water quality in a highly urban as well as natural areas all while restoring the neglected ecosystem of the river environment,
- Develop habitat corridors,
- Create greenways in and around culturally diverse, densely developed, and historic neighborhoods, and
- Upgrade Works Progress Administration infrastructure.

Project Description

Meandering through neighborhoods along the Arroyo Seco, the Lower Arroyo Linkages will provide safe pedestrian and cycling links in the highly urban lower reaches the watershed. Construction of stormwater best management practices will help to improve water quality by reducing sediment and trash entering the Arroyo Seco, and infiltrate dry weather and some wet weather runoff, preventing urban pollutants associated with runoff from entering the Arroyo Seco. Non-native vegetation will be replaced with native/drought tolerant plants and degraded/unused areas will be transformed into viable open spaces where residents can recreate.

Those benefitting will include: pedestrians and bicyclists, as wells as multi-modal transit users to schools, existing and proposed parks, communities, the Southwest Museum, historic Route 66, Juan Bautista de Anza Historic National Trail, historic Gabrielino National Recreation Trail, Dodger Stadium, Rose Bowl, Audubon Center, and other historic and culturally significant points of interest. Key to the project is an emphasis on linking neighborhoods using the greenway through multi-user benefits for pedestrians, bicyclists, recreation enthusiasts, multi-model transit users, disabled individuals, and potentially equestrian riders.

Public safety upgrades to bridges, roads, and bicycle and pedestrian facilities are at the forefront of this project. Transformation of portions of lower watershed from crime plagued locations to safe new pedestrian and bicycle bridges, linkages to public transit, and trails will occur allowing safe passage for school children, residents, commuters, and visitors alike. Bicyclist safety will be greatly improved with a direct and uninterrupted linkage between Los Angeles River bicycle trails and Pasadena.

As part of the Works Progress Administration (WPA) economic recovery effort, the Arroyo Seco concrete channelization led to the birth of the freeway system in Los Angeles. The Arroyo Seco Parkway, a national civil engineering landmark and California Historic Parkway, is located in the former floodplain of the Arroyo. However, various features of the parkway are unsafe for autos travelling at modern highway speeds given current traffic volumes; unsafe conditions exist at several neighborhood access/egress points. Historical trails, rock retaining walls, and local public art throughout the Arroyo Seco were additionally constructed under the auspices of the WPA. After years of heavy use these structures are in dire need of modern updates, safety improvements, and environmental enhancement compatible with the historic nature of Craftsman era architecture and but updated to modern engineering design standards.

Achieving quality of life improvements for diverse communities within the watershed, the greenway will provide residents with improved transportation access, to recreation and cultural facilities, promote safer neighborhoods, and spur ongoing revitalization.

Specific Projects include:

- Arroyo Seco Greenway Improvements: Historic trails, rock retaining walls, and local public art throughout the Greenway originally constructed through the WPA will be rehabilitated and enhanced with historic and interpretive elements
- Arroyo Seco Park, Bushnell Way Elementary School Pedestrian Improvements (Figure 11)
- Avenue 64 Stairway, Bikeway, and Open Space Improvements (Figure 12)
- Arroyo Seco swales and streambank stabilization: Native riparian edge treatments along parks, existing parking lots, and trails will be constructed to improve water quality entering the Arroyo Seco stream. Streambanks will be stabilized to minimize erosion and enhance stream habitat.
- Southwest Museum, Sycamore Grove Park, Montecito Heights Park, Audubon Center Vicinity Linkage Improvements (Figure 10)
- Cypress Avenue Bridge and Access Improvements (Figure 8)
- Avenue 43 Bridge Vicinity Improvements (Figure 9)

Benefits

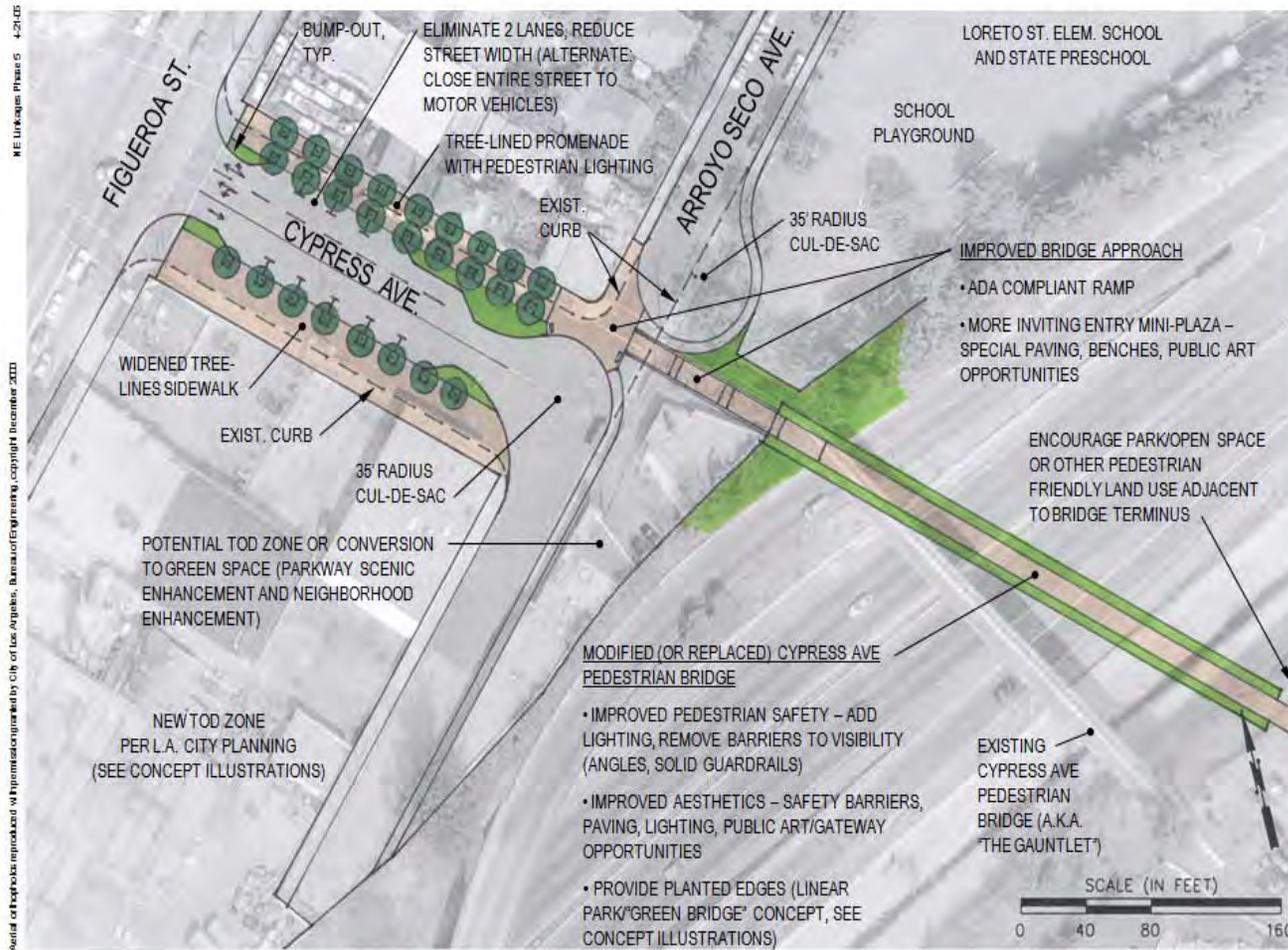
The Lower Arroyo Linkages project achieves the Watershed Restoration Goals by:

Restoration Goal 2: Better manage, optimize, and conserve water resources while improving water quality

- Hillside protection measures reduce erosion and sediment entering the Arroyo Seco
- Plantings help stabilize steep erodable slopes and improve aesthetics
- Naturalizing and daylighting storm drains helps to infiltrate urban runoff and associated pollutants.

Restoration Goal 3: Restore, protect, and augment habitat quality, quantity, and connectivity

- Native plantings in newly created and existing open spaces create habitat for resident and migratory bird species.
- Naturalizing and daylighting storm drains creates additional riparian habitat and helps to enhance the infiltrate urban runoff and associated pollutants.



ISSUES & OPPORTUNITIES:

- Bridge is considered unsafe and uninviting for pedestrians - isolated, poor visibility.
- Bridge access not ADA compliant.
- Bridge is lacking aesthetic value - "utilitarian".
- Cypress Ave R.O.W. east of Figueroa St. is underutilized, street is wider than necessary for traffic volume.

DESIGN CONCEPT ADVANTAGES:

- Realignment eliminates angles, improving visibility.
- Improved security, pedestrian friendliness.
- Improved aesthetics for bridge and approaches.

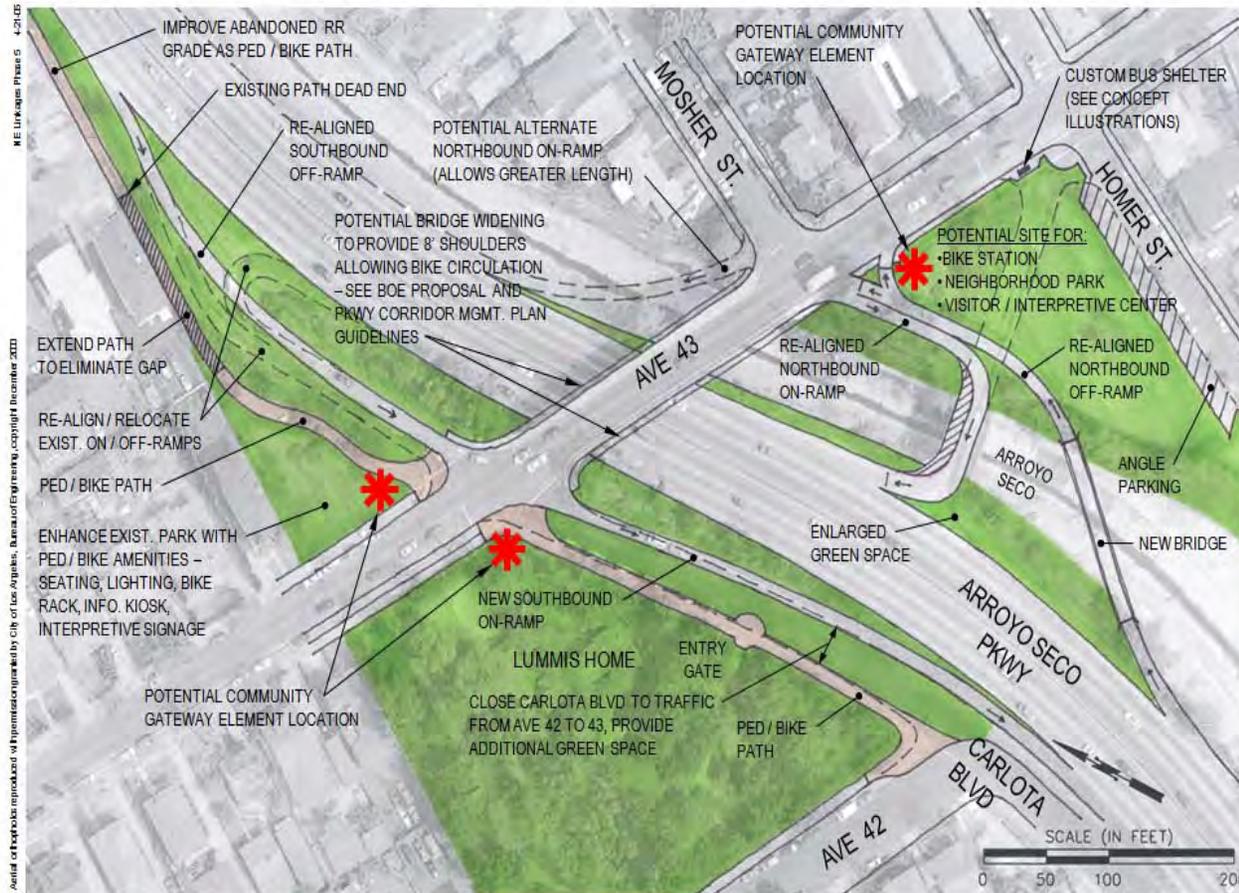
IMPLEMENTATION ISSUES:

- Modifications to bridge subject to provisions of Parkway Corridor Mgmt. Plan.
- Maintenance, security requirements for additional green space.
- Cul-de-sac encroaches on school property; need for R.O.W. acquisition.
- Cul-de-sac length must meet California Vehicle Code (700' max.), and Police and Fire Dept. access requirements.
- Bridge currently supports large gas line; realignment would require rerouting.
- Land use at east bridge terminus - need stronger "anchor" destination than existing.
- Proposed improvements subject to LADOT, Recreation and Parks Dept., Caltrans, DWP, LAFD, and LAPD review and approval.

Cypress Avenue Bridge and Access Improvements

Thomas Bros. Map Page No. and Grid: 594 J6

Figure 10: Schematic Diagram of the Cypress Avenue Bridge and Access Improvements (Source: Huitt Zollars and Fred Glick, CDM)



ISSUES & OPPORTUNITIES:

- Key gateway to community and resource-rich area from parkway.
- Parkway on/off-ramp safety concerns.
- Abandoned railroad grade dead ends – missed opportunity for linkage.

DESIGN CONCEPT ADVANTAGES:

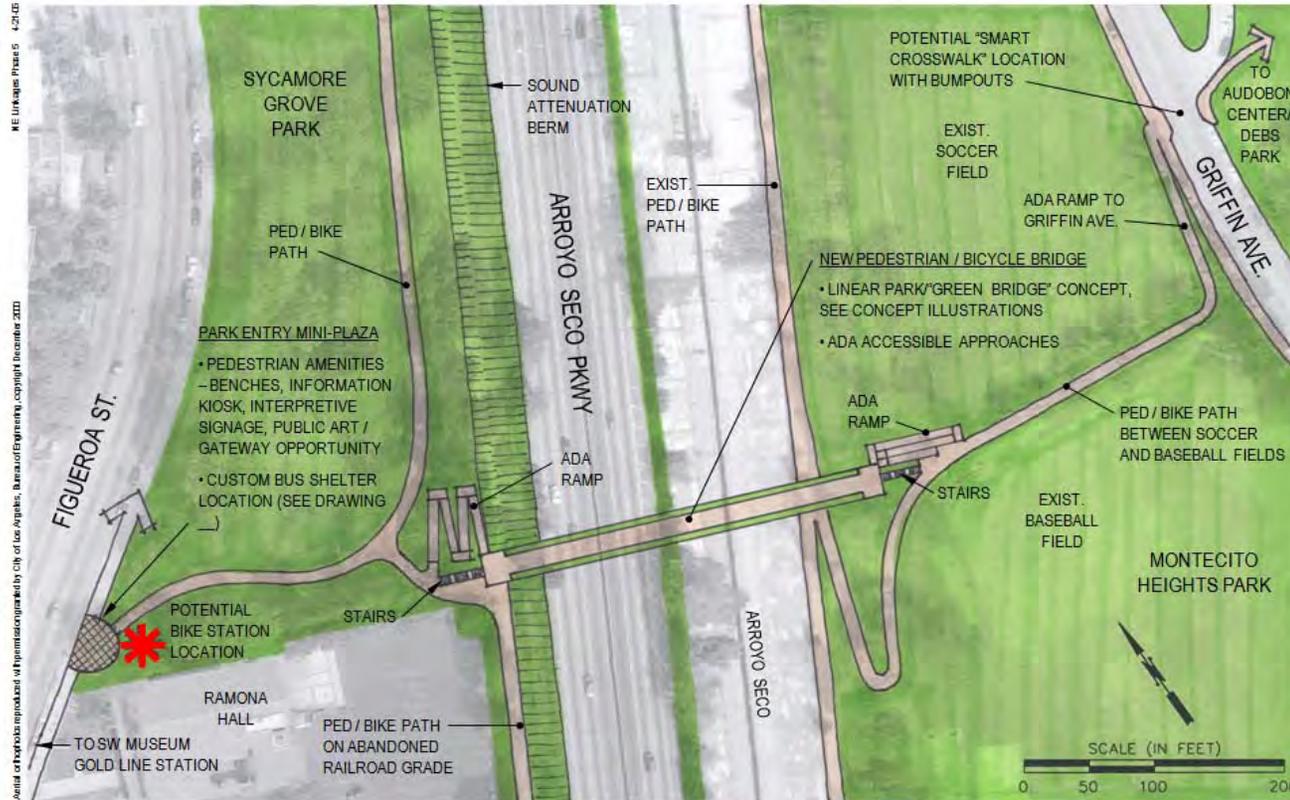
- Creates stronger community gateway.
- Improves parkway on/off-ramp safety.
- Provides additional open space along parkway, helping to strengthen park-like parkway character.
- Creates larger open space at Homer St.
- Strengthens cross-parkway ped / bike access.
- Helps create continuous green north-south ped/bike corridor.

