

RE-TRANSFORMING LANDSCAPE AT THE CONFLUENCE OF ARROYO SECO AND THE LOS ANGELES RIVER

Directed Design Research Report

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I. EXECUTIVE SUMMARY

In today's world, where "green" means more than the presence of trees, and "health" goes beyond the absence of illness, it has become our responsibility and our purpose to cultivate a city that is more than just a place to live... it is a place to live well. Urban rivers and riverfront areas are commitments to multi-purpose, multi-use spaces, in which residents and visitors can interact with and experience their new surroundings in a multitude of ways.¹ Such a dynamic environment will be a better place to live, work and play.

However, in many countries, a lot of rivers are seriously polluted and channelized. This leads to a series of issues, such as ecological degradation of urban rivers, lack of accessibility, lack of open space around urban riverfront, disordered development of urban riverfront area, and the crisis of historical continuity and heritage protection.

Taking the confluence of Arroyo Seco and the Los Angeles River as an example. The site, located in northeast Chinatown, is a complicated site in which freeways, rail infrastructure and the rivers are tightly intertwined. What's more, the Confluence is a very important site with immense potential. The objectives of this study are to re-transform the Arroyo Seco from a channelized and single-functional channel to a multi-functional corridor of significant natural and cultural value, to provide safe access and create activities and recreation for people within the maze of pre-existing infrastructure, to create a synergy that elevates an urban riverfront landscape to a thriving and harmonious balance of complex systems where modern infrastructure meets natural ecology, to regenerate for developing to bring new life and investment to nearby urban settlements, and to present a set of proposed work tasks to address these issues.

II. TOPIC

My research topic relates to landscape transformation at the confluence of Arroyo Seco and the Los Angeles River.

¹ Skidmore, Owings & Merrill LLP, *SOM City Design Practice*, <http://www.som.com/books/citydesign/index.html>

The city and riverfront have a close relationship. Great riverfronts are places where people, plants and animals coexist. We need to create a synergy that elevates an urban landscape into a thriving and harmonious balance of complex systems where modern infrastructure meets natural ecology. This balance depends heavily on connectivity, both on a micro and macro scale. Without such dynamic connections, the potential for urban riverfront area is diminished, and its vision for the future left unclear.

In many cases, the industrial functions of our cities over the past century have resulted in degraded riverfront environments and constructed physical barriers. For example, currently, in the Arroyo Seco Confluence, freeways, railways and industrial physical structures create obstacles to pedestrian and bicycle modes of travel. As the viability of former functions and activities has shifted, people are rediscovering the social, economic and historical values of rivers. It is a great opportunity to recover the river corridor for providing multi-purpose, multi-use spaces, renovate and redevelop urban riverfront to bring new life and investment into existing urban settlements.²

2.1 Ecological degradation of urban rivers

Physically the river provides an outline and structure for the infrastructure of green space. However, at present, a lot of rivers are seriously polluted and channelized. Urban rivers gradually lost the value of green infrastructure. For example, once a meshwork of meandering rivers, streams, arroyos, and washes, the Los Angeles River is a fully engineered flood-control system [Figure 2-1]. No longer a natural, aqueous phenomenon, it is now a man-made web of vascular networks.³ Polluted runoff from urban areas contaminates all 51 miles of the Los Angeles River, most of its tributaries, San Pedro Bay, beaches north and south of the L.A. River's mouth, and ocean waters.⁴ Another example is the Arroyo Seco. Today it has been channelized, dammed, and obstructed at multiple locations [Figure 2-2]. Its natural habitats have been fragmented or destroyed, and many creatures native to the Arroyo can no longer be found in the watershed.⁵

² Skidmore, Owings & Merrill LLP, *SOM City Design Practice*, 77, <http://www.som.com/books/citydesign/index.html>

³ Kazys Varnelis, *The Infrastructural City: Networked Ecologies in Los Angeles* (Actar Barcelona/New York, 2009), 36

⁴ <http://www.savelariveropenspace.org/background.html>

⁵ *Arroyo Seco Watershed Management and Restoration Plan Final Report* (March 1st, 2006), 28



Figure 2-1 The Los Angeles River is a fully engineered flood-control system.



Figure 2-2 The Arroyo Seco has been channelized by concrete.

We should improve water quality and habitat quality, restore and strengthen natural role of rivers, and promote the ecological restoration and purification of river corridor.

2.2 Lack of accessibility

Currently, in some urban rivers, there are several roadways and other physical impediments blocking easy access to urban riverfront development. For the public, it is difficult to enter and access the riparian area. For example, currently, in the Arroyo Seco Confluence, freeways, railways and industrial physical structures create obstacles to pedestrian and bicycle modes of travel [Figure 2-3]. By creating convenient, continuous, diverse recreational and more seamless transit system to and from rivers, residents and tourists would benefit from a greater connection to urban riverfront.



Figure 3-3 In the Arroyo Seco Confluence, freeways, railways and industrial physical structures create obstacles to pedestrian and bicycle modes of travel.

2.3 Lack of open space around urban riverfront

Due to the rapid development and expansion of cities, urban river corridors become more and more narrow. This led to lack of open space for people around urban riverfront. For example, at the Arroyo Seco Confluence, freeways and railroads predominate much of the area, and the light industrial buildings are located near the river [Figure 2-4]. There is no room for providing open space for people.



Figure 4-4 At the Arroyo Seco Confluence, freeways and railroads predominate much of the area, and the light industrial buildings are located near the river.

2.4 Disordered development of urban riverfront area

With the rapid development and expansion of cities, some urban riverfront areas are occupied by a variety of dispersed sites, such as industrial area, railroads and highways. For instance, with the rail yards, warehouses, and other industrial uses that line the Los Angeles River's edge, the River has become both literally and figuratively isolated from most people and communities.⁶

⁶ *Los Angeles River Revitalization Master Plan* (April, 2007), 6

The organization, sustainability and harmony of urban riverfront area is directly linked with the health and wellbeing of its inhabitants. By thoughtfully creating a healthy dynamic between the riverfront area and the people moving through it, urban riverfront area will serve to promote not only a better environment, but also a better life for the city.

III. ISSUES AND INQUIRIES

3.1 The conception of “river”

What is “nature”? What is “ecology”? And what is “river”? How rivers work? What are functions of rivers?

A natural river should be an ecosystem that usually consists of river channel, floodplain, wetlands, forests, scrublands, oxbow lakes, islands, and river water quality is very good. However, today, in many cities, rivers have been channelized, become large drains of cities. Some natural components, such as wetlands, scrublands and islands, all disappeared. Industrial wastewater, urban living sewage and urban trashes all flow into the river.

Using ecological flood control, water storage and water treatment system, can a polluted river be changed to a healthy river with good water quality? If we restore forests, scrublands, riparian plants and wetlands, can a channelized and single-functional river be changed to a multi-functional river corridor of significant natural and cultural value?

