

## Roadmap to Large-Scale Ecosystem Restoration in the Arroyo Seco Watershed

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### Abstract

The Arroyo Seco Watershed Assessment (ASWA) provides a framework for the integration of transportation, energy, water resources and restoration concerns in the development and rehabilitation of the Arroyo Seco Watershed, a subwatershed of the Los Angeles River Watershed. The framework culminates with top tier restoration projects spanning the entire watershed from the crest to the confluence with the Los Angeles River, as follows.

The Upper Arroyo Seco Channel Restoration is a multi-use project that extends from NASA's Jet Propulsion Lab (JPL) upstream to the watershed divide that will improve water supply, recreation, water quality and ecosystem health. The project is a culmination of years of grassroots planning efforts and analysis focusing on southern California ecosystems. Upstream of JPL, 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. The Central and Lower Arroyo Restoration projects will continue aquatic and upland habitat restoration efforts. Meandering through neighborhoods along the Arroyo Seco, the Lower Arroyo linkages will provide safe pedestrian and cycling links in the highly urban lower reaches of the watershed. ASWA implementation will involve restoration 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 and Coast Live Oak Woodland. Native fish restoration is a key driver for watershed protection efforts and inter-agency cooperation.

### Overview

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 Seco Watershed Sustainability Campaign (ASWSC), developed by Arroyo Seco Foundation (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.

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 that 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 U.S. Army Corps of Engineers (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.

The phasing of these projects follows a 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.

### **Project 1: Upper Arroyo Seco Restoration**

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. It 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. Upstream of JPL, 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 affected 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, water quality and sediment deposition that adversely affects 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. Awareness needs to be developed regarding wildfire impacts on Arroyo Seco morphology and habitat. Although, such impacts from natural causes may be best left to evolve naturally. Project components are designed to:

- Improve flood water, sediment and debris flowthrough 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 and 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, and provide active and passive recreational areas that are integrated into native ecosystem habitats; and 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.

## Key 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 the city of Pasadena water supply; and 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; and 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 that preserves sandy streamside habitat with limited siltation; and 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 species 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.
- Fish migration corridors will be reestablished and open space will increase.

### ***Water Quality Impacts and Aesthetics***

- 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; and native ecosystems will be reestablished, enhancing a natural aesthetic.

## **Project 2: Arroyo Seco Channel Improvements in Hahamongna Watershed Park**

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, which 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. Project components are designed to:

- Improve flood water, sediment and debris storage through reestablishment of a natural alluvial channel/floodplain system, and 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, and Grassland.
- Reestablish wildlife migration corridors through restoration of HWP native ecosystems and provide active and passive recreational areas that are integrated into native ecosystem habitats.

#### Key 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; and 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, and 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; and 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 and 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 and 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.

### **Project 3: Brookside Park Golf Course Arroyo Seco Channel Naturalization**

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. Project components are designed to:

- Improve flood water, sediment and debris storage through reestablishment of a natural channel/floodplain system and 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, and Coast Live Oak Woodland,
- Reestablish wildlife migration corridors and provide active and passive recreational areas that are integrated into native ecosystem habitats that upgrade Works Progress Administration (WPA) infrastructure.

#### Key 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.
- 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. Oak titmouse and other oak woodland species would benefit from restored woodland habitat and control of invasive plant species.
- Yellow warbler and other riparian species 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 and Aesthetics*

- Renaturalization of the channel and reestablishment of a floodplain will have a direct positive impact on water quality, and native ecosystems will be reestablished, enhancing a natural aesthetic.

## **Project 4: Lower Arroyo Linkages**

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. Project components are designed to:

- Improve water quality in 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 WPA infrastructure.

### Key Issues

#### *Safety*

- The Cypress Avenue bridge is considered unsafe and uninviting for pedestrians. 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; and 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 is not American with Disabilities Act (ADA) compliant. Pedestrian and bicycle circulation opportunities exist east and west of parkway to SW Museum Gold Line Station.

### *Water Quality Impacts*

- Opportunities exist at the Cypress Avenue Bridge to improve water quality by addressing steep unvegetated and highly erosive slopes.

## **Project 5: Confluence Gateway Multi-use Project**

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 (the 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 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.

#### 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 and Community Support***

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

### **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, and 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 water spreading areas to replenish groundwater 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 percent) 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 percent of its land as open space; by contrast, San Francisco has 25 percent, New York 27 percent. Excluding the Angeles National Forest, open space is 15 percent of the Arroyo Seco watershed. Public park space is 10 percent 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 they align and realign 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.

**Best Management Practices (BMPs) 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 are “soft” management practices that are aimed at eliminating pollutant sources. In addition to BMPs, the watershed contains many opportunities to daylight storm drains 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.

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