IMPLEMENTATION ISSUES:

- Feasibility of new on/off-ramp alignments.
- Bridge and on/off-ramp modifications subject to provisions of Parkway Corridor Mgmt. Plan.
- Traffic impact of partial Carlota Blvd. closure.
- Caltrans / City R.O.W. boundary determination.
- Improvements subject to LADOT, Recreation and Parks, and Caltrans (bridge, on/off-ramps) review and approval.

Avenue 43 Bridge Vicinity Improvements

Figure 11: Schematic Diagram of Avenue 43 Bridge Vicinity Improvements (Source: Huitt Zollars and Fred Glick, CDM)



Southwest Museum, Sycamore Grove Park, Montecito Heights Park, Audubon Center Vicinity Linkage Improvements

Figure 12: Schematic Diagram of the Southwest Museum, Sycamore Grove Park, Montecito Heights Park, Audubon Center Vicinity Linkage Projects (Source: Huitt Zollars and Fred Glick, CDM)

ISSUES & OPPORTUNITIES:

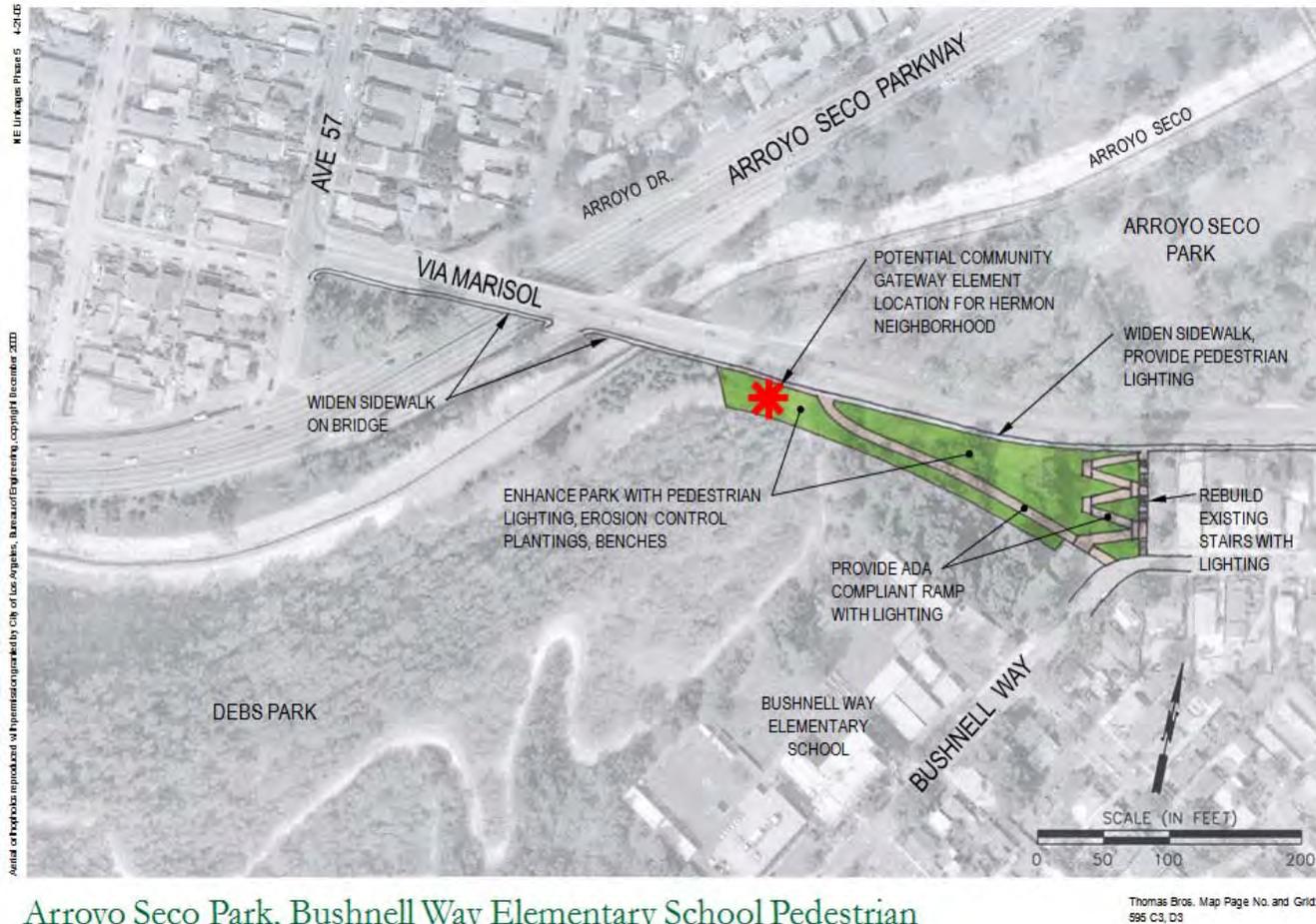
- Parkway and Arroyo Seco form barrier to pedestrian and bicycle circulation, hindering cross-parkway access to community resources; few pedestrian friendly bridges.
- Proximity of key resources east and west of parkway to SW Museum Gold Line Station; pedestrian linkage opportunity.
- Parkway noise impact on Sycamore Grove Park.

DESIGN CONCEPT ADVANTAGES:

- Creates a strong pedestrian / bicycle linkage between several resources on opposite sides of the parkway.
- Connects with north-south pedestrian / bicycle corridors on either side of the parkway, creating larger trail network.
- Sound attenuation berm enhances Sycamore Grove Park experience.

IMPLEMENTATION ISSUES:

- Bridge subject to provisions of Parkway Corridor Mgmt. Plan Caltrans design criteria.
- Caltrans / City R.O.W. boundary determination.
- Improvements subject to LADOT, Recreation and Parks Dept. and Caltrans review and approval.



Arroyo Seco Park, Bushnell Way Elementary School Pedestrian Improvements

ISSUES & OPPORTUNITIES:

- Heavily used pedestrian route across Parkway to Bushnell Way Elem. School by school children and parents.
- Portion of pedestrian route through park is steep, dark, has no paved path.
- Erosion from park hillside onto Via Marisol and sidewalk during heavy rains.

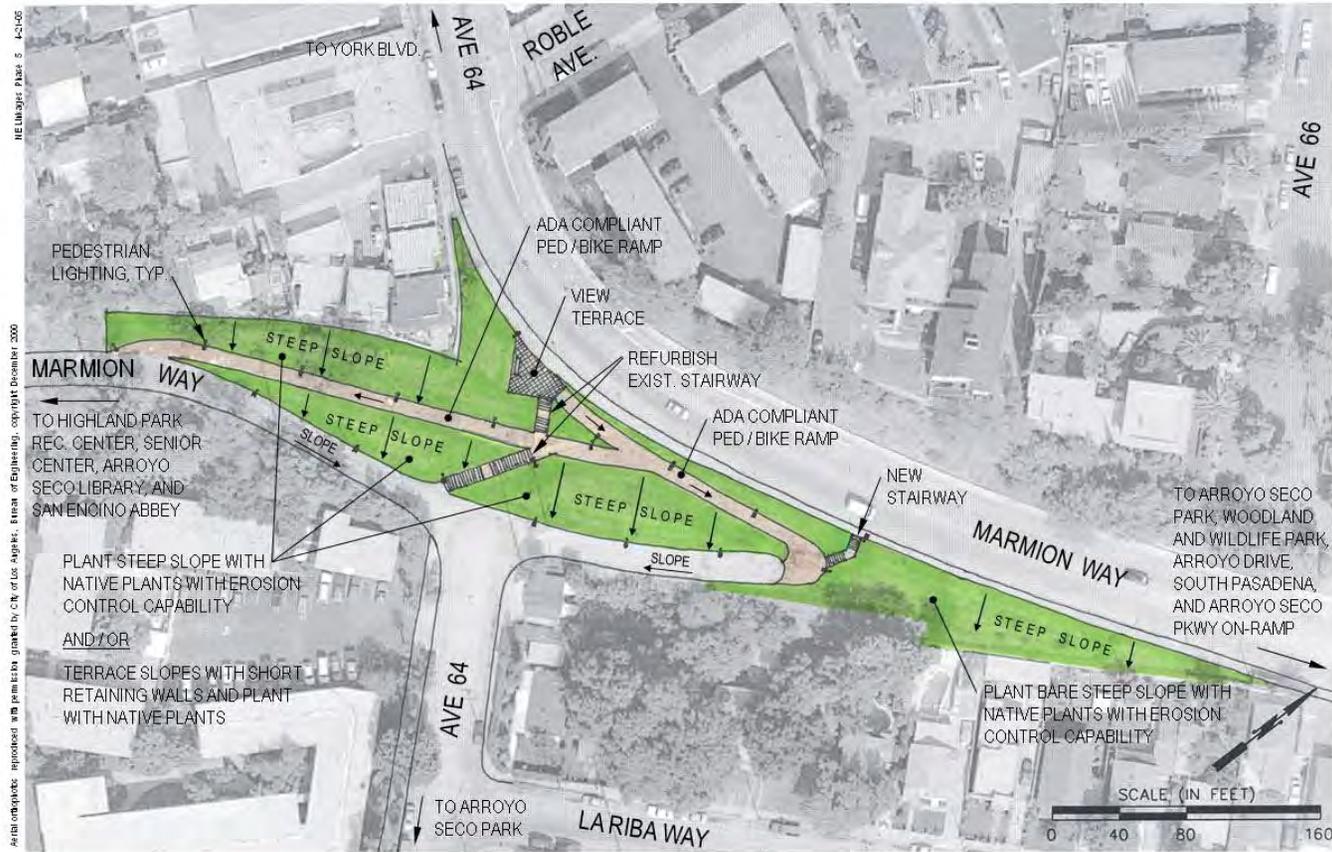
DESIGN CONCEPT ADVANTAGES:

- Increased pedestrian safety and friendliness for school children and parents.
- Improved ADA accessibility.
- Reduced erosion
- Enhanced green space.
- New community gateway element

IMPLEMENTATION ISSUES:

- Modifications to bridge subject to provisions of Parkway Corridor Mgmt. Plan.
- Enhanced park with improved access requires additional maintenance and security.
- Improvements subject to LADOT, Recreation and Parks Dept., and Caltrans (bridge) review and approval.

Figure 13: Arroyo Seco Park, Bushnell Way Elementary School Pedestrian Improvements (Source: Huitt Zollars and Fred Glick, CDM)



Avenue 64 Stairway and Open Space Improvements

ISSUES & OPPORTUNITIES:

- Underutilized, unmaintained, unlit open space invites undesirable activity (graffiti, drug activity, dumping).
- Steep unvegetated slopes with high erosion potential.
- Nexus of potential east-west and north-south ped / bike routes has poor accessibility (ADA, peds and bikes)
- Good views south from top of slope.

DESIGN CONCEPT ADVANTAGES:

- Creates attractive, inviting local green space with view opportunity.
- Plantings help stabilize steep erodable slopes and improve aesthetics.
- Improves ADA and bike accessibility.
- Strengthens cross-parkway ped / bike linkage from Highland Park Library / Senior Center to Arroyo Seco Park.
- Lighting and potential increase in pedestrian / bike traffic increases visibility, enhancing safety.

IMPLEMENTATION ISSUES:

- Achieving ADA compliance for slopes.
- Maintenance, security requirements.
- Improvements subject to LADOT and Rec. and Parks review and approval.

Figure 14: Avenue 64 Stairway and Open Space Improvements (Source: Huitt Zollars and Fred Glick, CDM)

Restoration Goal 4: Improve recreational opportunities and enhance open space

- Cypress Avenue Bridge realignment eliminates angles, improving visibility and safety.
- Improved security, pedestrian friendliness, aesthetics/safety for bridges, approaches, and on/off ramps.
- Create stronger community gateway
- Strengthens cross-parkway pedestrian and bike access and helps create continuous green north-south pedestrian and bike corridor
- Provides additional open space along parkway, helping to strengthen park-like parkway character.
- Create larger trail network
- Creates a strong pedestrian / bicycle linkage between several resources on opposite sides of the parkway
- Enhance green space.
- Improved ADA accessibility
- Increase pedestrian safety and friendliness for school children and parents

Key Issues

The Arroyo Seco Greenway will address the following issues:

Safety

- The Cypress Avenue Bridge is considered unsafe and uninviting for pedestrians - isolated, poor visibility
- There are safety concerns with the Parkway on/off-ramp at the Avenue 43 Bridge
- Erosion from park hillside onto Via Marisol and sidewalk during heavy rains.
- Portion of pedestrian route through Arroyo Seco Park is steep, dark, has no paved path.
- Underutilized, unmaintained, unlit open space invites undesirable activity (graffiti, drug activity, dumping).

Focal Species Benefiting most from the Project

- Arroyo chub and other aquatic species would benefit from improved water quality from stabilizing banks with native trees and riparian vegetation.
- Yellow warbler and other migratory birds would benefit from native plantings and enhanced riparian habitat.
- California quail and other terrestrial species would benefit from improved connectivity to larger patches of quality habitat existing in parks and open spaces.

Linkages, Circulation, and Open Space

- The Cypress Avenue Bridge access not ADA compliant
- The abandoned railroad grade dead end in the Avenue 43 Bridge vicinity is a missed opportunity for linkage.
- New community gateway element at Arroyo Seco Park near Bushnell Way Elementary School

- Parkway and Arroyo Seco form barrier to pedestrian and bicycle circulation, hindering cross-parkway access to community resources; few pedestrian friendly bridges
- Proximity of key resources east and west of parkway to SW Museum Gold Line Station is a pedestrian linkage opportunity
- Heavily used pedestrian route across Parkway to Bushnell Way Elem. School by school children and parents

Water Quality Impacts

- Steep unvegetated slopes with high erosion potential.
- Aesthetics
- The Cypress Avenue Bridge is lacking aesthetic value - "utilitarian."
- Parkway noise impact on Sycamore Grove Park
- Avenue 64 Stairway/Bikeway has good views south from top of slope.

Conceptual Cost: \$100 million

5.1.5 Project 5: Confluence Gateway Multi-use Project

Purpose and Need

The Confluence Gateway Multi-use project represents an essential part of the larger Arroyo Seco Greenway Project and the Los Angeles River Revitalization. The Arroyo Seco Confluence provides the key linkage of the Los Angeles River to vital habitat and wildlife corridor, joining the San Gabriel Mountains to the Santa Monica Mountains. The Confluence is also a key spot for flood management and water quality improvements, as it drains a large urban watershed of the Los Angeles River system.

Envisioned as a series of integrated transportation, water resource, and habitat enhancement projects along the 20 mile Arroyo Seco River Corridor, the Arroyo Seco Greenway Project has the goals of improving public safety, transportation, economic vitality, recreation, water quality, and ecosystem health in neighborhoods throughout the Arroyo Seco Watershed. As part of this overall transformation, the Confluence Gateway Multi-use project will improve access to the river through the construction of a bicycle trail and separate pedestrian trail adjacent to the arroyo. Specifically in the area of the Confluence, rehabilitation represents a safety priority for residents and visitors who currently access the arroyo via this stretch of land despite illegal activities that take place. The pedestrian path will also provide linkages to two Metro rail stations, the historic Bautista de Anza Trail, and the proposed Confluence Park to be constructed by the Santa Monica Mountains Conservancy (planned adjacent to the confluence of the Los Angeles River and Arroyo Seco). Confluence



Arroyo Seco: Looking upstream from the confluence (ASF 2007)

Park is the third element of the Los Angeles River State Park; the other two elements, Cornfields and Taylor Yard, have already undergone significant planning and development as park components. The Confluence has historic and cultural significance as the location of downtown Los Angeles when the pueblo was established in 1781.

Objectives

As proposed, the Confluence Gateway Multi-use project's components are designed to meet the following goals and objectives:

- Goal: Improve access to the Los Angeles River and Arroyo Seco
 - Objective: Develop strategies that provide for increased open space and trails adjacent to the River and Arroyo Seco
- Goal: Develop a network of paths, trails, and roadways that facilitate pedestrian and bicycle connections to recreation and open space opportunities
 - Objective: Design streets and publicly accessible open spaces to create safe passageways

Project Description

The Confluence Gateway Multi-use project will restore a 1/3 mile stretch of urban land alongside the Arroyo Seco (Figure 15), in the Arroyo Seco Scenic Byway Corridor, into a riparian greenway and open space park with native landscaping and a bicycle/pedestrian path. Not only will the project embody a first step in enhancing river access and recreation opportunities, it will provide a key link between the planned Los Angeles River greenways at the confluence and the Metro Rail station in the historic Lincoln Heights neighborhood, thus enabling light rail and bicycle access to the Arroyo Seco and the Los Angeles River. Ultimately, the Arroyo Seco greenway is envisioned to extend to South Pasadena, and this initial segment at the confluence will be an important hub in the regional river parkway and bicycle trail network.

The site is located along the southeastern edge of the Arroyo Seco channel and is partially shaded by the SR-110/I-5 freeway interchange. Local residents frequently trespass through the property to access the river, even though the parcel is neglected, littered with debris, and used as a homeless encampment.