3.2 More water and less water

The water flow in the river depends on rainfall. Sometimes the river is beautiful [Figure 3-1], sometimes the river is terrible [Figure 3-2]. In the channelized river, water flows into the ocean [Figure 3-3], can never be reused. How to design the river and operate the ecological function of the river during the dry and flood periods? In the dry period, what initiatives can be used to maintain the ecological function of the river? During flood season, which ecological approaches can be used for flood control and storing water? According to the different water flows, can we design a dynamic landscape in urban riverfront?



Figure 5-1 The L.A. River



Figure 3-2 The L.A. River flooding⁷



Figure 6-3 The dry season and wet season of the Arroyo Seco at the Confluence⁸

In addition, if we want to regenerate and redevelop urban riverfront area, the most urgent mission is the ecological restoration of river. But the ecological restoration of river needs enough water to support new landscapes and ecologies. Could we find a way to balance the relationship between the ecological restoration of river and water supply?

3.3 Urban development and urban ecology

Cities must be designed and developed in accordance with nature so that both may flourish and survive⁹. At the same time, in urban riverfront projects, we should make urban riverfront open space and the existing urban fabrics continue to work. The challenge is to re-imagine the degraded riverfront environment and overcome the constructed physical barriers. Urban riverfront must embrace a mindset for ecological vibrancy and sustainable development.

⁷ http://you-are-here.com/location/la_river.html

⁸ Right image: http://1.bp.blogspot.com/_ZR9oPn0H2pM/R6RO2wwziFI/AAAAAAAAAQE/ttsj_gjxNHw/s1600-h/P1261951.JPG

⁹ Skidmore, Owings & Merrill LLP, *SOM City Design Practice*, 55, <http://www.som.com/books/citydesign/index.html>

3.4 The complexity of the site

The Arroyo Seco Confluence with the Los Angeles River, is a complicated site in which freeways, rail infrastructure and the rivers are tightly intertwined. Aside from meeting the flood control requirements, what design initiatives can create activities and recreation for people with this maze of pre-existing infrastructure? How to improve water quality and biodiversity?

IV. PROJECT DESCRIPTION

My research project [Figure 4-1, 2,3] is the confluence of Arroyo Seco and the Los Angeles River, located within the original flood plains of the Los Angeles River and Arroyo Seco water bodies, which are located within the lower Los Angeles River Watershed. The site is a complicated site in which freeways, rail infrastructure and the rivers are tightly intertwined. What is more, the Arroyo Seco has been channelized by concrete, freeways and rail infrastructure predominate much of the area. The Metro Gold Line, opened in 2002, cuts across the northern portion of the Project Area and provides frequent access to downtown Los Angeles, the many communities located in the northeastern sections of Los Angeles, and the cities of South Pasadena and Pasadena. The railroad tracks serving Metro's Metrolink regional passenger rail service and freight service parallel the western and eastern banks of the Los Angeles River, which are adjacent to a series of electrical transmission lines. The railroads, freeways and electrical transmission lines are visual and physical obstacles to the future revitalization of the Arroyo Seco Confluence.¹⁰

¹⁰ *Cornfield Arroyo Seco Specific Plan and Redevelopment Plan: Draft Environmental Impact Report* (September, 2009), 1-4, http://planning.lacity.org/eir/CornfieldArroyo/DEIR/CASP_DEIR_Index-file.html

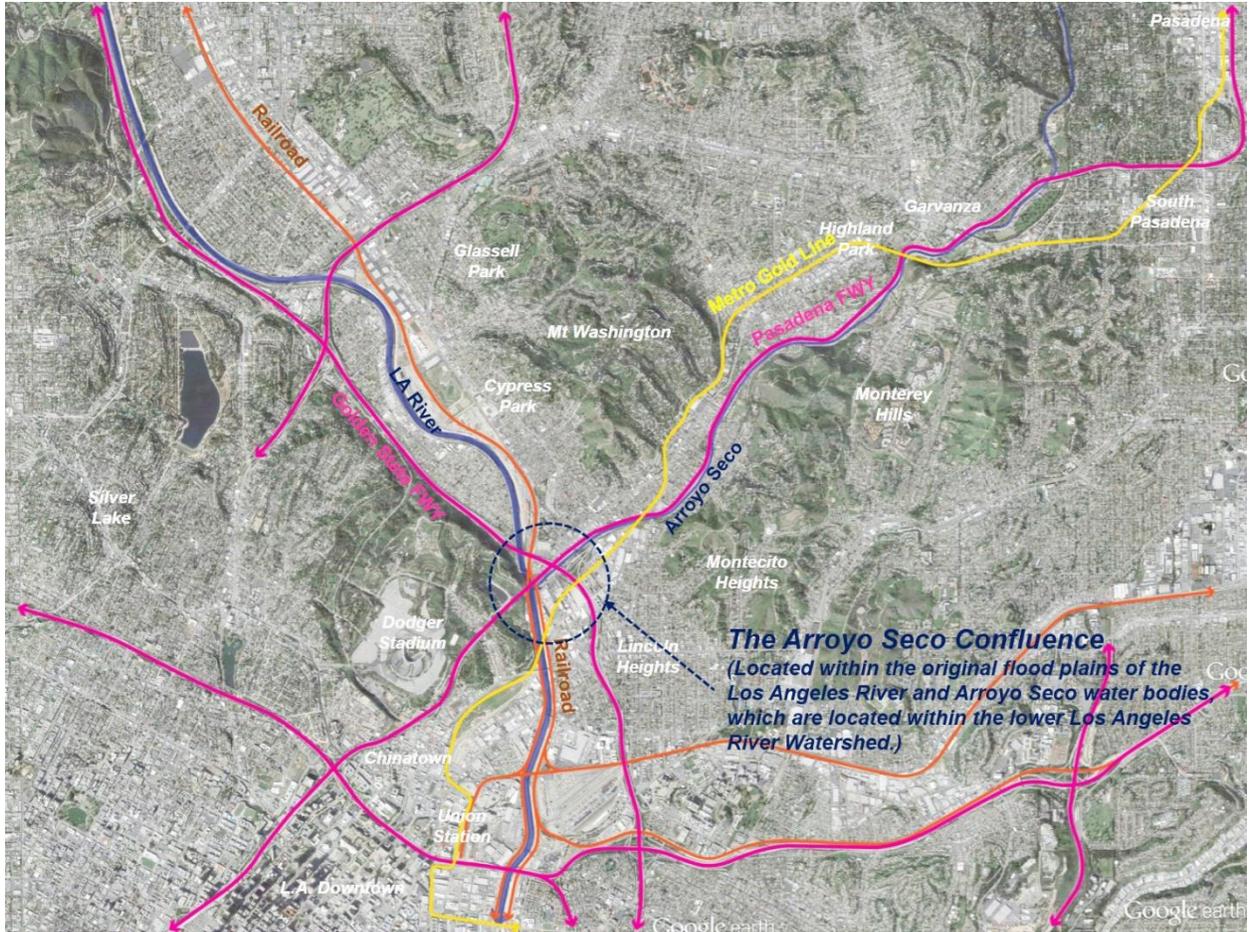


Figure 4-1 Research project area

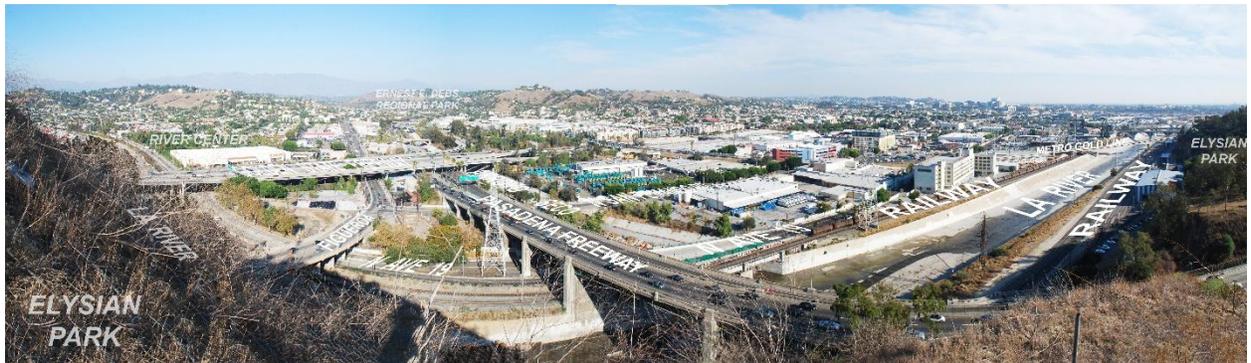


Figure 4-2 Present view of the Arroyo Seco Confluence (Looking east towards the Confluence from Elysian Park)



Figure 4-3 The Arroyo Seco Confluence Aerial View

The Pasadena Freeway/State Route 110 (SR 110) parallels the path of the Arroyo Seco. Entrances and exits to and from SR 110 are located on the northern perimeter of the Plan Area. The Golden State Freeway/Interstate Highway 5 (I-5) cuts north-south through the Project Area. I-5 runs in a trench from Lacy Street to Spring Street at the southeast portion of the Project Area. Entrances and exits to I-5 are located at North Broadway/Pasadena Avenue and at Avenue 26 across from Lacy Street. I-5 and SR 110 provide excellent regional access for the Project Area. But freeways, railways and industrial physical structures create obstacles to pedestrian and bicycle modes of travel [Figure 4-

4, 5,6].¹¹



Figure 4-4 Bridges across the river



Figure 4-5 The railways along the river

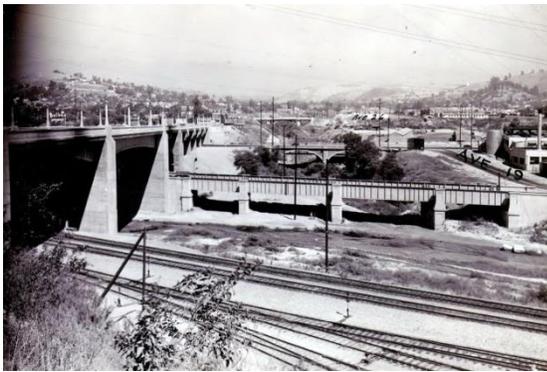


Figure 4-6 The Arroyo Seco Confluence (before channelization & present)¹²

However, the Arroyo Seco Confluence is a very important site with immense potential: unparalleled

¹¹ Cornfield Arroyo Seco Specific Plan and Redevelopment Plan: Draft Environmental Impact Report (September, 2009), 1-4, http://planning.lacity.org/eir/CornfieldArroyo/DEIR/CASP_DEIR_Index-file.html

¹² http://www.arroyoseco.org/images/Confluence_Slideshow.pdf, 9-10

opportunity for habitat and stream restoration; key spot for flood management and water quality improvements; easy access to touch the river; gateway to the river through Downtown; historical, cultural, environmental and hydrologic importance.¹³

Basing on the above, the most important objective of this study is to transform the Arroyo Seco from a channelized and single-functional channel to a multi-functional corridor of significant natural and cultural value. Secondly, it is to provide safe access and create activities for recreation within the maze of pre-existing infrastructure. Thirdly, it is to create a synergy that elevates an urban riverfront landscape to a thriving and harmonious balance of complex systems where modern infrastructure meets natural ecology. Finally, the confluence will be regenerated for developing to bring new life and investment to nearby urban settlements.

V. DESIGN RESEARCH

5.1 Precedents

5.1.1 Buffalo Bayou Promenade, Houston, TX

Buffalo Bayou Promenade designed by SWA Group. This project was created under challenging urban conditions, overhead freeways and utilities, steep slopes, limited access and critical flood elevations [Figure 5-1]. The Master Plan transforms the formerly neglected bayou system of downtown Houston into 23 acres of new parkland with extensive bike trails and pedestrian connections to the downtown area¹⁴ [Figure 5-2]. Designers created a safety pedestrian system and bikeway for people under freeways and bridges [Figure 5-3], and provided some recreation area for activities and events [Figure 5-4]. In order to provide a safe pedestrian environment at night for people, designers used special event lighting in this park [Figure 5-5].