Vegetation at the site consists of ruderal (weedy) vegetation such as non-native grasses, shrubs, and a few trees, including non-native palm trees. Wildlife use at the site is limited to those species adapted to living in disturbed, urbanized areas. The Arroyo Seco channel and the Los Angeles River channel are concrete-lined and devoid of vegetation. The channels are used for foraging by a limited number of bird species, including Black-necked stilt (*Himantopus mexicanus*) and Brewer's blackbird (*Euphagus cyanocephalus*). Non-native species, including Rock dove (*Columba livia*), utilize the freeway overpasses for nesting and roosting.

Converting the area into a riverside park will deter illegal activities and provide a safe, legitimate way for the public to safely reach and enjoy the river. As part of the Los Angeles Northeast Community City Plan, the greenway may also accommodate a future equestrian trail from South Pasadena to Elysian Park. In support of the project, local residents have partnered

with the Arroyo Seco Foundation, City of Los Angeles, and Caltrans to help clear the area and assist with planting and landscape maintenance.

The bicycle and pedestrian paths will begin at Avenue 19, adjacent the confluence of the Los Angeles River and the Arroyo Seco. The paths will then meander along the rim of the Arroyo Seco to the northeast beneath the San Fernando Road Bridge and into an open space area on a larger parcel owned by Caltrans. The trails will end on the far side of the Caltrans property at Avenue 26, just 600 feet from the Metro Rail station. Access points to the park will be enhanced with decorative entry features. Educational/interpretive signage documenting the historic, cultural, and natural aspects of the Juan Bautista de Anza Historic National Trail and other relevant Arroyo Seco/Los Angeles River features will be installed. The trail and open space will be landscaped with native trees, such as oak, willow, and sycamore, and illuminated at night with energy-saving and 'dark-sky' lighting fixtures. The trees will be strategically placed to preserve the migratory and resident bird movements that persist along the Los Angeles County's rivers, and extend the downstream natural habitat along the Arroyo Seco. Native landscaping will require minimal irrigation, which will be provided by a solar-powered system. The project will help catch freeway runoff and prevent some of it from entering the waterway. To reflect the Arroyo Seco's urban setting, areas shaded by transportation infrastructure will be beautified with features such as painted murals, decorative gravel, and colorful porous concrete pavers arranged in attractive patterns. As many of the hard-scape features as possible will be made from recycled materials.

The Confluence Gateway Multi-use project will be the first step in providing public access to the Arroyo Seco, connecting the Los Angeles River to the regional rail transit system, and establishing a key bicycle and pedestrian linkage between the planned Los Angeles River and Arroyo Seco greenways. Additionally, it will transform a neglected and downtrodden urban space into a native habitat and greenway park where the community and river visitors from across the region can gather and enjoy a safe and attractive recreational space. Refer to Figure 13 for a conceptual site plan.

The Confluence Gateway Multi-use project is a vital part of a much larger vision for the complete makeover of the Los Angeles River and the Arroyo Seco. The program is a multi-objective approach to environmental and community restoration. The Los Angeles River Revitalization Master Plan is an ambitious vision to convert the Los Angeles River and Arroyo Seco Confluence area into a community open space and improved water environment. The approach to accomplish this includes the construction of Arroyo Seco wetlands, landscaped roofs, water collection cisterns, and wider or terraced channels. These improvements would provide for the diversion and filtration of rainwater into the cisterns and



Water quality sampling at the confluence (ASF 2007)

wetlands (thus decreasing polluted runoff into the waterways), the pooling of water in certain areas to provide for recreational opportunities, and decreases in bank erosion and flow speed to allow for vegetation growth along the waterways.



Figure 15: Confluence Gateway Multi-use Project Conceptual Site Plan

Benefits

The Confluence Gateway Multi-use project will accomplish the following major benefits:

- **Increased mobility** – The addition of linkages, recreational opportunities, and open space for local residents and tourists will add an important component linking planned greenways and open spaces in other areas along the arroyo and Los Angeles River.
- **Improvement of a neglected and currently unsafe area** – The parcel targeted by the program is commonly used as a homeless encampment and littered with debris and is unsafe for people trying to access the arroyo.
- **Provision of open space and recreational opportunities** – Surrounding housing is comprised of a high density residential development with low income residents who will especially benefit from increased and safer open spaces.
- **Increased access** – Upgraded and safer linkages to the Arroyo Seco riverfront will increase use by local residents and tourists.
- **Shorter access** – Local residents and visitors arriving on the regional light rail system will benefit from this key link between Metro Gold Line Station and the planned Los Angeles River park system.

- **Implementation of Regional Plans** – Planned trails and pathways are one component of achieving the objectives and strategies of the Integrated Regional Water Management Plan developed for the area.

Key Issues

The Confluence Gateway Multi-use project will address the following key issues:

Safety

- In addition to improvements to the safety issues described above, the addition of lighting beneath freeway ramps, and the use of the second archway beneath the San Fernando Road Bridge to avoid a potentially unsafe at-grade crosswalk will enhance pedestrian safety in this area.

Focal Species Benefiting most from the Project

- Yellow warbler and other migratory birds would benefit from native plantings and enhanced riparian habitat.
- California quail and other terrestrial species would benefit from improved connectivity to larger patches of quality habitat existing in parks and open spaces.

Recreation

- Construction of the planned bicycle path would link to the larger, comprehensive river parkway planned for the Arroyo Seco in the Cornfields Arroyo Seco Specific Plan. Therefore, it will serve as a key link between the Arroyo Seco River Parkway and the trails planned along the Los Angeles River forming a continuous system as envisioned in the Cornfields Arroyo Seco Specific Plan.

Revitalization

- Park facilities will attract more people to the area and spur ongoing neighborhood revitalization efforts.

Community Support

- The Arroyo Seco Foundation (project proponent) will accomplish the Confluence Gateway Multi-use project with support from numerous community non-profit organizations including; CASO, CASA, the Arroyo Seco Scenic Byway Corridor Committee, the Anahuak Soccer/Urban Semillas, and the Los Angeles Conservation Corps.
- The Program has no known opposition and will expand the community involvement already garnered during the Los Angeles River Revitalization Master Plan and the Arroyo Seco Feasibility and related studies.

Consistency with local land use, watershed, water management, and general plans

- Plans with applicable goals that will be met through development of the Confluence Gateway Multi-use project include the City of Los Angeles General Plan, City of Los Angeles River Improvements Overlay Zone, City of Los Angeles 2005 Urban Water Management Plan, Integrated Regional Water Plan for the Los Angeles River Watershed, Los Angeles River Revitalization Master Plan, Arroyo Seco Restoration Feasibility Study,

Arroyo Seco Watershed Management and Restoration Plan, and the Arroyo Seco Parkway Management Plan.

Costs

Project Categories	Requested Grant Funds	Other Funding Sources	Total Cost
Project Management/Administration	\$165,640	\$170,000	\$335,640
Planning/Design/Permitting	\$445,000	\$0	\$445,000
Implementation/Construction	\$1,832,888	\$0	\$1,832,888
Total	\$2,443,526	\$170,000	\$2,613,528

5.2 Distributed Project Themes

The Arroyo Seco Greenway seeks to improve public safety, transportation, economic vitality, recreation, water quality, and ecosystem health in neighborhoods throughout Los Angeles, La Canada Flintridge, South Pasadena, Pasadena, and Altadena. Although this document emphasizes the needs and potential benefits prompting the localized top tier projects, it is recommended that the further development of these mega-projects include consideration and application of distributed project themes enumerated in this section. More importantly, these themes should be applied to the watershed as a whole in order to realize the goals and objectives of the Arroyo Seco Greenway. The distributed project themes are:

Ecosystem Restoration - Restore endangered riverine and upland ecosystem communities and reestablish wildlife migration corridors for the following ecosystem communities:

- Riversidian Alluvial Fan Sage Scrub
- Southern Sycamore Riparian Woodland
- Streambed Riparian
- Mule Fat Scrub
- Southern Willow Scrub
- Coast Live Oak Woodland
- Grassland

Multi-modal Connectivity -- Meandering through neighborhoods along the Arroyo Seco, the greenway will provide safe pedestrian and cycling links from highly urban lower reaches to the upper reaches of the watershed in the Angeles National Forest. Key to the project is an emphasis on linking neighborhoods using the greenway through multi-user benefits for pedestrians, bicyclists, recreation enthusiasts, multi-modal transit users, disabled individuals, and potentially equestrian riders.

Water Supply - Protect and preserve foothill lands to enhance percolation into the groundwater basin and to prevent aggravated runoff. Expand water conservation and recycling programs through the watershed. Create conjunctive use of groundwater basin for enhanced storage

during wet periods and for use during dry periods. Develop upper watershed reforestation and revegetation programs to reduce sediment flow and improve local retention. Naturalize the stream in Hahamongna for greater percolation and habitat benefits and reconsider the use and expansion of the spreading basins. Review the functionality and effects of the upper basin flood control structures such as debris basins and check dams.

Cultural and Historic Improvements – Historic trails, rock retaining walls, and local public art throughout the Greenway originally constructed through the WPA should be rehabilitated and enhanced with historic and interpretive elements

Streambank Stabilization – Native riparian edge treatments along parks, existing parking lots, and trails should be constructed to improve water quality entering the Arroyo Seco stream. Streambanks should be stabilized to minimize erosion and enhance stream habitat.

Recreational Opportunities and Open Space – Almost one-half (48%) of California's residents live in southern California. Yet, Los Angeles has a scarcity of open space. Los Angeles is one of the most park-poor cities in the nation, with only 10% of its land as open space; by contrast, San Francisco has 25%, New York 27%. Excluding the Angeles National Forest, open space is 15% of the Arroyo Seco watershed. Public park space is 10% of the watershed (excluding golf courses, cemeteries, and gardens/parks with an entry fee). Because park space is concentrated on a thin strip along the Arroyo Seco, it is some distance from most residential areas and not evenly distributed geographically throughout the watershed. Areas for land acquisition for open space protection and recreational opportunities should be identified, prioritized, and eventually acquired and enhanced. (ASF 2002)

Land Acquisition for Stream Stability – Healthy, sustainable streams are allowed to change course naturally as it aligns and realigns within a natural floodplain. Side channels and ponds improve fish habitat and provide habitat for wetland dependent wildlife. Acquiring land to extend the width of the Arroyo Seco corridor is crucial to the sustainability of stream restoration projects.

BMP and Stormwater Improvements – Identify sites where BMPs could be implemented to improve water quality. BMPs are projects or programs that can be employed to reduce contaminated runoff: Structural BMPs constructed at a particular site to reduce contaminated runoff, and Nonstructural BMPs which do not involve construction of a device in a specific location. In addition to BMPs, the watershed contains many opportunities to daylight stormdrains to create more attractive open space and improve stormwater quality.

Energy Efficiency – Integrate energy efficient systems into project elements (e.g., solar lighting and irrigation, low impact development (or “shrink growth”, Cal Poly Pomona, 2010), sustainable design, closed loop systems, water-use efficiency, and other related elements).

6. Data Gaps and Next Steps

This section describes data gaps and next steps in the planning and implementation of the ASWA.

Project Ranking: Stakeholder review and input to the matrix of Arroyo Seco Watershed Projects, Appendix B is needed to revise project information, as necessary, and to provide missing information such as "project footprint" information (e.g., length of stream miles restored and number of acres restored). Based on stakeholder input, the ASWA can be updated to reflect accurate information and ranking.

Project Integration: Localized projects and distributed projects, included in the matrix of Arroyo Seco Watershed Projects, Appendix B, and new projects not yet included in the matrix, should be included and integrated into the ASWA. The ASWA provides a helpful framework for adding new projects to the planning process and revising projects to allow for better integration with the Arroyo Seco Greenway.

Concept Development: Further studies and engineering feasibility is recommended for each of the Tier 1 Arroyo Seco Greenway projects. These projects require close coordination with the Army Corps of Engineers, California Department of Fish and Game, US Fish and Wildlife Service, Regional Water Quality Control Board, Caltrans, County of Los Angeles, City of Los Angeles, City of Pasadena, and other CASA and CASO participants early on in the planning process to address constraints and opportunities as well as past, current, and future planning that affect the Arroyo Seco Greenway. The ASWA can help facilitate concept development to minimize duplication of effort and to implement projects in a united manner.

Funding Strategy: The ASWA will help to facilitate the formation of a funding strategy for implementation of the Arroyo Seco Greenway. Future signatories of the Arroyo Seco Greenway Agreement can work together to establish a funding strategy tapping federal, state, local, and private resources. In this way, multiple initiatives canvassing all sectors, (e.g., transportation, energy, water, and environment) can be employed to accomplish the agreed upon goals of the ASWA and Arroyo Seco Greenway Agreement.

6.1 Process for Adding Projects to the ASWA

New projects can be added to the ASWA online through the ASF website at www.arroyoseco.org/aswa. The new projects will be posted online for stakeholders to view. ASF in coordination with CASA, CASO, and other signatories of the Arroyo Seco Greenway Agreement will hold joint meetings on a quarterly basis to update the ASWA project matrix, discuss new projects, and identify action items to integrate new projects into the Arroyo Seco Greenway.

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Council of Arroyo Seco Organizations

Appendices

- A** Arroyo Seco Greenway Agreement
- B** Arroyo Seco Watershed Projects
- C** Memorandum: Flood Hazard, Sediment Management, and Water Feature Analyses, Hahamongna Watershed Park, Pasadena, CA
- D** Arroyo Seco Watershed Assessment Meeting Notes

Appendix A
DRAFT Arroyo Seco Greenway Agreement

Draft

ARROYO SECO GREENWAY AGREEMENT

THIS agreement is made and entered into this date, 2010 by and between the County of Los Angeles, the cities of Los Angeles, Pasadena, South Pasadena and La Cañada Flintridge, the Santa Monica Mountains Conservancy, and the California Department of Transportation, the US Department of Agriculture, the US Army Corps of Engineers and various non-governmental agencies.

WITNESSETH

Whereas, the Arroyo Seco, extending from the San Gabriel Mountains to downtown Los Angeles at the confluence with the Los Angeles River, is a unique natural treasure in Southern California and offers exceptional possibilities for cooperation and collaboration to manage, protect, and restore our natural heritage and to enhance it for people and wildlife; and

Whereas, a series of studies and plans have identified the goals and projects for managing and enhancing the Arroyo Seco, including the Arroyo Seco Watershed Restoration Feasibility Study, completed in May, 2002 by North East Trees and the Arroyo Seco Foundation, the USACE Arroyo Seco Reconnaissance Study, the City of Pasadena's Arroyo Seco Master Plan, the Northeast Linkages Study and other studies and plans

Whereas, the Arroyo Seco Parkway has recently been declared a federal scenic byway, and the California Department of Transportation has initiated a comprehensive corridor management program to enhance the Parkway and improve its connections to the neighborhoods that surround it; and

Whereas, the US Army Corps of Engineers and the County of Los Angeles have recently initiated an Arroyo Seco Watershed Feasibility study to consider appropriate projects to restore and improve ecosystem values in the watershed; and

Whereas the County of Los Angeles and the cities of the Arroyo Seco watershed are working together to develop a comprehensive storm water and water quality program to improve the health of the Arroyo Seco stream and the Los Angeles River;

WHEREAS, the County of Los Angeles has flood management and stormwater responsibility in the watershed as well as jurisdiction over the unincorporated community of Altadena; and.

Whereas, the Cities of La Cañada Flintridge, Pasadena, South Pasadena and Los Angeles each have jurisdiction over significant stretches of the Arroyo Seco watershed; and,

WHEREAS, the parties have limited resources and recognize that full and effective implementation of watershed management will depend upon support from the regional, state and federal levels of government; and,

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WHEREAS, it is desirable to provide a forum and organizational vehicle for interested parties to promote communication, cooperation and collaboration among the agencies with responsibility for the management of the Arroyo Seco watershed;

NOW, THEREFORE, in consideration of the foregoing, the parties hereto agree to develop the Arroyo Seco Watershed Greenway Agreement to work together cooperatively to restore and enhance the Arroyo Seco Watershed for current and future generations of Southern Californians.

This Agreement is entered into for the purpose of establishing a cooperative program for planning and managing the Arroyo Seco Watershed and an inter-agency vehicle to:

- evaluate and assess progress toward implementing the Program,
- formulate project implementing agreements for the various elements of the program and
- pursue collaborative projects in pursuit of its goals.

Section 1: Goals

The goals of the Arroyo Seco Greenway Agreement are to:

1. Restore the natural hydrological functioning of the watershed to the maximum extent possible
2. Better Manage, Optimize, & Conserve Water Resources While Improving Water Quality to meet relevant regulatory standards
3. Restore, Protect and Augment Habitat Quality, Quantity and Connectivity
4. Improve Recreational Opportunities and Enhance Open Space
5. Promote Economic Development through cultural and ecological tourism

In order to achieve these goals, the Arroyo Seco Watershed Management Plan shall be developed by December 31, 2009.