¹³ http://www.arroyoseco.org/images/Confluence_Slideshow.pdf, 14-15

¹⁴ <http://www.asla.org/2009awards/104.html>

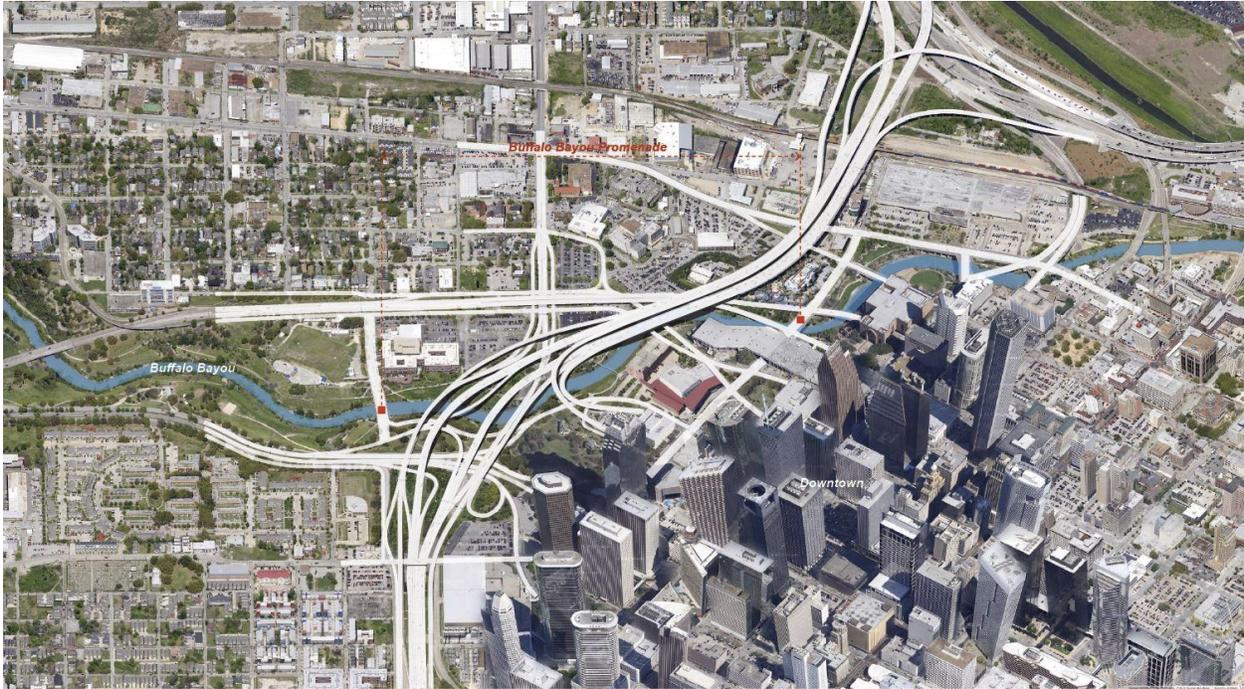


Figure 5-1 Buffalo Bayou Promenade site map

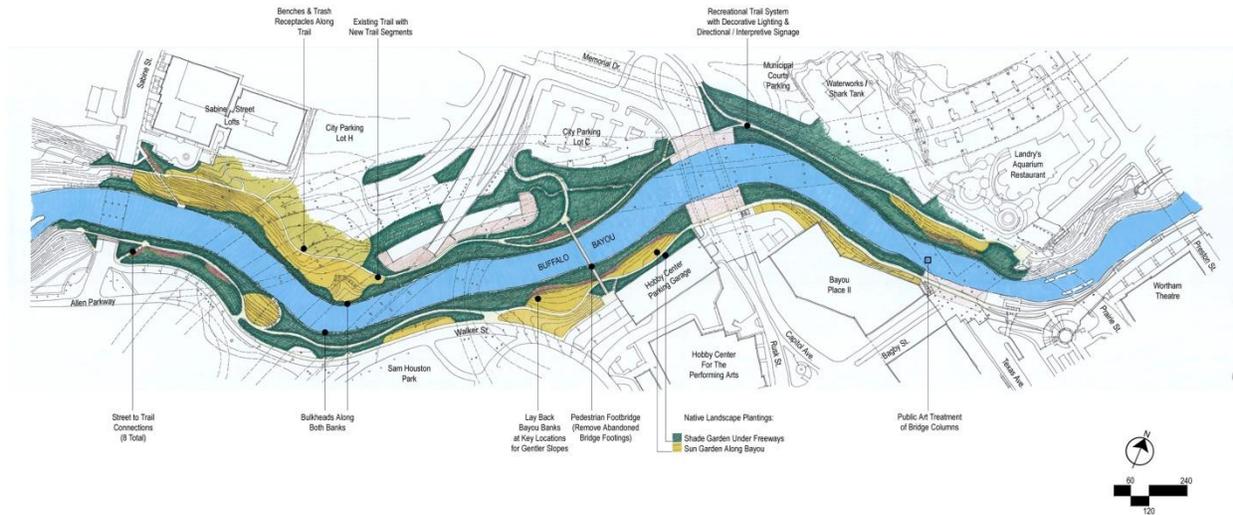


Figure 5-2 Buffalo Bayou Promenade Master Plan¹⁵

¹⁵ http://www.asla.org/2009awards/images/largescale/104_00.jpg



Figure 5-3 Providing continuous pedestrian and bike trails under freeways and bridges¹⁶



Figure 5-4 Providing some recreation area for activities and events¹⁷



Figure 5-5 Special event lighting for the park¹⁸

¹⁶ Left: <http://landscapeurbanism.com/strategy/buffalo-bayou-promenade/>
Right: http://www.asla.org/2009awards/images/largescale/104_06.jpg

¹⁷ Left: http://www.asla.org/2009awards/images/largescale/104_11.jpg
Right: http://www.asla.org/2009awards/images/largescale/104_12.jpg

¹⁸ Left: <http://cdn.archinect.net/images/1200x/kx/kx4l0rm9z4p6eoez.jpg>
Right: http://www.asla.org/2009awards/images/largescale/104_16.jpg

Because Buffalo Bayou is the principal drainage system for much of Houston [Figure 5-6], the design team had to treat the waterway and its banks with special care.¹⁹ Gabion edge treatments allow for safety and visual clarity. The stepped design provides water egress at any point while allowing floating storm debris to pass through. The gabion cages, utilized over 14,000 tons of recycled crushed concrete. The open gabion cages also allow tree roots and riparian ground covers to form a natural edge while providing a porous foundation for the riparian benthic community [Figure 5-7].²⁰ Native and naturalized riparian plants were chosen for their deep-rooted ability to control erosion and sustain the future hydrologic actions of the bayou [Figure 5-8].



Figure 5-6 Buffalo Bayou is the principal drainage system²¹



Figure 5-7 Gabion wall system for protecting riverbank²²

¹⁹ <http://www.asla.org/2009awards/104.html>

²⁰ <http://www.asla.org/2009awards/104.html>

²¹ Left: <http://www.flickr.com/photos/jade001/3712309416/>

Right: Ying-Yu Hung, Gerdo Aquino, Charles Waldheim, Julia Czerniak, Adriaan Geuze, Alexander Robinson, Matthew Skjonsberg, *Landscape Infrastructure: Case Studies by SWA* (Birkhauser Press, 2010), 51

²² Ying-Yu Hung, Gerdo Aquino, Charles Waldheim, Julia Czerniak, Adriaan Geuze, Alexander Robinson, Matthew Skjonsberg, *Landscape Infrastructure: Case Studies by SWA* (Birkhauser Press, 2010), 42, 46