Section 2. Additional parties.

It recognized that there are other parties within the watershed that have significant responsibilities for watershed planning and management but have not been included in this agreement. However, the parties hereto agree to request these other parties to implement the Watershed Management goals and practices recommended in the Plan and include them as parties to future project implementing agreements.

The Arroyo Seco Foundation, the Council of Arroyo Seco Agencies (CASA) and the Council of Arroyo Seco Organizations (CASO) shall be advisory bodies for the development and implementation of the goals and projects of the Agreement.

Section 3. Amendment.

This Agreement may be amended only with the unanimous approval of all parties.

Section 4. Executive Committee.

Each of the parties shall appoint a member and an alternate to an Executive Committee. The members so appointed shall elect a chairman to serve a two-year term. The Executive Committee shall meet time to time upon the request of the chairman, but at least quarterly. In order to ensure that the broad range of stakeholder interests is represented, CASO, CASA, the Arroyo Seco Foundation and North East Trees shall be entitled to one representative each on the Executive Committee.

The Executive Committee shall be responsible for reviewing and reporting to the parties as to whether adequate and reasonable progress is being made in the implementation of the Plan and of the watershed management program in annual report.

Section 5. Elements Schedule.

The Arroyo Seco Watershed Management Plan (Plan) shall consist of the following elements and schedules:

- Trail Connectivity
- Flood and Stream Management
- Water Quality
- Water Resources and Conservation
- Habitat Restoration
- Recreational Opportunities
- Economic Development and Cultural and Ecological Tourism.

The parties hereto agree to use their best efforts to develop the Plan and to formulate agreements to implement it in a timely fashion according to a mutually agreed upon schedule.

Section 6 - Local Jurisdiction

The intent of this agreement is to facilitate and develop the use of the most cost effective and productive measures for achieving the goals of Agreement.

Agencies retain their responsibility and authority to plan and manage their respective jurisdictions through general planning tools, ordinances, and other governmental mechanisms.

Section 7 - Project Implementation Agreements.

Plan elements shall be accomplished through the independent action of party agencies as well as through collaborative Project Implementation Agreements.

These agreements shall designate a lead agency and shall provide for funding anticipated planning, construction and maintenance costs. The participants in these Project Implementation Agreements can include parties to this agreement as well as other parties within or outside the watershed.

Section 8 - Termination.

The term of this Agreement shall commence upon the date when parties have executed this document and shall continue until a majority of the parties have withdrawn as provided in Section 10 below.

If this Agreement is terminated, then the parties hereto agree to consider the formation or designation of an agency to attempt to carry out the goals of the program as set forth in Section 1 and the implementation of the Plan Elements set forth in Section 5.

Section 9. Grants

All parties shall use their best efforts to aid lead agencies designated in Project Implementation Agreements to obtain funding for planning, construction and maintenance of the various projects identified in those agreements.

Section 10. Withdrawal of Parties.

Any of the parties to this agreement may withdraw by giving written notice of withdrawal to the other parties this Agreement. The withdrawing party shall be responsible for financial obligations hereunder only to the extent incurred and agreed to by the party prior to and until the effective date of withdrawal. The balance of the parties shall continue to pursue the performance agreements entered into unless terminated as provided in Section 8 above.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement on the day and year first above written.

Dated and signed by

Mayor of Los Angeles, Pasadena, South Pasadena, La Canada Flintridge
Chair of the County of Los Angeles Board of Supervisors

Appendix B

Arroyo Seco Watershed Projects

Arroyo Seco Watershed Projects (As of May 13, 2010)

Region	Name	Description	CEQA Status Y=Complete (1) P=Progress (0.5) N=No Progress (0)	Project Footprint Mi. Ac.		Goals Addressed	% Match Secured	Agency Contact	Species	Similar to Projects from Arroyo Seco Watershed Restoration Feasibility Study -Phase II	Reference
All	Arroyo Backyard Program	Create outreach materials on BMPs , work with governments to develop incentives/rebates	N/A			2, 3		No lead agency identified			Arroyo Seco Watershed Management and Restoration Plan, page 77
All	Citizen Wildlife Monitoring Program	Develop program to monitor wildlife and record observations	N/A			3		No lead agency identified	Spotted Towhee, Oak Titmouse, Arroyo Chub, Yellow Warbler, California Quail		Arroyo Seco Watershed Management and Restoration Plan, page 78
All	Local Government Ordinances and Policies	Develop runoff fee, buffer zones, permeability zones, and standard plans to reduce and treat runoff	0			2, 3		No lead agency identified			Arroyo Seco Watershed Management and Restoration Plan, page 79
All	Increase street sweeping, density of trash cans, and signage to reduce wastes in storm drains		Exempt			2		No lead agency identified			Arroyo Seco Watershed Management and Restoration Plan, page 79
All	Work with nonprofits and local agencies to id and secure key parcels for habitat and watershed restoration		Exempt			2, 3, 4		No lead agency identified			Arroyo Seco Watershed Management and Restoration Plan, page 81
All	Reduce impacts of domesticated animals and livestock on Arroyo Seco Water Quality	Implement BMPs at livestock facilities and employ biocontainment where possible, enforce pet waste ordinances, make waste bags available in public parks for dog waste pickup, develop education materials	Exempt			2		No lead agency identified			Arroyo Seco Watershed Management and Restoration Plan, page 82
All	Implement Green Streets throughout watershed	Produce and distribute conceptual and detailed design materials to agencies throughout the watershed, produce outreach materials and present concept at meetings, identify pilot projects in each Arroyo city and write grants to develop	N/A			2		No lead agency identified			Arroyo Seco Watershed Management and Restoration Plan, page 83
All	Decrease Impermeability in Arroyo Seco Watershed	Remove impervious surfaces throughout watershed where feasible	0			1		No lead agency identified			Greater Los Angeles IRWMP, page 12 http://www.ladpw.org/wmd/irwmp/docs/Adopted%20IRWMP,%20December%202013,%202006%20Lowres/13.%20Appendix%20C.pdf

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All	Education for Conservation in Arroyo Seco Watershed	Educate about ways to conserve water: landscaping, impervious surfaces, cisterns, etc	N/A			2		No lead agency identified		Greater Los Angeles IRWMP, page 12 http://www.ladpw.org/wmd/irwmp/docs/Adopted%20IRWMP,%20December%2013,%202006%20Lowres/13.%20Appendix%20C.pdf
All	Equestrian BMPs in Arroyo Seco Watershed	Influence property owners through education or enforcement of need for BMPs for equestrian facilities and backyard livestock	Exempt			2		No lead agency identified		Greater Los Angeles IRWMP, page 12 http://www.ladpw.org/wmd/irwmp/docs/Adopted%20IRWMP,%20December%2013,%202006%20Lowres/13.%20Appendix%20C.pdf
All	Stormwater BMPs in Arroyo Seco Watershed	Install BMPs throughout watershed to improve stormwater quality	0			2		No lead agency identified		Greater Los Angeles IRWMP, page 12 http://www.ladpw.org/wmd/irwmp/docs/Adopted%20IRWMP,%20December%2013,%202006%20Lowres/13.%20Appendix%20C.pdf
All	Trail and Habitat Connectivity in Arroyo Seco Watershed	Connect trail network and pockets of habitat	Exempt			3, 4		No lead agency identified		Greater Los Angeles IRWMP, page 12 http://www.ladpw.org/wmd/irwmp/docs/Adopted%20IRWMP,%20December%2013,%202006%20Lowres/13.%20Appendix%20C.pdf
All	Open Space Acquisition	Acquire and restore open space adjacent, or near adjacent to, the Angeles National Forest, Hahamonga Watershed Park, or downstream stretches of the Arroyo Seco to LA River Confluence	Exempt			3, 4		Mountains Recreation & Conservation Authority; SMMC		SMMC Prop. 84 Project List http://smmc.ca.gov/pdf/attachment751_Project%20List%20LAR.pdf
All	Arroyo Seco Greenway Development	Arroyo Seco Greenway development project including Arroyo Seco Golf Course and South Pasadena Woodlands preservation project	0					Mountains Recreation & Conservation Authority; SMMC		SMMC Prop. 84 Project List http://smmc.ca.gov/pdf/attachment751_Project%20List%20LAR.pdf
Central	Central Arroyo Park Habitat Restoration and BMP Implementation	Install infiltration gallery at end of Seco Street drain prior to discharge to Arroyo, protect and improve oak woodland habitat for wildlife corridor, naturalize main stream channel through golf course, plant natives on golf course,	P Part of Central Arroyo MP - CEQA Outdated			1, 2, 3, 4		Pasadena		Arroyo Seco Watershed Management and Restoration Plan, page 65
Central	Annandale Golf Course Habitat Restoration and Infiltration	Native plants and trees, reduce runoff from golf course and surrounding residents	0			2, 3, 4		Pasadena	California quail, Oak Titmouse, Spotted Towhees	Arroyo Seco Watershed Management and Restoration Plan, page 69
Central	Pasadena Reclaimed Water Supply	Extend reclaimed water line from Glendale to Pasadena	0			2		No lead agency identified; Arroyo Seco Foundation		Greater Los Angeles IRWMP, page 12 http://www.ladpw.org/wmd/irwmp/docs/Adopted%20IRWMP,%20December%2013,%202006%20Lowres/13.%20Appendix%20C.pdf

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Central	Pasadena Central Storm Drain Outlet BMPs	Install BMPs at SD outlets in Pasadena's central Arroyo Seco	P Part of Lower Arroyo MP - CEQA Outdated			2		No lead agency identified; Arroyo Seco Foundation			Greater Los Angeles IRWMP, page 12 http://www.ladpw.org/wmd/irwmp/docs/Adopted%20IRWMP,%20December%2013,%202006%20Lowres/13.%20Appendix%20C.pdf
Central	Pasadena Central Streamcourse Restoration	Establish natural stream course through Pasadena's central Arroyo Seco	P Part of Lower Arroyo MP - CEQA Outdated			1		No lead agency identified; Arroyo Seco Foundation			Greater Los Angeles IRWMP, page 12 http://www.ladpw.org/wmd/irwmp/docs/Adopted%20IRWMP,%20December%2013,%202006%20Lowres/13.%20Appendix%20C.pdf
Central	San Rafael Hills	Acquire open space in Cities of Pasadena, Glendale, La Canada Flintridge at east end of San Rafael Hills north of the 134 Freeway	Exempt			3, 4		Mountains Recreation & Conservation Authority; SMMC			SMMC Prop. 84 Project List http://smmc.ca.gov/pdf/attachment751_Project%20List%20LAR.pdf
Lower	Lower Arroyo Park Habitat Restoration and BMP Implementation	Remove concrete lining or expand and modify low flow wetlands; restore aquatic habitat, protect and restore riparian vegetation, restore coastal sage scrub and oak woodland habitat	P Part of Lower Arroyo MP - CEQA Outdated			1, 2, 3, 4		Pasadena	Spotted Towhee, Oak Titmouse, Arroyo Chub, Yellow Warbler, California Quail		Arroyo Seco Watershed Management and Restoration Plan, page 64
Lower	San Rafael Creek Restoration	Develop working group to protect and restore creek while preserving property rights; restore riparian habitat, remove invasives, remove concrete lining at bottom of creek, restore natural confluence with Arroyo Seco, develop trails and interpretative materials	N/A	1		1, 2, 3, 4		Pasadena			Arroyo Seco Watershed Management and Restoration Plan, page 69 - 70
Lower	Arroyo Seco Park/Golf Course Habitat Corridor	Restore, protect, and expand habitat along hillsides on eastside, restore and naturalize stream diversion north of Stoney Drive, plant native plants in hazards and out of bounds areas, naturalize channel in golf course, establish habitat connectivity with habitat parcels in surrounding cities and the "island" parcel	0			1, 2, 3, 4		South Pasadena	California Quail, Arroyo Chub		Arroyo Seco Watershed Management and Restoration Plan, page 71
Lower	San Pasqual Stables BMPs	Install natural stormwater BMPs along Arroyo Seco channel wall to treat runoff from equestrian center	0			2		South Pasadena		San Pasqual Stables Improvement	Arroyo Seco Watershed Management and Restoration Plan, page 72
Lower	Arroyo Seco Channel Naturalization	Study feasibility of channel naturalization between 110 Freeway and York Street, remove channel or bottom in feasible areas and restore, engineer mechanism to bring Arroyo Seco golf course diversion to elevation of Arroyo Seco, reintroduce native fish (chub)	0			1, 2, 3, 4		South Pasadena	Arroyo Chub		Arroyo Seco Watershed Management and Restoration Plan, page 73
Lower	Lincoln Heights Freeway Interchange and Restoration	Restore riparian and coastal sage throughout site, install infiltration gallery or subsurface flow wetland for Avenue 25 storm drain, create minipark with public acces	p		6	2, 3, 4		Los Angeles			Arroyo Seco Watershed Management and Restoration Plan, page 74

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Lower	Sycamore Grove Park Stream Restoration	Naturalize north branch storm drain and restore stream through Sycamore Grove Park, install subsurface structural BMP under Arroyo Seco Alternative School, daylight storm drain or install BMPs in vacant storm drain easement north of Arroyo Seco Alternative School	0			1, 2, 3, 4		Los Angeles		North Branch	Arroyo Seco Watershed Management and Restoration Plan, page 74
Lower	Welch Site BMP and Habitat Restoration	Acquire property, investigate clean-up of subsurface soil and groundwater contamination, install infiltration gallery or subsurface flow wetland for Pasadena Ave. storm drain, convert property to public open space with coastal sage and riparian habitat	0		3	2, 3, 4		Los Angeles			Arroyo Seco Watershed Management and Restoration Plan, page 74
Lower	Garvanza Park/Garvanza Elementary /Luther Burbank Middle School BMP Implementation	Install infiltration galleries under Garvanza Park ballfields and open space at NE corner and under parking areas/black top to treat Ave. 63 storm drain, install infiltration galleries under parking at SW edge of campus to treat discharge from Figueroa storm drain, if infeasible install bioretention areas and cisterns to retain runoff from onsite rooftops and parking lots	0		25	2		Los Angeles/LAUSD			Arroyo Seco Watershed Management and Restoration Plan, page 76
Lower		Redesign of pedestrian overpass linking confluence area to Cypress Street and creation of defensible open space at entrances on either side of freeway	P	Scoping Meeting	March 2009		3, 4		Claire Bowin (claire.bowin@lacity.org) (213) 473-9987		Cornfields Arroyo SP Draft, page 12 http://cornfieldsla.googlepages.com/CASPDoc11-13-08overview.pdf
Lower		Conversion of Figueroa from automobile oriented area to place to sit, walk, or wait for public transit	P	Scoping Meeting	March 2010		3, 4		Claire Bowin (claire.bowin@lacity.org) (213) 473-9988		Cornfields Arroyo SP Draft, page 14 http://cornfieldsla.googlepages.com/CASPDoc11-13-08overview.pdf
Lower		Living streets in Confluence Area	P	Scoping Meeting	March 2011		2, 4		Claire Bowin (claire.bowin@lacity.org) (213) 473-9991		Cornfields Arroyo SP Draft, page 28 http://cornfieldsla.googlepages.com/CASPDoc11-13-08stormwater.pdf
Lower		Develop open space network of designated greenways, squares, green fingers, and River/Arroyo Esplanade with native plants, stormwater BMPs, water conservation etc	P	Scoping Meeting	March 2012		2, 3, 4		Claire Bowin (claire.bowin@lacity.org) (213) 473-9990		Cornfields Arroyo SP Draft, page 4 http://cornfieldsla.googlepages.com/CASPDoc11-13-08parks_2.pdf
Lower		Implement roadway, pedestrian, transit, bicycle mobility standards with BMPs	P	Scoping Meeting	March 2013		2, 4		Claire Bowin (claire.bowin@lacity.org) (213) 473-9989		Cornfields Arroyo SP Draft, pages 5-7 http://cornfieldsla.googlepages.com/CASPDoc11-13-08circulation.pdf
Lower		Pedestrian Scale Improvements up to 1/2 mile from River	Y	Final Programmatic EIR/EIS Approved	May 2007		4		Claire Bowin (claire.bowin@lacity.org) (213) 473-9996		Draft LA RIO - page 2 http://cityplanning.lacity.org/code_studies/RioProject/LARIO/Section7.pdf