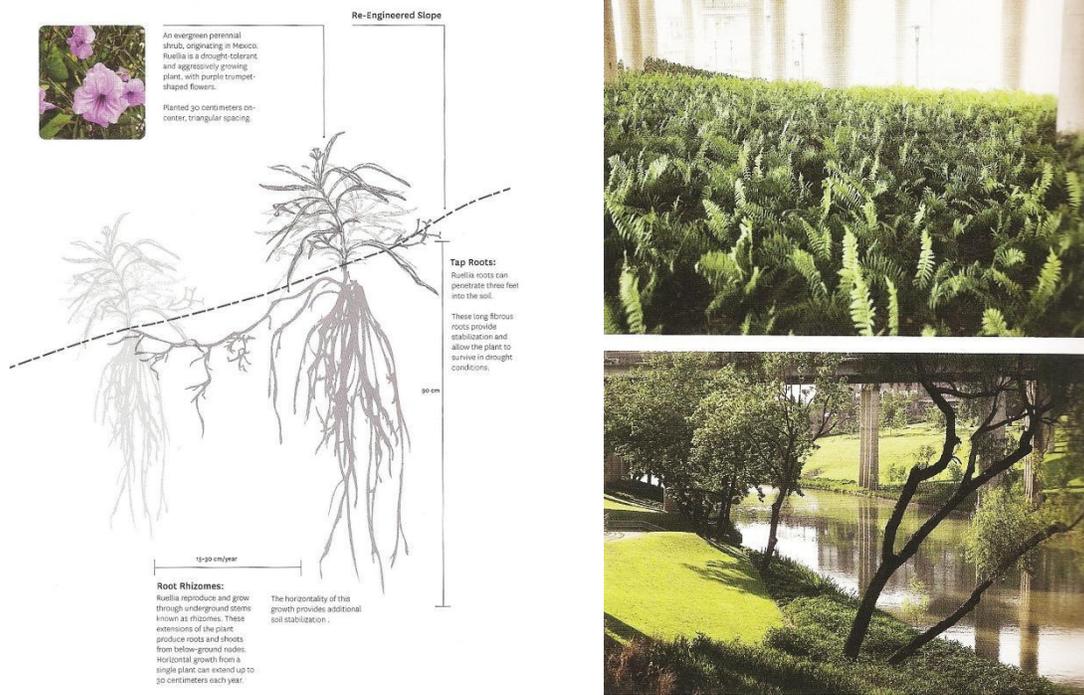


Figure 5-8 Native and naturalized riparian plants²³

Comparing the Arroyo Seco Confluence with the Buffalo Bayou Promenade project [Figure 5-9], we can find that their sites are located under the highway and bridges, and their environments are complex. In the Arroyo Seco Confluence project, we should primarily consider the Arroyo Seco's function of the drainage channel, should control flooding. In addition, we should make better use of the limited land which is located under freeways and bridges for providing a safety pedestrian system and bikeway and creating recreational areas for people, should rebuild the ecological riverbank with native and local plants for restoring the river, and use landscape lighting to provide a safe environment at night for people.

²³ Ying-Yu Hung, Gerdo Aquino, Charles Waldheim, Julia Czerniak, Adriaan Geuze, Alexander Robinson, Matthew Skjonsberg, *Landscape Infrastructure: Case Studies by SWA* (Birkhauser Press, 2010), 46

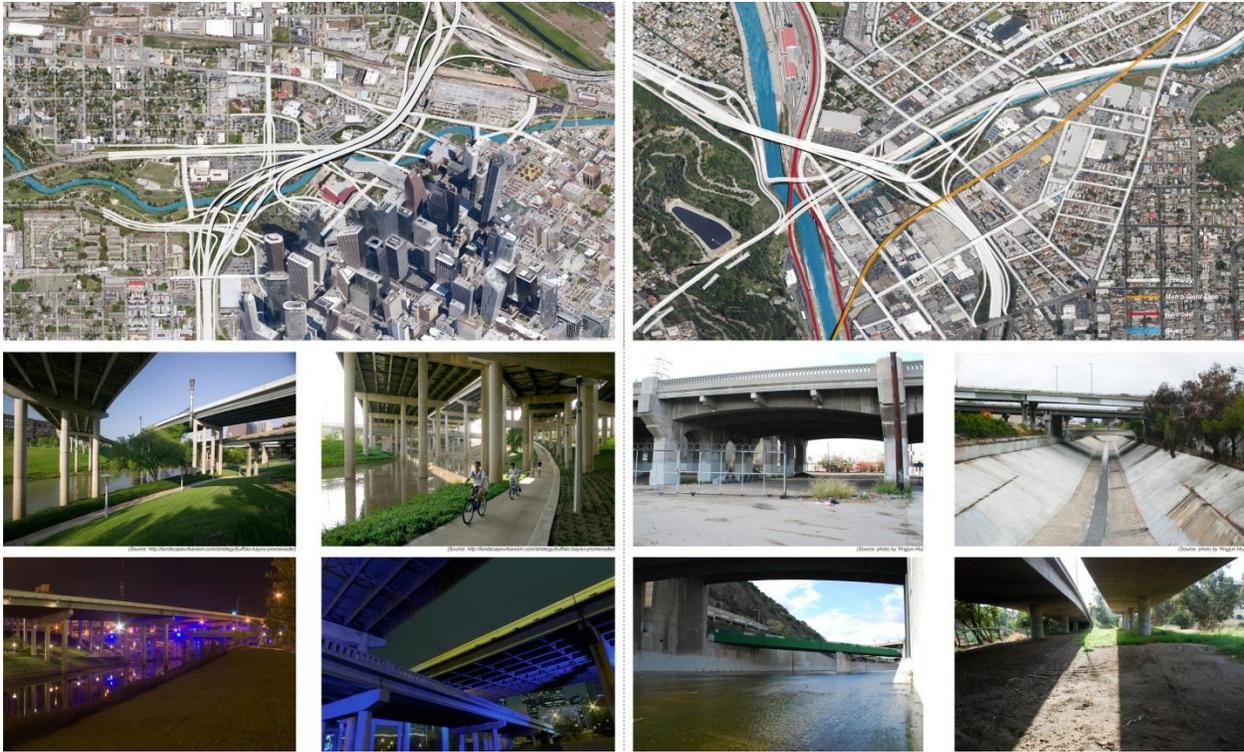


Figure 5-9 The Buffalo Bayou Promenade project & the Arroyo Seco Confluence project²⁴

5.1.2 Guadalupe River Project, San Jose, CA

The Guadalupe River is truly the heart of San Jose, linking various corners of the downtown and connecting the city to the region through a network of trails. Fish have returned, breeding, migrating and spawning in the channel. Birds, mammals and amphibians find habitat in the vegetation along the river's edge. And humans who enjoy the stimulation of urban life can also find moments for quiet reflection in the park's plazas and gardens.²⁵

- Providing access for people either at points to the river or along banks [Figure 5-10].
- Developing open spaces so that people can gather along its banks and enjoy the rare resource of a natural river in a vital urban area.

²⁴ Middle left one, two, and down left one: <http://landscapeurbanism.com/strategy/buffalo-bayou-promenade/>
Down left two: http://v8.cache7.c.bigcache.googleapis.com/static.panoramio.com/photos/original/53051194.jpg?redirect_counter=1

²⁵ *Guadalupe River Park Master Plan* (2002), 1 (<http://www.sjredevelopment.org/grp/Guadalupeplan.pdf>)