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Lower		Redesign vacant streets, cul-de-sacs, and street ends to provide pocket parks with dual pipes and SW BMPs up to 1/2 mile from River	Y Final Programmatic EIR/EIS Approved May 2008			2, 3, 4		Claire Bowin (claire.bowin@lacity.org) (213) 473-9994			Draft LA RIO - page 3 http://cityplanning.lacity.org/code_studies/RioProject/LARIO/Section7.pdf
Lower		Install traffic circles, use native plants and SW BMPs up to 1/2 mile from River	Y Final Programmatic EIR/EIS Approved May 2009			2, 3, 4		Claire Bowin (claire.bowin@lacity.org) (213) 473-9995			Draft LA RIO - page 3 http://cityplanning.lacity.org/code_studies/RioProject/LARIO/Section7.pdf
Lower		LA River Bicycle Paths up to 1/2 mile from River	Y Final Programmatic EIR/EIS Approved May 2010			2, 4		Claire Bowin (claire.bowin@lacity.org) (213) 473-9992			Draft LA RIO - page 4 http://cityplanning.lacity.org/code_studies/RioProject/LARIO/Section7.pdf
Lower		LA River Transit Amenity Improvements up to 1/2 mile from River	Y Final Programmatic EIR/EIS Approved May 2011			2, 4		Claire Bowin (claire.bowin@lacity.org) (213) 473-9993			Draft LA RIO - page 4 http://cityplanning.lacity.org/code_studies/RioProject/LARIO/Section7.pdf
Lower	LA Arroyo Seco Partial Channel Removal	Widen channel and remove concrete invert and side slopes where feasible	0			1		Army Corps/ Flood Control			Greater Los Angeles IRWMP, page 12 http://www.ladpw.org/wmd/irwmp/docs/Adopted%20IRWMP,%20December%202013,%202006%20Lowres/13.%20Appendix%20C.pdf
Lower	North Branch Stream Daylighting	Daylight Project 5202 storm drain through Sycamore Grove Park	0			1		Los Angeles		North Branch	Greater Los Angeles IRWMP, page 12 http://www.ladpw.org/wmd/irwmp/docs/Adopted%20IRWMP,%20December%202013,%202006%20Lowres/13.%20Appendix%20C.pdf
Lower	Arroyo Seco Parkway (110) BMPs	Install BMPs	0			2		Caltrans			Greater Los Angeles IRWMP, page 12 http://www.ladpw.org/wmd/irwmp/docs/Adopted%20IRWMP,%20December%202013,%202006%20Lowres/13.%20Appendix%20C.pdf
Lower	South Pasadena Partial Channel Removal	Widen channel and remove concrete invert and side slopes where feasible	0			1		South Pasadena/Army Corps/ Flood Control			Greater Los Angeles IRWMP, page 12 http://www.ladpw.org/wmd/irwmp/docs/Adopted%20IRWMP,%20December%202013,%202006%20Lowres/13.%20Appendix%20C.pdf
Lower	South Pasadena Alternative Stream Course and BMPs	Enhance existing alternative stream course near Arroyo Park through golf course, install BMPs at storm drain outlets	0			1, 2		South Pasadena			Greater Los Angeles IRWMP, page 12 http://www.ladpw.org/wmd/irwmp/docs/Adopted%20IRWMP,%20December%202013,%202006%20Lowres/13.%20Appendix%20C.pdf
Lower	Pasadena Lower Storm Drain Outlet BMPs	Install BMPs at SD outlets in Pasadena's lower Arroyo Seco	0			2		Pasadena			Greater Los Angeles IRWMP, page 12 http://www.ladpw.org/wmd/irwmp/docs/Adopted%20IRWMP,%20December%202013,%202006%20Lowres/13.%20Appendix%20C.pdf

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Lower	Pasadena Lower Streamcourse Restoration	Establish natural stream course through Pasadena's lower Arroyo Seco	P Part of Lower Arroyo MP - CEQA Outdated			1		Pasadena			Greater Los Angeles IRWMP, page 12 http://www.ladpw.org/wmd/irwmp/docs/Adopted%20IRWMP,%20December%2013,%202006%20Lowres/13.%20Appendix%20C.pdf
Lower	Los Angeles River Revitalization Master Plan Opportunity Site 13 - Arroyo Seco Confluence	Regional scale onsite water quality treatment plant, removal of concrete along east bank LA River in areas where hydraulically feasible, potential berming, installation of cisterns, or excavation to increase flood storage, linear multi-purpose trail along both sides of the river with a pedestrian connect to the Arroyo and into adjacent neighborhoods, restoration of arroyo banks and bottom, creation of urban parkland	Y Final Programmatic EIR/EIS Approved May 2007			1, 2, 3, 4		Los Angeles		Confluence Park	Greater Los Angeles IRWMP, page 19 http://www.ladpw.org/wmd/irwmp/docs/Adopted%20IRWMP,%20December%2013,%202006%20Lowres/13.%20Appendix%20C.pdf
Lower	Arroyo Seco Park	Create native riparian edge along park, installation of grass strips or swales to treat runoff from existing parking lot and nearby streets; spike bank near outlet with LA River to allow greening of bank	0			1, 2, 3, 4		Los Angeles			Greater Los Angeles IRWMP, page 21 http://www.ladpw.org/wmd/irwmp/docs/Adopted%20IRWMP,%20December%2013,%202006%20Lowres/13.%20Appendix%20C.pdf
Lower	North Branch Stream Daylighting in Sycamore Park	Daylighting 740 feet of historic creek with trash screens	0			1, 2, 3, 4		Los Angeles		North Branch	Greater Los Angeles IRWMP, page 21 http://www.ladpw.org/wmd/irwmp/docs/Adopted%20IRWMP,%20December%2013,%202006%20Lowres/13.%20Appendix%20C.pdf
Lower	Sycamore Grove	Install cistern to collect runoff, install parking lot BMPs, treat tennis court runoff through BMPs, develop swales and retention areas to process runoff, upgrade irrigation system to smart system, install permeable pathways, replace concrete swale with bioswale	0			2		Los Angeles			Greater Los Angeles IRWMP, page 22 http://www.ladpw.org/wmd/irwmp/docs/Adopted%20IRWMP,%20December%2013,%202006%20Lowres/13.%20Appendix%20C.pdf
Lower	Confluence Park 2	Conversion of industrial land to public park including watershed restoration elements such as cistern, non-structural BMPs, and a bioswale, additional of visitor serving amenities to increase awareness	0			2, 3, 4		Los Angeles		Confluence Park	Greater Los Angeles IRWMP, page 29 http://www.ladpw.org/wmd/irwmp/docs/Adopted%20IRWMP,%20December%2013,%202006%20Lowres/13.%20Appendix%20C.pdf
Upper	Upper Arroyo Seco Stream Protection and Restoration	Protection of parcels, removal or modification of parcels that impede stream passage, monitor terrestrial and aquatic fauna	0			3, 4		City of Pasadena, the Lincoln Avenue Water Company, and the Angeles National Forest			Arroyo Seco Watershed Management and Restoration Plan, page 63
Upper	Woodbury Road BMP	Convert median to planted bioretention areas to treat wet and dry weather from street LA County storm drain	0			2		Altadena, LA County Dept of Public Works			Arroyo Seco Watershed Management and Restoration Plan, page 64

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Upper	Hahamonga Watershed Park Habitat Restoration and BMP Implementation	Install infiltration gallery for Altadena storm drain prior to discharge into stream, install infiltration gallery for the Figueroa Storm Drain prior to discharge to stream, install infiltration gallery for storm drain along Ventura St. prior to discharge to Arroyo Seco, restoration of oak woodlands, riparian habitat, and scrub habitat	P Part of Hahamonga MP - CEQA outdated			1, 2, 3, 4		Pasadena	Spotted Towhee, Oak Titmouse, Yellow Warbler, California Quail, and possibly Arroyo Chub		Arroyo Seco Watershed Management and Restoration Plan, page 65
Upper	Flint Wash Restoration	Remove invasives, restore riparian habitat, remove fish barriers and improve stream geometry, establish wildlife corridor (easements, signage, and fencing replacement), reintroduce native fish	0	0.7 5		1, 2, 3, 4		Pasadena	Arroyo Chub		Arroyo Seco Watershed Management and Restoration Plan, page 67-68
Upper	Flint Wash Restoration La Canada	Develop and acquisition of easement or property to wash and stream banks, removal of invasives, restoration of native habitat, removal of fish barriers, improve stream geometry, reintroduce native fish, work with Corps to examine feasibility of removing concrete, removal concrete where possible, restore in newly unlined sections	P Part of Corps Study	0.4		1, 2, 3, 4		La Canada Flintridge and LA County Flood Control	Arroyo Chub		Arroyo Seco Watershed Management and Restoration Plan, page 71
Upper	Millard Creek Protection/Restoration	Improve Millard Creek Watershed to increase water flow and improve wildlife habitat by removing invasives and fish barriers, purchase land for conservation, educate residents	0			1, 2, 3		No lead agency identified; Altadena Foothills Conservancy		Millard Canyon Linkage	Greater Los Angeles IRWMP, page 12 http://www.ladpw.org/wmd/irwmp/docs/Adopted%20IRWMP,%20December%202013,%202006%20Lowres/13.%20Appendix%20C.pdf
Upper	San Gabriel Foothills Land Conservation	Acquire and conserve habitat in foothills of San Gabriel Mtns.	Exempt			3, 4		Angeles National Forest			Greater Los Angeles IRWMP, page 12 http://www.ladpw.org/wmd/irwmp/docs/Adopted%20IRWMP,%20December%202013,%202006%20Lowres/13.%20Appendix%20C.pdf
Upper	Woodbury Road Median Swale Pilot Project	Remove existing median, replace with swale	0			1, 2		Altadena			Greater Los Angeles IRWMP, page 12 http://www.ladpw.org/wmd/irwmp/docs/Adopted%20IRWMP,%20December%202013,%202006%20Lowres/13.%20Appendix%20C.pdf
Upper	Hahamonga Fish Passage	Remove existing barriers, incorporate passage into future projects	P Part of Hahamonga MP - CEQA Outdated			1		Pasadena			Greater Los Angeles IRWMP, page 12 http://www.ladpw.org/wmd/irwmp/docs/Adopted%20IRWMP,%20December%202013,%202006%20Lowres/13.%20Appendix%20C.pdf
Upper	Flint Wash Stream Restoration	Enhance existing unlined portion of Flint Wash though LCF and PAS	0			1, 3, 4		Pasadena/La Canada Flintridge			Greater Los Angeles IRWMP, page 12 http://www.ladpw.org/wmd/irwmp/docs/Adopted%20IRWMP,%20December%202013,%202006%20Lowres/13.%20Appendix%20C.pdf
Upper	Hahamonga Conservation Pool	Regrade basin to allow for permanent water conservation pool and splash pool for sediment	P Part of Hahamonga MP - CEQA Outdated			2		Pasadena			Greater Los Angeles IRWMP, page 12 http://www.ladpw.org/wmd/irwmp/docs/Adopted%20IRWMP,%20December%202013,%202006%20Lowres/13.%20Appendix%20C.pdf

Final Watershed Assessment of the Arroyo Seco Watershed

Upper	Hamamonga Storm Drain Outlet BMP	Install BMPs at SD outlets in Hahamonga	P Part of Hahamonga MP - CEQA Outdated			2		Pasadena			Greater Los Angeles IRWMP, page 12 http://www.ladpw.org/wmd/irwmp/docs/Adopted%20IRWMP,%20December%2013,%202006%20Lowres/13.%20Appendix%20OC.pdf
Upper	Hahamonga West Side GW Recharge Basins	Construct additional spreading basins on west side of Hahamonga	P Part of Hahamonga MP - CEQA Outdated			2		Pasadena			Greater Los Angeles IRWMP, page 12 http://www.ladpw.org/wmd/irwmp/docs/Adopted%20IRWMP,%20December%2013,%202006%20Lowres/13.%20Appendix%20OC.pdf
Upper	Hahamonga Streamcourse Widening	Re-align and widen streamcourse through Hahamonga	P Part of Hahamonga MP - CEQA Outdated			1		Pasadena			Greater Los Angeles IRWMP, page 12 http://www.ladpw.org/wmd/irwmp/docs/Adopted%20IRWMP,%20December%2013,%202006%20Lowres/13.%20Appendix%20OC.pdf
Upper	Hahamonga PWP Surface Water Treatment Plant	Renovate and improve existing surface water treatment plant	P Part of Hahamonga MP - CEQA Outdated			2		Pasadena			Greater Los Angeles IRWMP, page 12 http://www.ladpw.org/wmd/irwmp/docs/Adopted%20IRWMP,%20December%2013,%202006%20Lowres/13.%20Appendix%20OC.pdf
Upper	Lincoln SPS and Surrounding Streets	Improve drainage on Loma Alta, incorporate trail improvements with Lincoln SPS	0			1, 3, 4		No lead agency identified			Greater Los Angeles IRWMP, page 12 http://www.ladpw.org/wmd/irwmp/docs/Adopted%20IRWMP,%20December%2013,%202006%20Lowres/13.%20Appendix%20OC.pdf
Upper	Upper Arroyo Seco Barrier Removal	Remove barriers to fish movement, especially upstream of Hahamonga	0			1, 3		Angeles National Forest			Greater Los Angeles IRWMP, page 12 http://www.ladpw.org/wmd/irwmp/docs/Adopted%20IRWMP,%20December%2013,%202006%20Lowres/13.%20Appendix%20OC.pdf
Upper	Brown Mountain Dam Removal	Remove Brown Mountain Dam	0			1, 3		Angeles National Forest		Brown Mountain Dam	Greater Los Angeles IRWMP, page 12 http://www.ladpw.org/wmd/irwmp/docs/Adopted%20IRWMP,%20December%2013,%202006%20Lowres/13.%20Appendix%20OC.pdf
Upper	Flint Canyon Trail Restoration Project	Construct slope shoring wall and widening of existing trail along Flint Canyon	0			3, 4		Pasadena/La Canada Flintridge		Flint Canyon Trails & Habitat	Greater Los Angeles IRWMP, page 18 http://www.ladpw.org/wmd/irwmp/docs/Adopted%20IRWMP,%20December%2013,%202006%20Lowres/13.%20Appendix%20OC.pdf
Upper	Stream Restoration of North Branch	Stream restoration of north branch and stormwater management enhancements	0			1, 2		Mountains Recreation & Conservation Authority; SMMC		North Branch	SMMC Prop. 84 Project List http://smmc.ca.gov/pdf/attachment751-Project%20List%20LAR.pdf

Appendix C

**Memorandum: Flood Hazard, Sediment Management,
and Water Feature Analyses, Hahamongna Watershed
Park, Pasadena, CA**

Memorandum

To: Tim Brick, Arroyo Seco Foundation

From: CDM Team

Date: April 29, 2010

*Subject: Flood Hazard, Sediment Management, and Water Feature Analyses,
Hahamongna Watershed Park Pasadena, CA*

Introduction

CDM, under contract to the Arroyo Seco Foundation, is preparing an Arroyo Seco Watershed Assessment (ASWA) to attract funding for restoration projects in the Arroyo Seco watershed. The ASWA scope of work includes a review of relevant documents addressing hydrologic, hydraulic, and sediment transport characteristics of the Arroyo Seco watershed. The scope also includes documenting baseline conditions, opportunities, constraints, and recommendations to improve the natural hydrologic function of the watershed along with habitat improvements in the watershed. This memorandum provides an analysis of Flood Hazard, Sediment Management, and Water Features in the Hahamongna Watershed Park. The contents of this memorandum will be included in the ASWA document.

Philip Williams and Associates (PWA) prepared a report for Takata Associates, dated January 20, 2000, that addresses flood hazards, sediment management and water features in the Hahamongna Watershed Park, located between the Devils Gate Dam and the Jet Propulsion Laboratory (JPL) bridge in Pasadena, California. This park encompasses a number of features associated with the Arroyo Seco drainageway, including:

- Devils Gate Dam operated by the Los Angeles County Department of Public Works (LACDPW) for the management of Arroyo Seco floods and associated sediment loads.
- A series of 13 percolation ponds owned and operated by the City of Pasadena for the recharge of the Raymond Basin aquifer. These ponds are referred to in the report as the “spreading grounds”.

- Passive and active recreational activities associated with the Watershed Park.

The PWA report summarizes a study undertaken as part of a master planning process conducted by Takata and Associates for the City of Pasadena. The objectives of the study include:

- Evaluating flood hazards within the park,
- Developing a sediment maintenance strategy for the park, and
- Assessing the feasibility of a water feature in the park.

Recommendations made in the PWA study include:

- Facilities within the park should be located outside of the designated flood and debris inundation zones or constructed to withstand inundation,
- Sediment management should be limited to Areas 1 and 2 in the park, as identified in the PWA study and located in Figure 1, that are currently active Arroyo Seco sediment and debris inundation zones. Sediment in both areas should be excavated using a strategy that is based on maximum elevations of deposition and not a regular schedule.
- Maintain the primary function of the Devil's Gate Dam to control flood volumes and peak flows to minimize downstream property damage, but analyze dam operations to maximize groundwater recharge and "flow-assisted" sediment discharge.
- Restore a natural Arroyo Seco riparian zone within the park, including an intermittent open water feature, through restoration of a natural flow regime.
- If the percolation ponds are to be maintained in the park, ponds 12 and 13 should be eliminated and replaced with ponds to the west of the active Arroyo channel, removing groundwater recharge facilities from the most active part of the upstream depositional area, described in the PWA report as Area 2 (see Figure 1).
- Consider pumping water contained in the water feature up to the spreading grounds. However, the study hesitates to recommend such a pump-back system due to its cost and location in the flood and debris inundation zones.

Background

The PWA report provides an extensive section that characterizes the Arroyo Seco channel and watershed. Arroyo Seco is a first-order tributary to the Los Angeles River that originates in the San Gabriel Mountains, a range that is regarded to have one of the highest erosion rates in the world. The combination of geologic, climatic and topographic characteristics of the Arroyo Seco headwaters results in flood hydrographs that have steep ascending and

descending limbs and high peak flows. This type of hydrograph is characterized as “flashy”. In addition, flood flows are also characterized by high concentrations of sediment and debris. As the Arroyo Seco channel exits the San Gabriel Mountains, its gradient decreases and conveyance area increases, resulting in decreased velocity and sediment transport capacity. This reduction of sediment transport capacity causes Arroyo flows to deposit excess sediment and debris, creating a geomorphic feature called an alluvial fan. The Hahamongna Watershed Park is located on such a feature, albeit one that has been modified by the presence of the Devil’s Gate Dam. Alluvial fans are generally known to be highly dynamic areas where the active channel constantly migrates across the fan as deposited sediment eliminates channel capacity causing flow to overflow perched banks and establish a new channel in a lower, adjacent location. The combination of flashy hydrology and high volumes of sediment creates a highly dynamic flow situation that can cause extensive damage to development located in flood inundation zones. Devil’s Gate Dam is intended to prevent such damage downstream by retaining excess sediment and flow. This flood control and sediment management strategy requires stringent operational procedures to maintain flood storage capacity that can be diminished by trapped sediment. The LACDPW maintains the operational capability of the dam through the excavation of excess sediment and debris and controlled releases of stored floodwaters and base flow intended to sluice sediment downstream, a procedure referred to in the PWA study as “flow-assisted sediment transport”.

Downstream of the San Gabriels, the Arroyo Seco is a highly manipulated drainageway that not only includes the spreading grounds and Devil’s Gate Dam, but also long reaches of concrete-lined trapezoidal or rectangular channels needed to efficiently move large volumes of water downstream to the LA River and its coastal outfall. The result of this manipulation has included loss of floodplain and habitat throughout the drainageway, necessary due to encroachment of urban development that in many areas extends up to the edge of the channel. An obvious approach to eliminating flood hazard risks and depositional impacts is to restore of the functions inherent in a natural drainageway including reestablishing the sediment storage capacity of alluvial fans and the flood storage capacity of floodplains, this can be done by purchasing properties and eliminating structures located in flood inundation zones. Renaturalizing the Arroyo Seco in this manner would mean that the concrete-lined channels could be removed and, depending on the degree of reestablishment, potentially the Devil’s Gate Dam. In addition, restoration of the natural channel and floodplain would maximize recharge of the associated alluvial aquifer and eliminate the need for spreading grounds and associated water supply infrastructure.

Unfortunately, the reestablishment of a natural floodplain and channel through the acquisition of flood prone properties and elimination of structures in the flood hazard zones would result in the displacement of homes and businesses and a reduced revenue base for municipalities already strapped for money to pay for mandated public services, not to speak of property purchase costs. Thus, engineers, architects and planners are tasked with identifying increasingly imaginative ways to apply “band-aids” to a system that becomes increasingly difficult and more expensive to maintain and, in the long run, may not prove

sustainable. This, in essence, is the approach being taken on Arroyo Seco and innumerable other watersheds as attempts are being made to meet flood and sediment control; water supply; recreational; and habitat enhancement objectives in a system that is increasingly constrained by urban development. However, watershed managers are increasingly realizing that eventually, the system will become unsustainable and will break down under the stress and strain of a series of natural catastrophes that would not be catastrophic under natural conditions. Consequently, allowing floodplains and stream channels to be kept free of development and allowed to evolve unhindered as open space corridors through both urban and non-urban areas is probably the only long-term sustainable method to effectively manage flood and sediment/debris flows.

Assuming that the purchase of flood prone properties and renaturalization of stream channels and floodplains is unachievable in the near future, it is necessary then to look at means for reducing risks associated with flood and debris flows. In addition, it is also beneficial, both socially and environmentally, to reestablish habitats and increase recreational opportunities along drainage courses associated with flood and debris risk reduction. The PWA study has taken this approach with a focus on the Hahamongna Watershed Park as a reach of Arroyo Seco that can be improved to meet multiple objectives that include flood and sediment/debris management, habitat enhancement, increased recreational opportunities and water supply augmentation.

Following are comments regarding the recommendations contained in the report.

- As stated in the PWA report, geomorphic- and sediment-related flood hazards are very unpredictable. As is also stated in the report, modeling results presented should be assumed to be order-of-magnitude predictions of sediment delivery and erosion - especially as an assessment of the long-term flood-related hazard, which can change as each passing flood changes the topography and climate change modifies precipitation and wildfire patterns.
- The Hahamongna Watershed Park reach of Arroyo Seco receives highly sediment-laden flows originating in the upstream San Gabriel Mountains, an extremely dynamic area whose characteristics are constantly changing and evolving. These watershed characteristics require an on-going analysis including further assessment of the ability to store flood and sediment flows that could impact water storage and/or infiltration capacity. These assessments should include a subsurface investigation of the infiltration zone to identify percolation rates, an analysis of the impacts to percolation rates due to predicted sediment and debris accumulation and an identification of associated existing park facilities such as the spreading grounds diversion structure and ponds that will need to be modified, relocated, or decommissioned as part of future water supply augmentation improvements.

- The PWA report recommends that the spreading grounds be abandoned in favor of in-stream infiltration and a seasonal water feature behind the dam. If use of Devil’s Gate Reservoir for conservation storage is an acceptable operational approach and the Raymond Basin adjudication can be modified to allow recharge credits for individual purveyors from on-line infiltration in the Devil’s Gate Dam pool, then it is possible that supply yields could increase over current spreading ground results. Several issues exist with regards to modifying infiltration facilities within the park, including:
 - During higher flows water would not have the time or ability to percolate in the Arroyo Seco channel due to the grade and topography of the basin floor and would therefore flow to the dam. This added storm water, which would normally be diverted to the spreading basins, would result in the reservoir filling up more rapidly and since the seasonal incoming totals already exceed the limited capacity of the reservoir, even more storm water would be lost to the ocean.
 - The master plan state that this alternative does not meet some of the basic master plan goals and objectives, nor does it adequately address the operational constraints of the involved water agencies, and, therefore, was eliminated from further consideration.
 - Per the master plan, Pasadena Water and Power (PWP) operates the 13.1 surface acres of spreading grounds for the Raymond Basin Management Board (RBMB). Any modifications to the spreading ground facilities including operation and maintenance of the facilities and any changes to use of the water or location of the recharge facility must be approved and supported by PWP and the RBWB.
 - In addition, any changes to the adjudicated water rights associated with the spreading grounds and recharge of the Raymond Aquifer, Pasadena’s right to water from the Arroyo currently requires that it be diverted from the stream. The limits of what exactly constitutes a diversion and how it alternatively could be achieved would require consultation with the California Water Resources Control Board.

The amount of infiltration that can occur if the extent of the spreading grounds is increased to include the Devil’s Gate flood storage/conservation pool is unknown; a detailed study and analysis will be required to assess the degree to which infiltration can occur through the underlying substrate. Some preliminary observations:

- The master plan calls for the creation of a seasonal flood storage/water conservation pool behind the dam. Water from the pool would be pumped back to the spreading grounds rather than direct infiltration in the pool. The Raymond Basin requires that any changes to the spreading area and average annual quantity of water spread be equal to or greater than current quantities. PWP has estimated that 22-26 surface acres would be optimal to

accomplish this spreading. The master plan dedicates a total of 26 surface acres to the spreading operation. An additional eight acres will be created by the construction of three new spreading basins on the west side of the flood basin. On the east side, existing basins no.1 through no.4 will be expanded and two new basins constructed north of the existing basins, adding 4.9 acres to the existing 13.1 surface acres of spreading. Care should be taken in locating these facilities to ensure that impacts from the upstream depositional zone, described in the PWA report as Area 2, are minimized. Figure 2 includes the proposed location of the proposed spreading ground facilities. This figure is referenced as Figure 3-3 in the master plan.

- Due to the dynamic nature of the catchment area upstream of the park, on-going monitoring of watershed conditions and characteristics as well as infiltration rates, storage capacities habitat and park facilities will be necessary to maintain capacities and operational characteristics.
- Ponding flow behind the Devil's Gate Dam for two weeks at a time after a flood may be feasible if, as PWA recommends, the reservoir is drained immediately upon a forecast of rain. Los Angeles County has an existing project concept to store more water behind Devil's Gate Dam to be pumped to Eaton Wash spreading grounds.
- Open water features in the park will be dependent on Arroyo Seco flows and groundwater levels. It will be necessary to integrate geomorphic characteristics that develop in response to sediment loads and hydrology resulting in physical features, similar to those found on alluvial fans, with upland and riverine habitats that include riparian, open water and coastal sage scrub upland communities that support such species as the California gnatcatcher and provide passive and active recreational opportunities.
- Riverine and other alluvial features must be incorporated into the park in a way that accommodates the dynamic geomorphic processes that characterize Arroyo Seco.
- Most importantly, it is necessary to acknowledge that the quickly-changing nature of the Arroyo Seco requires the need for managers and designers to be flexible and responsive in developing park plans and maintaining implemented improvements. It is necessary to maintain an awareness of ever changing watershed characteristics and continuously updating improvements to address changing conditions.

The concept of City recharge credit for on-line channel and dam pool infiltration should be explored in greater detail. There may be a number of options for groundwater augmentation that could include maintenance or modification of the existing spreading grounds, expansion of the spreading grounds to include the entire inundation area behind the Devil's Gate Dam or an option that includes a combination of percolation ponds that take advantage of the dam pool as well as other constructed pools throughout the park. For instance, one or more of the percolation ponds could be rimmed with paths, benches, interpretive areas, perimeter habitat

and shade trees to provide recreational and habitat benefits. These ponds could continue to serve their primary purpose as recharge areas, and be cleaned out periodically to maintain infiltration capacity without significantly affecting the recreation and habitat experience. City of Pasadena infiltration allotment flows in excess of the spreading basin infiltration capacity could be allowed to infiltrate in the stream bed or dam pool for additional recharge credit as PWA envisions. This would:

1. Keep the spreading basins operational to maintain City usage rights;
2. Enhance habitat, recreational features and water features that would be integrated with high frequency flood inundation zones;
3. Maintain the City credit for groundwater recharge; and,
4. Not adversely affect the flood control function of the basin.

The Hahamongna Watershed Park can be developed into a multi-use facility that supports a number functions that include habitat and recreation in addition to flood control, sediment management and water supply augmentation. However, as is readily apparent from the analyses presented in the PWA study, careful consideration must be given to siting facilities and enhancements. The current configuration has provided flood control, reduced sediment impacts and groundwater augmentation, but at the expense of habitat and potential recreational opportunities.

Design considerations for future restoration and multi-benefit opportunities include the following:

1. Suspended sediment in flood flows will be deposited within the flood prone area of the park below the JPL bridge. Depending on the size of the flow and headwater catchment area conditions, such deposition can be considerable, inundating and damaging improvements in the flood prone area. Ideally, this area should be left unimproved, evolving naturally as sediment moves through the system. However, the need to provide water supply augmentation means that the system will have to be manipulated by mechanical removal of deposited sediment to maintain infiltration rates.
2. The potential exists to expand the spreading grounds throughout the flood prone area behind the dam; however, this approach will require active sediment management that could disrupt habitat and recreational facilities. Design analysis should be undertaken to develop a sediment depositional zone in the location identified in the PWA study as Area 2, adjacent to the existing spreading ground ponds and downstream of the JPL bridge. This area currently supports what appears to be a braided channel morphology, and, as identified in the PWA report, a significant area

of coastal sage scrub, an ecosystem that has the potential for high levels of species diversity. The coastal sage scrub is considered an endangered ecosystem that contains a number of endangered species and is listed as an Endemic Bird Area. In particular, the California gnatcatcher (*Polioptila californica*) is currently being used as an umbrella species to protect the endemic flora and fauna of this region from urban development. The coastal sage scrub eco-region is associated with riparian lands and oak woodlands, both of which are included in the park. Located on highly valued coastal real estate and threatened by human development, the coastal sage scrub ecoregion represents the struggle between preservation and human development and, therefore, this zone should be preserved in the park. Needless to say, a challenge exists between preserving valuable existing habitats and properly managing sediment deposition in such a way that ecological and environmental disruptions are minimized.

3. Areas subjected to high rates of sediment deposition will also experience high rates of disruption as vegetation is inundated and covered. This process can be viewed as one that naturally occurs in alluvial fan environments. Therefore, an appropriate approach to sediment management is to set aside Area 2 as a depositional zone, alluvial fan remnant with the expectation that it will be regularly inundated and experience periodic depositional episodes. This area should be adequately sized as a sediment trap forebay to the dam flood storage/water conservation pool. Care must be taken that the spreading ground increase proposed in the master plan is adequately protected from Area 2 sediment and floodwater inundation.
4. Coastal sage scrub communities should be preserved and encouraged around flood and sediment inundation zones as well as in the riparian corridor between Areas 1 and 2 as identified in the PWA study. These communities should be interspersed or associated with oak woodlands communities. An oak grove currently exists on the terrace above the flood prone area. Oak should be encouraged in areas of low recurrence interval flooding (50-year and capital flood inundation zones); perhaps oak groves or savannahs interspersed amongst sage scrub.
5. The PWA study identifies an intermittent water feature near the dam, in, or also near, sediment Area 1. This feature is intermittent because it will fill in response to runoff events, drying up between events. Typically, one would expect the feature to contain water during the wet season (October through May) and be dry during the summer months, depending on the weather. This feature can be expected to fill with sediment and debris over time that will require mechanical removal. PWA has recommended that the removal be based on a designated fill elevation as opposed to regularly scheduled excavation. This approach is reasonable and could result in fewer removal episodes with a lower impact on surrounding vegetation and habitat. However, during wet cycles, it may also result in more excavation episodes, which would probably be necessary anyway. A review of 2007 Google Earth™ aerial imagery indicates the presence of an open water body near the dam, adjacent to Oak Grove

Drive (see Figure 3). This location is near that described in the PWA report and could be improved to provide recreational and habitat benefits.

The PWA report provides a conceptual basis for multi-use/multi-function improvements to the park that could provide a cohesive design that preserves flood control and sediment management capabilities, possibly improved groundwater augmentation and enhancements to habitat and recreational activities. The risk associated with these improvements is based on the highly dynamic character of Arroyo Seco. It is extremely difficult to manage flows and sediment in the drainageway and during high flow years that may be combined with headwater areas denuded by wildfires, any improvements in the park's riparian zone could also be overwhelmed. The chances of this happening are unknown as climate patterns become more chaotic and unpredictable. As stated earlier, the most sustainable approach to flood control and sediment management is to restore the natural channel and associated floodplain and allow the arroyo to evolve on its own. The high expense associated with this approach, in terms of property acquisition, lost tax revenue, lost land development profits, and impacts to families and businesses may not be as high, in the long run, as continued maintenance in the watershed to protect and repair flood prone properties and facilities.