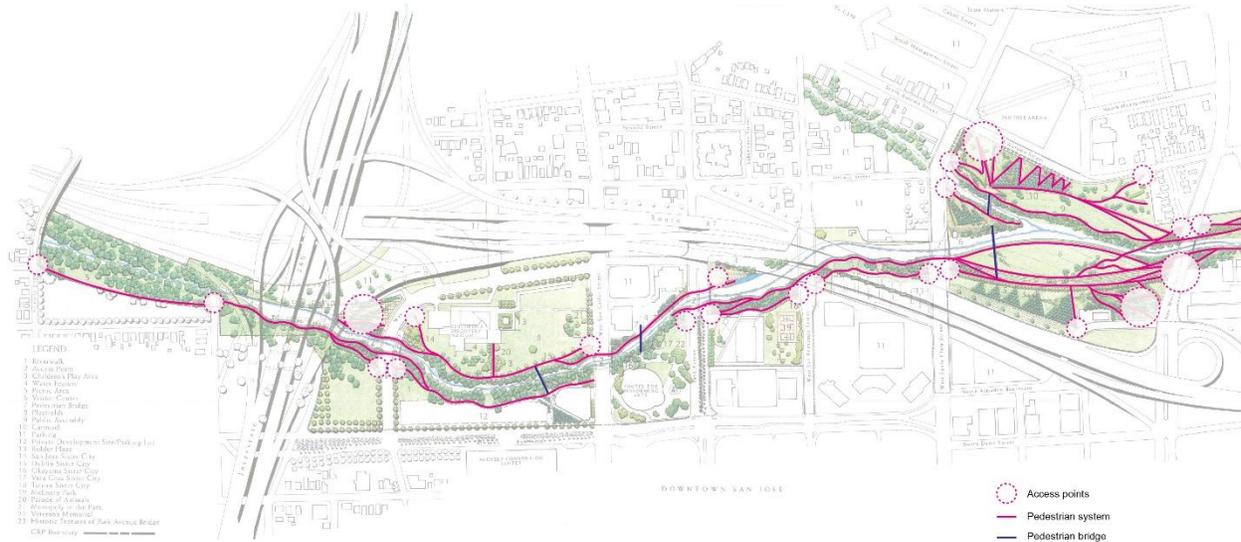


Figure 5-10 Providing access and open space for people

- The river channel was widened and deepened in most zones for flood control.

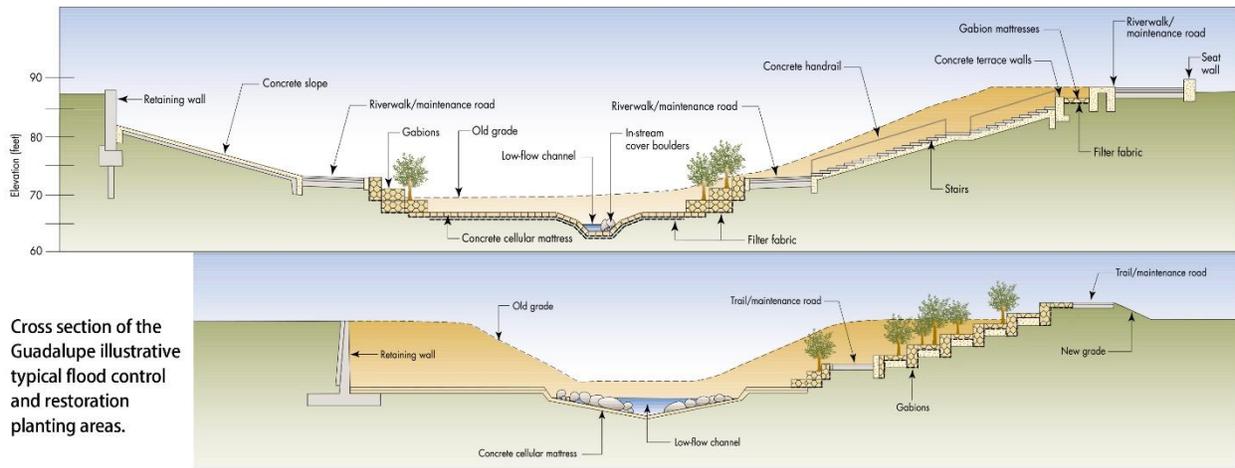


Figure 5-11 Widen and deepen the channel for flood control²⁶

- Using gabion wall system and terraces for protecting the bank.
- Building pedestrian way and bikeway along the river.

²⁶ Guadalupe River Park Master Plan (2002), 17 (<http://www.sjredevelopment.org/grp/Guadalupeplan.pdf>)



Figure 5-12 Gabion wall system and terraces for protecting the riverbank²⁷



Figure 5-13 Pedestrian way and bikeway along the river²⁸

Similarly, in the Arroyo Seco, the channelized channel can be widened and deepened for expanding floodplain and increasing flood capacity with using gabion wall system and terraces for protecting the riverbank. And riverwalk, pedestrian way and bicycle way can be also built along the riverbank for providing the access for people.

5.1.3 Kallang River Bishan Park Project, Singapore

The Kallang River Bishan Park project transformed 3 kilometers of Singapore's longest river from a concrete canal into a natural river with bioengineered slopes and landscaped banks. The new river teems with life, and has shown a 30% increase in biodiversity even before construction was completed. A first in the tropics, soil bioengineering techniques have been used to stabilize the river banks so that

²⁷ Left: <http://bikesiliconvalley.org/files/styles/grid-12/public/images/111.JPG>

Right: <http://rhorii.com/GRPG/GRPG2.html>

²⁸ Left: <http://rhorii.com/GRPG/GRPG2.html>

Right: http://4.bp.blogspot.com/-B_A5okO8k5E/Tb7IgSYL38I/AAAAAAAAABqw/UPoS6bJyho4/s1600/-12.jpg

they can withstand strong flood flows and also provide habitats for flora and fauna. The flood plains provide generous open space for recreational activities, and in the case of a heavy down pour, the park functions like a real river plain, allowing the river water to spread and slowing the waters down through friction thus reducing the hydraulic overload of the river in more dense urban areas downstream.²⁹

- A linear concrete drainage channel has been transformed into a meandering and natural river landscape³⁰.
- Liberating the river from the concrete, allowing it to flow through the park in a more naturalistic way for flood safety and natural water purification.



Figure 5-14 The Kallang River Bishan Park Before and After³¹

Ecological functions of the Kallange River:

²⁹ <http://newsroom.ch2mhill.com/pr/ch2m/cities-of-the-future-an-urban-230859.aspx>

³⁰ <http://newsroom.ch2mhill.com/pr/ch2m/cities-of-the-future-an-urban-230859.aspx>

³¹ Up: <http://assets.inhabitat.com/wp-content/blogs.dir/1/files/2012/10/bishan-park-before-and-after.jpg>

Down: http://www.detail-online.com/uploads/pics/landscape_of_the_year_2012_bishan_park_30.jpg

- Some of the plants used in the landscaping were chosen for their ability to naturally purify water.
- The new river bed can hold about 40 percent more water than the old canal³², because it forms a flood plain during heavy rainfall, helping to protect the surrounding city from flooding.
- Sixty-six species of wildflowers, 59 species of birds, and 22 species of dragonfly have already been identified in Bishan Park, part of a 30 percent increase in biodiversity.³³

Especially, the Kallang River Bishan Park project is a new vision for blue-green city infrastructure addressing the needs of water supply and flood management as well as creating spaces for people and nature in the city.³⁴



Figure 5-15 Create new recreation opportunities for adult and children³⁵

In the same way, we can meander the Arroyo Seco and remove most of concrete for allowing water to flow in a more naturalistic way for water treatment, create wetlands in the river and terraced remediation wetlands along the riverbank for water quality, and plant native vegetation types for habitat

³² <http://www.treehugger.com/urban-design/bishan-park-kallang-river-restoration-singapore.html>

³³ <http://www.toposmagazine.com/blog/new-river-park-in-singapore.html>

³⁴ <http://www.toposmagazine.com/blog/new-river-park-in-singapore.html>

³⁵ <http://newsroom.ch2mhill.com/pr/ch2m/cities-of-the-future-an-urban-230859.aspx>

and biodiversity.