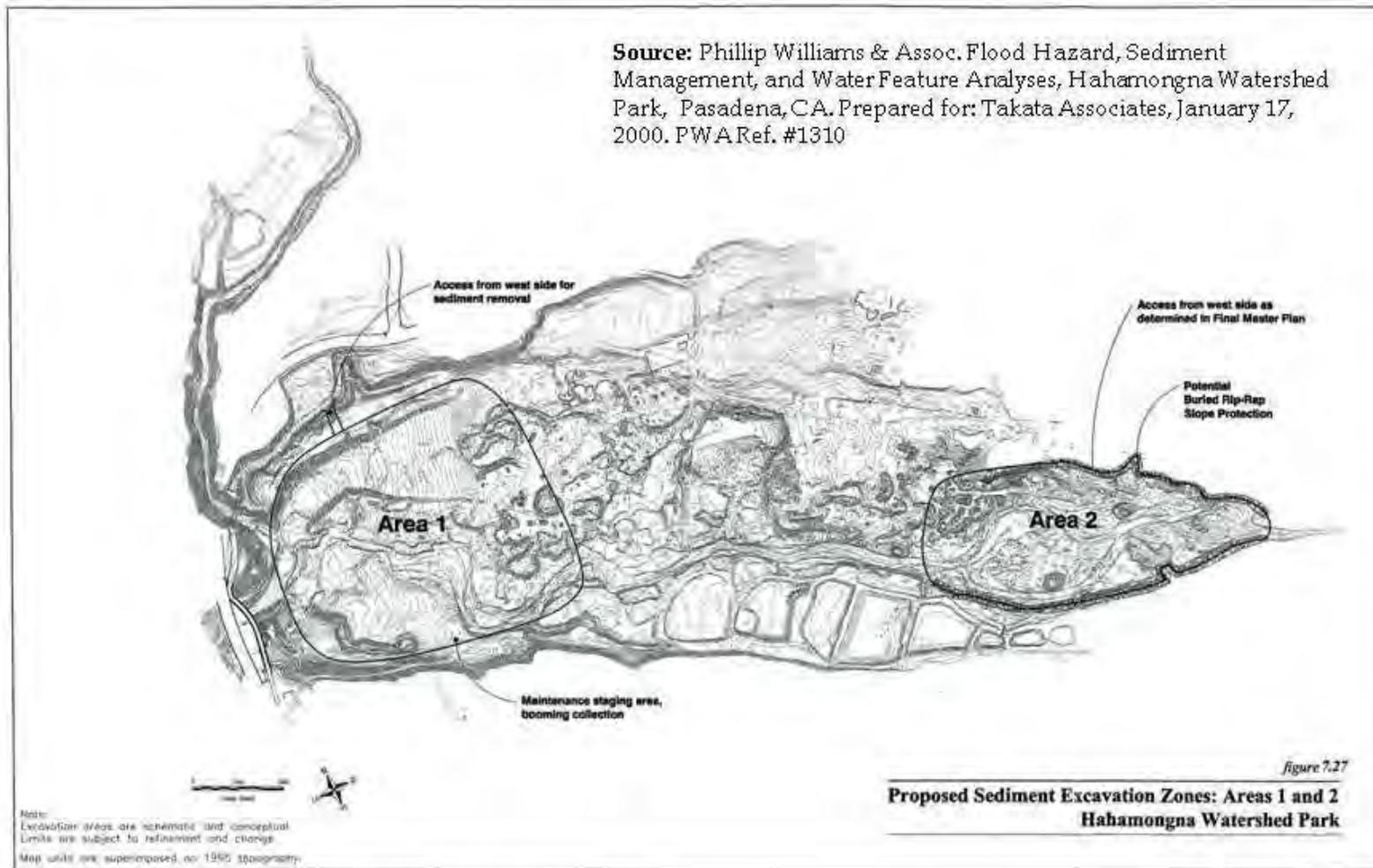


Figure 1 – Areas 1 and 2 Sediment Deposition Zones

**HAHAMONGNA WATERSHED PARK
MASTER PLAN
Spreading Basins & Northeast
Parking Area**



Figure 2 Proposed Spreading Basin Locations



Figure 3 Open Water Pool October, 2007

Appendix D

Arroyo Seco Watershed Assessment Meeting Notes

- Arroyo Seco Greenway Meeting (January 7, 2009)
- Arroyo Seco Foundation Site Tour (October 24, 2008)
- CASO Meeting Minutes (April 20, 2010)

Arroyo Seco Greenway Meeting Notes

1.0 Introduction

On January 7, 2009, the Arroyo Seco Foundation met with CDM in the Los Angeles Office to discuss an approach to scoping a document related to the Arroyo Seco Greenway. Attendees included Tim Brick, Nicole Possert, and Meredith McKenzie of the Arroyo Seco Foundation and Dave Ebersold, Wendy Katagi, Fred Glick, Darren Hartwich, and Nicole Cobleigh of CDM. The Arroyo Seco Greenway is related to CDM's scope of work on the Arroyo Seco Watershed Assessment. See excerpt from CDM's scope of work below regarding the purpose of the Arroyo Seco Watershed Assessment.

"Purpose of the Arroyo Seco Watershed Assessment: The purpose of the subject Watershed Assessment is to identify, prioritize and pursue funding for restoration projects that meet or exceed the restoration goals identified below:

Restoration Goals

- Restore the Natural Hydrological Functioning of the Watershed
- Better Manage, Optimize, Conserve Water Resources While Improving Water Quality
- Restore, Protect and Augment Habitat Quality, Quantity and Connectivity
- Improve Recreational Opportunities and Enhance Open Space

In this way, the Arroyo Seco Watershed Sustainability Campaign (ASWSC) will further align with the CALFED implementation priorities regarding: 1) building local community capacity, 2) development or refinement of watershed assessments and plans, and 3) development of conservation and restoration activities. The subject watershed assessment should also enhance future coordination with the Corps and other agencies relative to the Corps Arroyo Seco Watershed Feasibility Study and other related efforts."

The results of the scoping meeting provide a path forward to identify, prioritize, and pursue funding for restoration and multiple benefit projects that meet or exceed the restoration goals identified earlier. An initial Arroyo Seco Greenway paper will be produced that describes overarching vision for the Arroyo as well as the key elements of the Arroyo Seco Greenway. An Arroyo Seco Greenway outline and document will be prepared. Refer to meeting notes and action items below.

1.1 Responding to Call for Projects

- Pent up demand for projects
- ASF has a variety of projects, but they have not been consolidated as one package
- WPA 1930's model but more comprehensive and update to 21st century
- Emphasis on multi-modal transit in corridor
- Shape into a program
- Moving from planning and concepts to implementation
- Renewing WPA project
- Trail project styled to link entire Arroyo Seco
- Congressmen Adam Schiff and Xavier Becerra to repair rock walls and trails and upgrade to a new standard with historical, community buy in
- Potential partnership with Corps
- For CEQA/NEPA purposes lead agency could be Santa Monica Mountains Conservancy, LA County, or JPA

1.2 Review of Planning Projects

- 1911 J.B. Lippincott's design for Arroyo Seco
- Watershed Restoration Feasibility Study had 85 projects
- 2004 Caltrans Corridor Management Plan
- City of Pasadena planning efforts – Masterplan
- 2002 Corps' Reconnaissance Study on Ecosystem Restoration
- Corps' Feasibility Study moving slowly, but up to 5 projects with 70% federal match
- 2005 Linkages Study in LA (identified projects but did not cost them out)
- 2006 NE Trees Arroyo Seco Watershed Management Plan (contains rough costs for prioritized projects)
- IRWMP contains series of projects (15 major Arroyo Seco projects identified; some are flushed out and most are general except for disadvantaged community grants)

- 2002 National Scenic Byway (FHWA) Corridor Management Plan (2004) included a general list of projects with a tourism economic development emphasis
- Cal Poly Pomona student project (2000) multi-modal transit emphasis
- Community of LA has been actively involved in project identification and development
- City of LA Economic Development Corridor (Clean Tech Corridor) from Confluence to Long Beach
- LA River Master Plan: draft on bike trails out for public review, specifically addresses walkways and bike trails in regard to lower Arroyo Seco
- Upper LA IRWMP Steering Committee (DAC included)
- Cornfields Specific Plan in public review in March 2009
- Confluence Gateway activity node
- Debs Community Corridor connects Debs Park to Goldline, North Ranch, SW Museum

1.3 Priorities to Consider

- Quality of jobs (skill set mix such as artists and rock wall repair)
- Green infrastructure
- Greenbelt needs to coordinate with bigger Corps channel ecosystem restoration (i.e. no limit future restoration possibilities associated with channel naturalization)
- Road interface with park will require Caltrans partnership
- National register eligible roadway and concrete recycling in conjunction with replacement of underlying stormwater infrastructure to improve water quality of discharge to Arroyo Seco
- City of LA has an ongoing sewer project in vicinity (NE sewer issues)
- Multi-purpose and shovel ready projects
- Reference work in Arroyo Seco in byway study and vice versa

1.4 Schedule Considerations

- Scenic byway: potential study money at small scale, potential use for further studies, application due mid-February
- Stimulus package
- Utilize Watershed Assessment contract (CDM) due June 09

- Creation of governance structure for Arroyo Seco; JPA greenway agreement to push governance issues

1.5 Other Considerations

- AB 31: requires outreach for parks prior to applying for grant applications
- How to form a JPA; bring together agencies in watershed; address trails, habitat restoration
- Linking project for all communities along Arroyo Seco would be the trail
- Look at City of LA GP, River Revitalization Plan, Cornfield SP and other relevant planning documents: connectivity to linkages elements
- City of LA RAP waiting to see how AB31 would turn out; looking for money to be gained; City of Pasadena OS plan completed by end of June
- NE Community Plan connectivity issues
- Highland Park Specific Plan station overlay HPO Zone
- Deb's Park Audubon Center 2001 environmental document on framework document connecting to community; link Ramona Hall to Audubon Center
- Use CDM Watershed Assessment scope to address Pasadena and LA
- Cost and schedule controls will be HIGH; accountability is key
- Parkway priorities: Byway program grant funding allows Nicole Possert more time to coordinate with CDM's watershed assessment
- Assemblymember Kevin de Leon
- Two page concept; integrated planning program structure
- Start reconnaissance; Senator Hilda Solis new labor lead; What is the real bottom line? Game plan for getting jobs. What does the new administration want?
- Rails to trails conservancy: job development coming out of trail development
- Alliance for Water Efficiency: jobs related to water conservation and efficiency
- We are styling an earmark but Obama is saying no earmarks; alternative is a competitive process with jobs at the top and long-term infrastructure needs are key; economic stimulus will be completed in 2 months.
- How do I tailor my project to meet multiple criteria?

- Linkages are about putting a community back together. It is a broken community that needs to be fixed.

1.6 Arroyo Seco Greenway Concept Elements

- Two page concept description, to be completed under existing CDM Watershed Assessment contract
 - 1) Overarching Vision for Arroyo
 - a. Use existing linkages model and extend to other communities upstream and include water resources and restoration
 - b. Vision is an outgrowth of grassroots efforts (bottom up)
 - 2) Geographic Boundaries
 - a. Confluence to Angeles National Forest
 - b. Linear corridor
 - c. Arroyo Seco watershed with a neighborhood shed overlay
 - 3) Identify early action projects that are part of overall vision with community driven process in place
 - 4) Identify economic impact
 - 5) Identify reduced greenhouse gas emission associated with transit mode shift
 - 6) Consider all participating agencies/jurisdictions/interested parties, as appropriate; look at proportional distribution of projects per mile or other unit
 - 7) Include tourism
 - 8) Proposal to JPA setting tone to be completed under a separate document by ASF

1.7 Action Items

Task	Who	Due
Draft Arroyo Seco Greenway	CDM Wendy, Darren, Nicole NC,	1/21/09

Final Watershed Assessment of the Arroyo Seco Watershed

Document with graphic map	Fred	
Historic Images	Nicole P.	1/14/09
Forward Looking Images (such as Linkages and River Keepers)	Fred/Meredith	1/14/09
Vet Projects (include cost estimates) <ul style="list-style-type: none"> - Road/transit - Environmental - Representation of parties - Tourism 	Nicole P. CDM Wendy, Darren, Nicole NC CDM , Wendy CDM and Nicole P	1/15/09
Research Economic Impacts <ul style="list-style-type: none"> - Construction x economic multiplier - Ed Reyes Office (Lupe Vela) - IRWMP 	CDM, Cary Meredith CDM, Darren and Meredith	1/15/09
Quantify/Research Greenhouse Gas Emissions	CDM, Darren	1/16/09
Draft JPA Document to CDM	Tim	1/14/09
Mayor's Office (fact finding and touch base)	Meredith	ongoing
Pasadena Meeting <ul style="list-style-type: none"> - Need champion - High level agency meeting with all parties - State senate participation (Carol Lew) - SMMC and MRCA 	Tim	2/18/09

Final Watershed Assessment of the Arroyo Seco Watershed

Look at trail connectivity (bike, pedestrian, and equestrian)	CDM Fred, Nicole NC/ASF Meredith/Nicole P	1/15/09
Billing Categories	Tim	Done 1/7/09
Project development assistance to move Caltrans projects forward (Tom Quasebarth & Don Schroeder - CDM)	CDM Wendy, Darren	1/20/09

MEMORANDUM

Date: October 27, 2008

To: Tim Brick, Arroyo Seco Foundation

From: Wendy Katagi, CDM
Kansai Uchida, CDM
Dave Ebersold, CDM

RE: Meeting Notes from Arroyo Seco Foundation Site Tour, October 24, 2008

The Arroyo Seco Foundation led a site tour of the Arroyo Seco beginning with a group from the U.S. Army Corps of Engineers (Corps) and County (LACDPW) and concluding with a group from the City of Los Angeles, as notated below. This memorandum summarizes discussion from both tours. A list of attendees is included at the end of this memorandum.

CORPS AND LACDPW TOUR

Rose Bowl Site

- ASF is considering removing the concrete channel running through the golf course and drawing off perhaps the first 500 ft³/sec. of flow to run through as a natural stream. The rest could be diverted into a box channel or bypass. Hydrologic and hydraulic as well as sediment modeling is needed to determine engineering feasibility of naturalization options.
- Rose Bowl Commission concerns include maintaining the revenues from the golf course, which balance the operational deficit of the stadium, and continuing to use the golf course for parking during large events. Their proposal would be to cover the existing channel entirely and expand the parking lot over it.
- Stop signs on site have been repositioned to facilitate recreational uses.

JPL Superfund Site/Spreading Basin

- The area is an alluvial scrub habitat, of which there are few remaining in Southern California.
- The site was mined for gravel for several decades, and operation ended 15 years ago. No reclamation efforts have been made, but much of the ecosystem has re-established itself.
- BOC wells have been closed and the tanks have been removed. Perchlorate contamination persists, and the area is designated as a superfund site.

Final Watershed Assessment of the Arroyo Seco Watershed

- The National Forest begins just north of the site, and the parking lot at the mouth of the arroyo is scheduled to be removed.

Devil's Gate Dam/Flint Wash Bridge

- Deaths during the 1914 and 1916 floods spurred the formation of County Flood Control and the construction of Devil's Gate Dam in 1920, its first project.
- The dam was closed after the 1971 Sylmar Earthquake, and reopened with a new spillway four times the size of the original.
- Flint Wash Bridge was washed out about 20 years ago and was reconstructed last year. There was some flow underneath the bridge at the time of the tour, and overall the setting was inviting for pedestrian and equestrian uses. There was some visible water pollution, perhaps soap suds.
- The bridge re-establishes a 3.5 mile trail loop (with some discontinuities) around the Hahamongna watershed and proximate to the Rose Bowl.

Lower Channel

- The facility is 60 years old and was designed to get water out of the area as quickly as possible, during a time when it was assumed that California would be able to rely on imported water indefinitely.
- Stream restoration, concrete removal, addition of meanders and terracing, etc. would need to be balanced with safety concerns about keeping the public away during flooding, though this is already an issue with the existing channels.
- ASF states that the area is one of the best candidates for stream restoration in the country.

South Pasadena/Lower Arroyo

- Caltrans may be interested in assisting with mitigation at this site, because it lies adjacent to SR-110. Caltrans is actively seeking local proposals for mitigation projects, though it may move slowly with implementation or granting of permission.
- The channel is owned by the City of Los Angeles, but it is sandwiched between Caltrans property and City of South Pasadena property at this site. As such, the City of Los Angeles

may be uninterested in using Proposition O funds to finance restoration here, since the project would primarily benefit South Pasadena residents.

- There is a golf course with a small stream running through it near the site, separated from the channel by a small parking lot and an access road. The stream may make a good case study for how the proposed stream through the Rose Bowl golf course might look.
- Pedestrian access to the site is constrained by the freeway and the steep difference in elevation between the park and Arroyo Dr.

Sycamore Grove Park

- Sycamore Grove Park is located between Figueroa St. and the Pasadena Freeway just south of Avenue 49. The Arroyo Seco channel is located on the other side of the freeway.
- The park is located in a Historic Preservation Overlay Zone, due to the historic houses located across Figueroa St. This section of Figueroa is also designated as part of historic Route 66.
- The Southwest Museum Metro Gold Line station is located one-half block west of the park, and there is a pedestrian crosswalk at Woodside Dr. to provide access across Figueroa St. between the park and the station.
- There is a pedestrian bridge over the freeway and the channel to Ernest Debs Regional Park and S. Avenue 52.
- The watershed near the Southwest Museum runs into a storm drain that crosses 25 ft. beneath Figueroa St. and the park to reach the channel. The stream could potentially be daylighted after crossing under Figueroa to produce a riparian park between Figueroa and the channel. There may be concerns about preserving pedestrian access through the park, loss of lawn space, and retaining the nearby playspace.

CORPS, LACDPW, and CITY OF LOS ANGELES (Separately)

Confluence

- The Avenue 19 bridge seismic rehabilitation project is just being completed across the Arroyo Seco Channel, adjacent to the confluence with the LA River.
- ASF is interested in opening up the confluence as much as possible.
- The City of Los Angeles representatives explained that the LA River is a uniquely fast-flowing, high-volume river, and this presents special challenges for restoration.

- There is a lot of transportation and utility infrastructure at the confluence, including the Avenue 19 bridge, the San Fernando Rd. bridge, the I-5 crossing, the SR-110 crossing, the interchange ramps connecting the two freeways, a freight rail line, the Metrolink Ventura County and Antelope Valley right-of-way, and the Metro Gold Line.
- The city officials warned that extensive and costly reconfiguration of all of these transportation facilities would be needed in order to remove any concrete from the channel, though it is feasible from an engineering standpoint.
- The confluence is oversized for capacity, so there is some flexibility for changes.
- The city had considered a bike path in the channel, but this idea was discarded over safety and access concerns. A bike path along the rim of the channel may be more suitable.
- The state owns the nearby Taylor Yard and Cornfield sites, but little has been done at the confluence due to the technical constraints.
- This site is covered by the City's confluence Specific Plan. The city envisions stormwater quality improvement, some habitat restoration, and opening the site to the public at certain locations.

Final Tour Comments

- At the confluence, the Corps representatives explained that they can include recreational elements in their restoration projects, though they can't pursue solely recreational projects along their facilities. Projects must attain a cost effective habitat/ecosystem restoration project by federal standards, and the Corps has to base their arguments for each project in ecosystem benefits. This may disadvantage projects in urban areas where the built-up infrastructure and engineering constraints result in significantly higher costs. Typically, the Corps can carry out the ecosystem project and at least make accommodations for the city to the recreational portion.
- The Corps tends to focus on ecosystem restoration with a target species as a primary goal. This ecosystem-driven approach typically results in better water quality and aesthetic improvements that are also beneficial to the surrounding community. Stated goals include maximizing sustainability and retaining flood control without compromising the potential environmental benefits of restoration.
- The language used by congress is important, and projects are only certain to move forward if the Corps is "directed" to carry them out. Getting a Senator or Representative to include language to "direct" projects to be carried out would be helpful.
- The City officials added that, because of the unique technical and engineering constraints, LA River projects frequently get passed over for funding in favor of less expensive river projects elsewhere in the country that perform better under federal cost-effectiveness criteria.

- In light of the recent downturn in the economy, the government will likely begin to focus more attention on job-creating infrastructure projects. However, much of the nation's capital infrastructure is decaying, and will compete for Corps funds.

Afternoon Meeting Comments

- The County's approach to the Arroyo Seco thus far has been to propose creating a box channel along the current route and a low-flow stream somewhere else, though this may be dangerous due to the periodic high flows.
- ASF mentioned that flood control concerns will usually drive any habitat improvement that occurs, and this is the county's preoccupation. A strategy for approaching this is to demonstrate how a habitat project will improve flood control.
- ASF said that project grant proposals could potentially include an assessment of costs as well as the associated political and institutional challenges (i.e. the Rose Bowl golf course balancing the stadium's budget and being used for parking during events).
- One City official proposed having recreational activities such as kayaking or catch-and-release fishing at designated sites along the LA River. The Corps told the city of LA that they may be able to provide support on a modest access project.

Bureau of Sanitation Site

- The area under the freeways is Caltrans property. City property ends at the Bureau of Sanitation fence. Though Caltrans is interested in mitigation projects, it may be slow to act. At the very least, Caltrans should be able to remove the debris and stored materials from the site.
- The City wants greening and improved public access along the entire Arroyo Seco, and wants to avoid showing a disconnected segment on the grant application.
- The site is a short walk from the Lincoln Heights/Cypress Park Metro Gold Line station, though the walk would require crossing beneath a freeway. Access to the site is also limited by the narrow passage between the channel and the Bureau of Sanitation property. The site is currently secured by padlocked chain link fences.
- A bike trail through the property would provide improved access. There are constraints associated with having the bike path cross San Fernando Rd. A second archway exists beneath the bridge, though it has since been covered. In order for the archway to be uncovered, parts of the Bureau of Sanitation facility and the county parking lot across the street would need to be removed. The county would perhaps be able to contribute to the

project by allowing an easement for the bike path and re-fencing the parking lot. The bike path would need to connect into the Avenue 19 bike path at the new bridge.

- A parkway grant for a project at this site may be preferable, since improvements here would not likely include flood and stream control.
- There are rumors that the Department of Sanitation may move out of the site altogether, in which case a park or other recreational facilities may be possible.

Closing Comments

- Both the Mayor and Councilmember Ed Reyes are aware that federal funding in the coming years will be heavily focused on infrastructure. As such, they are both interested in moving the river projects forward.
- ASF recommends that the plan for the river go from the confluence all the way up to Pasadena Ave., and lumping all of the smaller projects together may help get more people behind them.
- The Cal Poly Student Study of the confluence may be a helpful reference.

Corps and LACDPW Tour Attendees

ASF: Tim Brick, Meredith McKenzie, Eileen Alduenda, Art Gonzalez

Corps: Josephine Axt, Brian Whelan, Kathy Shulman

LACDPW: Dan Sharp, Terri Grant

CDM: Dave Ebersold, Wendy Katagi, Kansai Uchida

City of LA Tour Attendees

ASF: Tim Brick, Meredith McKenzie, Eileen Alduenda, Art Gonzalez

City: Jill Sourial, Lupe Vela, Carol Armstrong, Claire Bowin, Krista Kline, Megan Whalen, Silvia Chiang

CDM: Dave Ebersold, Wendy Katagi, Kansai Uchida

CASO Meeting Minutes
April 20, 2010, 6:30-8:30 p.m.
Audubon Center

Key Presenter comment
 Audience comment

Meredith McKenzie, ASF opened the meeting at 7:00 p.m.

Arroyo Seco Parkway Improvements (Nicole Possert)

- Improve safety on 110 from I-5 to the South Pasadena/Pasadena border
- 2 major components
 - Addition of new side barriers in mostly northbound locations
 - Replace entire center barrier
- The 1996 Arroyo Seco Parkway Corridor Management Plan described rehabilitating the Parkway in an historically accurate manner
 - Included Actions for the Arroyo Seco Parkway and Corridor
 - Actions for restoring and rehabilitating the Parkway
 - Actions for building a safer Parkway
 - Actions for building and landscape framework
 - Actions for improving the environment
 - Actions for welcoming the visitor
 - Actions for engaging the public
 - Actions for maintaining the parkway
 - One of the 10 most historically important roads in the US
 - What makes the road historic?
 - Curb and gutter, pavement, lights, guardrails are like windows, dormers, eaves of a building restoration
- Post-Study Public Petitions
 - Highland Park Heritage Trust sent letter about issues it's faced to Caltrans
 - Light fixtures aren't historically accurate
 - Barriers aren't historically accurate
 - Reflective paint in the curb notches so that people know they're going the right way
 - AS Neighborhood council, etc. have asked Caltrans to stop work until these issues are resolved
- San Gabriel Watershed Council was helpful in saving many of the trees marked for removal
- If you want to help
 - Send email to assembly members Kevin de Leon and Anthony Portantino, cc Meredith, etc. so that people understand that it's a community concern
 - We want to try to change some of the design aspects
- **Comment: Safety – changing barriers instead of changing enforcement and conditions of use (speed limits, etc.)**
 - **The problem is ill-use**
 - Response: Yes! This is not classified as a freeway, it's an historic parkway. As such, recommendations:

- Lower the speed based on the geometrics, etc.
- SOUTHWEST MUSEUM COALITION
 - Museum is closed. Indefinitely
 - Goal now is how to reopen it as soon as possible. Still waiting to find funding to accept a low interest loan to restore building offered by Pasadena City?

Arroyo Seco Watershed Assessment (Wendy Katagi, CDM)

- Looking for opportunities to attract more funding for the Arroyo Seco watershed
- Agenda
 - Purpose of assessment
 - Restoration goals
 - Highlighting restoration opportunities
 - Funding
 - Schedule
 - Closing
- Purpose
 - Identify, prioritize and pursue funding for restoration projects that meet or exceed restoration goals
 - Roadmap for agencies seeking to restore the Arroyo (particularly to inform the USACE F4 currently underway)
 - Enhance cooperation and agreement on path forward
 - Attract funding
 - Implement vision
- Restoration Goals (1-4 from arroyoseco.org)
 - Restore the Natural Hydrological Functioning of the Watershed
 - Better Manage, Optimize, Conserve Water Resources While Improving Water Quality
 - Restore, Protect and Augment Habitat Quality, Quantity and Connectivity
 - Improve Recreational Opportunities and Enhance Open Space
- Projects included in ASWA (NETrees)
 - We will look at these projects and get updates
- Take fresh look at technical issues of watershed by reviewing/summarizing existing and relevant technical assessments for the Arroyo Seco
 - Hydrologic and hydraulic modeling
 - Summarize and comment on opportunities
 - Sediment management. How do we manage it? What are the opportunities and constraints?
 - Biological resources (target and multi-species restoration informs design)
 - Water quality reports
 - Water supply reports
- Highlighting Restoration Opportunities
 - The Upper Arroyo Seco Stream Sustainability Project

- Hahamonga watershed. Looking at ways to do better restoration using all of the features of the system in a fully integrated manner where habitat is a key driver
 - Improving water diversion facility for reliability and flood storage
 - Opportunities to allow stream flow to naturally infiltrate into the basin as opposed to existing diversion of stream to spreading grounds
- Arroyo Seco Greenway
 - Integrate transportation, water resource and habitat enhancement projects along the 20 miles of Arroyo Seco
 - Composed of smaller projects which would generally not require a full CEQA process
 - Tie together historic neighborhoods
 - Upgrade WPA infrastructure
 - Bring people to the river
- Linkages (on ASF website)
 - Bridge improvements
 - Restoring greenbelts
 - Maximize opportunities for habitat enhancement (e.g., sensitive birds, etc.)
- Central Arroyo Rose Bowl Improvements
 - Remove concrete channel running through the golf course and incorporate a natural stream
 - Missing component is H&H modeling. Now that the Corps has funding, they're working to get that done
 - Work with Rose Bowl Operating Committee to develop win-win improvements
- Confluence Gateway Greenway Program
 - Restore 1/3 mi stretch of urban land alongside the Arroyo Seco.
 - Riparian greenway w/bicycle path
 - Expand to include concrete removal
 - Conversion to soft bottom and terraced vegetation, where appropriate
 - Provide a focal point for restoration that brings back the importance of the confluence
 - Identify target and multiple species restoration to inform design
- Potential Funding
 - Legislative funding
 - Public/private partnership
 - Prop 1E, 84 Integrated Regional Water Management
 - Corps Feasibility Study-Key driver
 - EPA Grants
- Schedule
 - Draft Watershed Assessment (April 30)
 - Comments on ranking approach and project updates (May 5)
 - Final Watershed Assessment (May 31)
- ASWA PROJECT DISCUSSION
 - Email Wendy Katagi at katagiwr@cdm.com
 - for projects you can update
 - If you may have a new project that should be included
 - 11x17 Project Matrix: fairly recent projects; major things we need to know

- Need input on
 - Readiness to proceed (CEQA, permitting, etc.)
 - Footprint (stream/trail miles and project acreage)
 - Goals Addressed (refer to 4 main goals stated earlier)
 - % Match Secured (can be in-kind as well as cash)
- Tool for gathering information about projects in the Arroyo
- From master plan documents, ASF, NE Trees, IRWMP, Corps, stakeholders, etc.
- We will provide this electronically (website) so you can enter updates and needed information into the matrix
- Project Ranking Approach
 - **Need to find ways to get funding for projects that are high scoring, but may not be funded**
 - **Advance projects that DO have funding**
 - This is an iterative ranking tool allowing for refinement
 - Goal to show strong funding potential
 - Linking projects together
 - **2002 NE Trees study had 5 goals. Why do we now have 4?**
 - **Our goals come from the ASF Goals, also included in the grant. The 2002 study included 2 habitat related goals, whereas the ASWA has one major habitat goal. Also, the ASWA goal to restore natural hydrological function further reinforces the habitat goal-- consistent with the Goals in the 2002 Watershed Restoration Feasibility Study (NE Trees)**
 - **Quantitatively selecting projects may be too “engineering-ey”**
 - **When seeking community input, the ranking system should be very easy to understand**
 - **It would be best if the public doesn’t see the Total Score**
 - Response: we will present projects in terms of 3 levels of priority
- Who has new project?
 - **Gorganza(?) area: under construction**
 - **Condo Creep: You have to think beyond the fact that it’s an ugly faux-Mediterranean building**
 - **Just because you think you can do it, doesn’t mean that it is sustainable**
- We want to have a clear message: we have to restore our natural resource
- **Didn’t see Debs Park Restoration Plan (Martha, Nicole) in the project list**
- **River Improvement Overlay (RIO) Improvement design plan**
- **Looking at the 5 projects**
 - **It would draw more stakeholder interest if they were geographically named based on community groups (name them after neighborhoods, etc.)**
 - The presentation tonight highlights restoration opportunities in the Arroyo Seco; there will be more project references as integration of other projects and components are underway—making the assessment more robust
- **I like what you’ve done, but looking at the list, it’s going to be easier for bigger, multi-benefit projects to rank higher. Smaller projects won’t score as well, such as sweeping goals that are watershed wide**

- **Can we adequately compare distributed projects (i.e. decrease impervious area in the watershed) and centralized projects using this method?**
- Response: we will have a section that highlights the watershed-wide types of activities in addition to centralized projects
 - just like the Arroyo Seco Greenway ...
- **What about single-benefit projects? They wouldn't score as high**
- **We should enhance larger projects with the smaller, single-benefit projects**
- this is the kind of discussion we want; to be able to connect the smaller projects to the larger projects
 - **if we start identifying them by neighborhoods, zip codes, then when there's a ranking for smaller projects, local groups can find these project descriptions to help move along the larger distributed projects in their local areas**
 - **not just focus on the entire watershed, but move it to the community level**
- **TIM BRICK: a lot of the intent of this study is to inform the USACE study. We want to go to them and say "these are the projects that are important". They want to do 5 big projects. We need to pursue other mechanisms like a Joint Powers Agreement (JPA) to take on distributed programs, etc.**
 - **USACE study been going on for 8 yrs**
 - **At the end of the study (2011?) they will recommend 5 or 6 BIG projects for restoring ecosystem function in the Arroyo Seco Watershed**
 - **This ASWA project ranking is the way to come up with community support and a technical basis to try to influence the USACE results to projects we think are most important**
- **Distributed projects will usually lose out to big, centralized projects**
- We will post online a Table of Contents and Draft document for the ASWA which will include recommendations
 - JPA
 - Data Gaps
 - Distributed projects (Green Streets, rain gardens, city-wide projects)
- **How do you help people become oriented to the place their living (sense of place)?**
 - **We teach teachers to teach the students in their own areas**
 - **When I hear that area at the confluence being developed, it encourages the area of Cypress Park in a positive way. The project would bring them pride in their area, which would result in cleaner streets, safer areas, etc.**
 - **If this project at the confluence gets pushed through, the people in the area have something to be proud of and to advance**

Save Hahamonga Update (Tim Brick)

- Pasadena City was going to bring up reviewing the Athletic Fields on Monday 19th
 - They didn't talk about it on the 19th, but had it on the consent calendar to discuss later

- Hahamonga is a really environmentally rich zone
 - City of Pasadena 2003 master plan included a big athletic field in the basin
 - Environmental advisory commission and Hahamonga advisory committee raised issues to the Mayor asking that that decision be reviewed
 - It seems that ½ of the council members are open to reviewing this decision
- ASF started a petition campaign.
 - Now have ~520 signatures
 - You really get a sense of why people love Hahamonga by reading the comments on the savehahamonga.org website
 - Once they've agreed to reopen the decision, we'll start to contact city council members directly. Maybe have a community meeting on the topic and have a discussion about what it means and why we should keep it natural
- Funding for the Athletic Fields
 - Funding comes from some sources that weren't intended directly for athletic fields
 - 1992, Pasadena got 1.86M from County parks bond measure
 - There was no requirement for athletic fields, though the building of athletic fields would not be inconsistent with the grant
 - In 1996, another 1M was tacked onto the grant
 - This is money that should have been spent on Hahamonga, should have enhanced trails, restored mining, native species, etc.
 - 1M obtained from California Department of Parks soccer fund
 - In summary, 1M of the 3M was designed for soccer fields
 - They're currently going through the environmental impact report
 - The plan is to take sediment from behind the dam, create a plateau on which to create the athletic fields
 - We need to get a way to get the younger people (**Facebook**) involved
 - We want them to say "I love soccer, but I love birds, frogs, etc"; once the young people support it, it'll be all over.
 - **Why don't they just upgrade the fields that are already there?**
 - One of the City Council members, who is now not supportive of the athletic park, Jackie Robinson, wants smaller, community parks, where more casual sports are played, and bring a sense of place, as opposed to a highly regulated, high impact soccerplex.

Announcements

- Lummis Day
 - 1 week from Saturday, there's a fundraiser for Lummis Day (June 6) at the museum and Lummis home... crafts, poetry, entertainment
 - May 1 silent auction
- April 29th AS Neighborhood Council elections (anyone with a stake can vote)
- April 29th Highland Park Neighborhood Council elections
- Arroyos and Foothills Conservancy (May 1)
- May 15 & 16: Teachers Workshop
- Earth Day project at Debs Park 9-noon

Meredith closed the meeting.

CDM

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