5.1.4 First San Diego River Improvement Project, San Diego, CA

First San Diego River Improvement Project [Figure 5-16, 17] was a successful collaboration by Public Agencies, Engineers, Biologists and Landscape Architects in designing a highly sustainable and functional flood control system that respected and preserved the natural habitat. The first completed segment included a 2.5 mile section encompassing 42-acres of riparian woodland and 15-acre freshwater re-vegetation. The first phase of the project has been completed for over twenty years and the resulting landscaped corridor contains created wetland habitats, wildlife preserves, picnic areas, bikeways, and pedestrian paths.³⁶

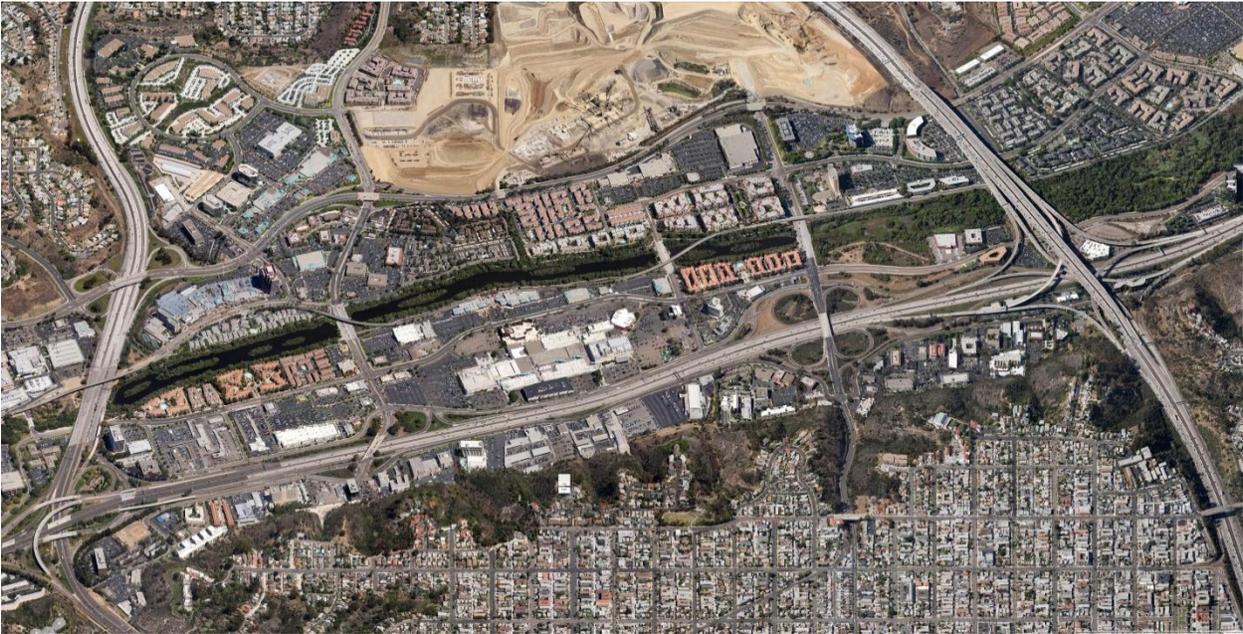


Figure 5-16 First San Diego River Improvement Project site map³⁷

³⁶ <http://www.asla.org/2011awards/309.html>

³⁷ Source from Google Maps



Figure 5-17 First San Diego River Improvement Project master plan³⁸

The section [Figure 5-18] shows that the riverbank and islands are covered with native vegetation. With the restoration of the river, native vegetation and wildlife have returning to the river [Figure 5-19]. Additionally, the river and adjacent development area provide opportunities for promoting development each other [Figure 5-20]. Adjacent developments provide chances for connections to the river, resulting in overall benefits to users and visitors. Today the aerial view of Mission Valley shows a significant reorientation towards the central corridor with residential and commercial development now facing the river and taking advantage of the scenic quality and recreational amenities offered to the public [Figure 5-21].³⁹

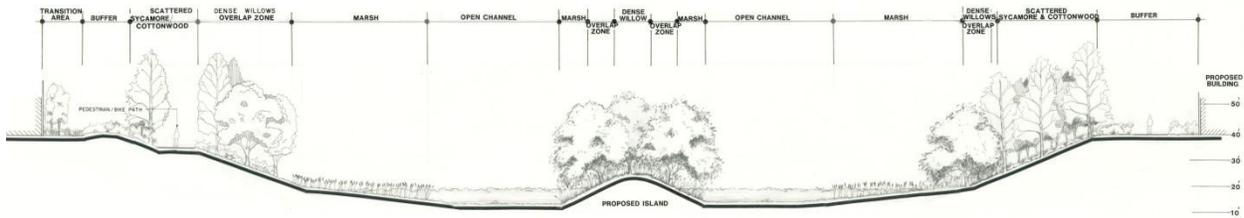


Figure 5-18 Typical section (looking west)⁴⁰

³⁸ http://www.asla.org/2011awards/images/largescale/309_01.jpg

³⁹ <http://www.asla.org/2011awards/309.html>

⁴⁰ http://www.asla.org/2011awards/images/largescale/309_06.jpg



Figure 5-19 With the restoration of the river, native vegetation and wildlife have returning to the river

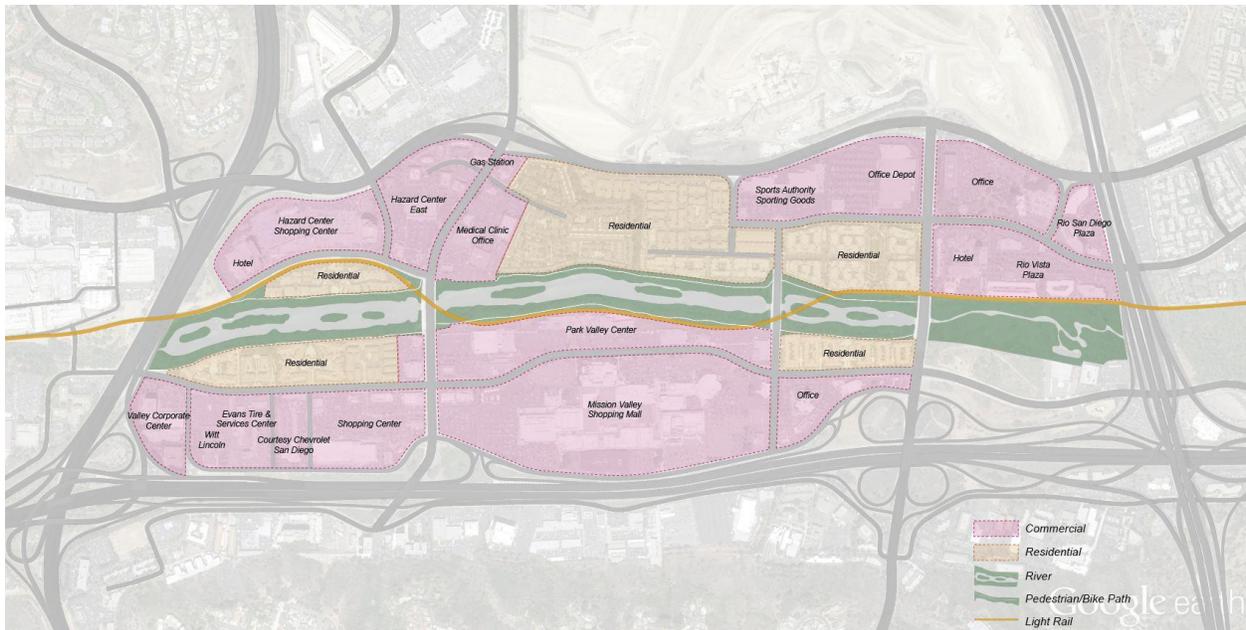


Figure 5-20 Neighborhoods and land use

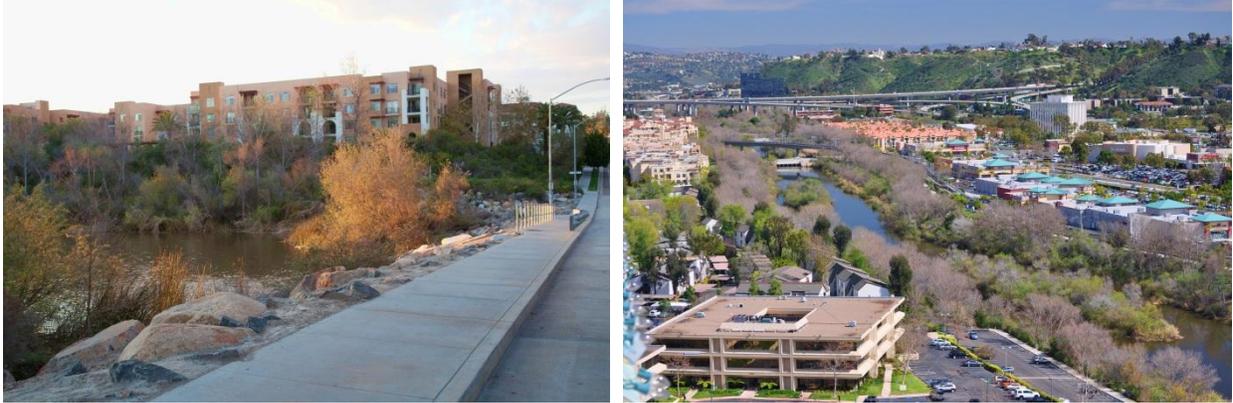


Figure 5-21 Adjacent residential and commercial developments⁴¹

Basing on First San Diego River Improvement Project, we should take into consideration the harmonious development of the river restoration and adjacent development areas in the Arroyo Seco Confluence [Figure 5-16]. This site has an unparalleled opportunity for habitat and river restoration. We should create a healthy dynamic landscape between the river and adjacent development areas in order to promote not only a better environment but also a better life for the city.



Figure 5-22 First San Diego River Improvement Project & the Arroyo Seco Confluence project⁴²

⁴¹ Left: http://www.asla.org/2011awards/images/largescale/309_12.jpg

Right: http://www.asla.org/2011awards/images/largescale/309_13.jpg

⁴² Down left one: http://www.asla.org/2011awards/images/largescale/309_03.jpg

Down left two: http://www.asla.org/2011awards/images/largescale/309_13.jpg

Down right one: <http://bridgehunter.com/photos/19/05/190512-L.jpg>

Down right two: <http://static.panoramio.com/photos/original/32733840.jpg>

5.1.5 Beijing 798 Art District, China

In Beijing 798 Art District [Figure 5-23], designers reused factory buildings to develop cultural creative industry [Figure 5-24, 25]. After the presence of artists and cultural institutions, and transform into a vacant rental scale plant, 798 Art District developed into galleries, design studios, art exhibition space, artist studios, fashion shops, restaurants and bars and other cultural and artistic elements [Figure 5-26]. It brings more popularity and more business opportunities of cultural creative industries for 798 Art District, provides strong support for the sustainable development of 798 Art District. After the crisis of the rapid sublimation in the collision and the success of the region, the 798 Art District has become a Beijing's new symbol.⁴³



Figure 5-13 Being 798 Art District map⁴⁴

⁴³ <http://798-art-district.com/book-about-beijing-798/>

⁴⁴ <http://celladdition.files.wordpress.com/2011/02/798map3-568x356.jpg>



Figure 5-24 Factory buildings before reusing⁴⁵



Figure 5-25 Factory buildings after reusing⁴⁶

⁴⁵ Left: <http://celladdition.files.wordpress.com/2011/02/p11906732.jpg>

Middle: <http://celladdition.files.wordpress.com/2011/02/798-art-zone-3.jpg>

Right: <http://celladdition.files.wordpress.com/2011/02/1.jpg>

⁴⁶ Up left: http://media.photobucket.com/image/798%20art%20zone%20map/Miss_Asphyxia_/photodump/bei3.jpg

Up right: http://v8.cache4.c.bigcache.googleapis.com/static.panoramio.com/photos/original/23103335.jpg?redirect_counter=1

Down left: http://upload.wikimedia.org/wikipedia/commons/8/87/Space-gallery_798-art-district.jpg

Down right one: http://celladdition.files.wordpress.com/2011/02/1_1255099399_798-art-district.jpg

Down right two: <http://celladdition.files.wordpress.com/2011/02/80874d1c875d0db31f18cb0bb6c4b68d.jpg>



Figure 5-26 Beijing 798 Art District⁴⁷

In the Arroyo Seco Confluence project, Lacy Street Studio [Figure 5-27, 28] is near the Arroyo Seco Confluence, and Lincoln Heights / Cypress Park Station (Metro Gold Line) is located at the southwest of Lacy Street Studio and provides frequent access to downtown Los Angeles. And there are some old buildings (Los Angeles Lofts) [Figure 5-29] which locate at Lacy Street. Unfortunately, Lacy Street's management has done very little in the way of maintenance to the buildings. Therefore, learning from the Beijing 798 Art District, in the future, we could renew and redevelop the light industrial area around the Arroyo Seco Confluence, introduce creative industry into the light industrial area, and introduce art cultural elements into the landscape system, thereby change the surrounding environment and promote sustainable development around the Arroyo Seco Confluence.

⁴⁷ Up left: http://1.bp.blogspot.com/_SZWzsGwkzps/TIz-G0r3nul/AAAAAAAAAXM/ID2ejbpDqe4/s1600/IMG_3314.JPG
Up right: http://3.bp.blogspot.com/_AHRXR9-G31c/S9vS3EpJbXI/AAAAAAAAACU/4yqDUF_4ApA/s1600/DSC_0398.JPG
All of the below pictures: photograph by Gao Qin

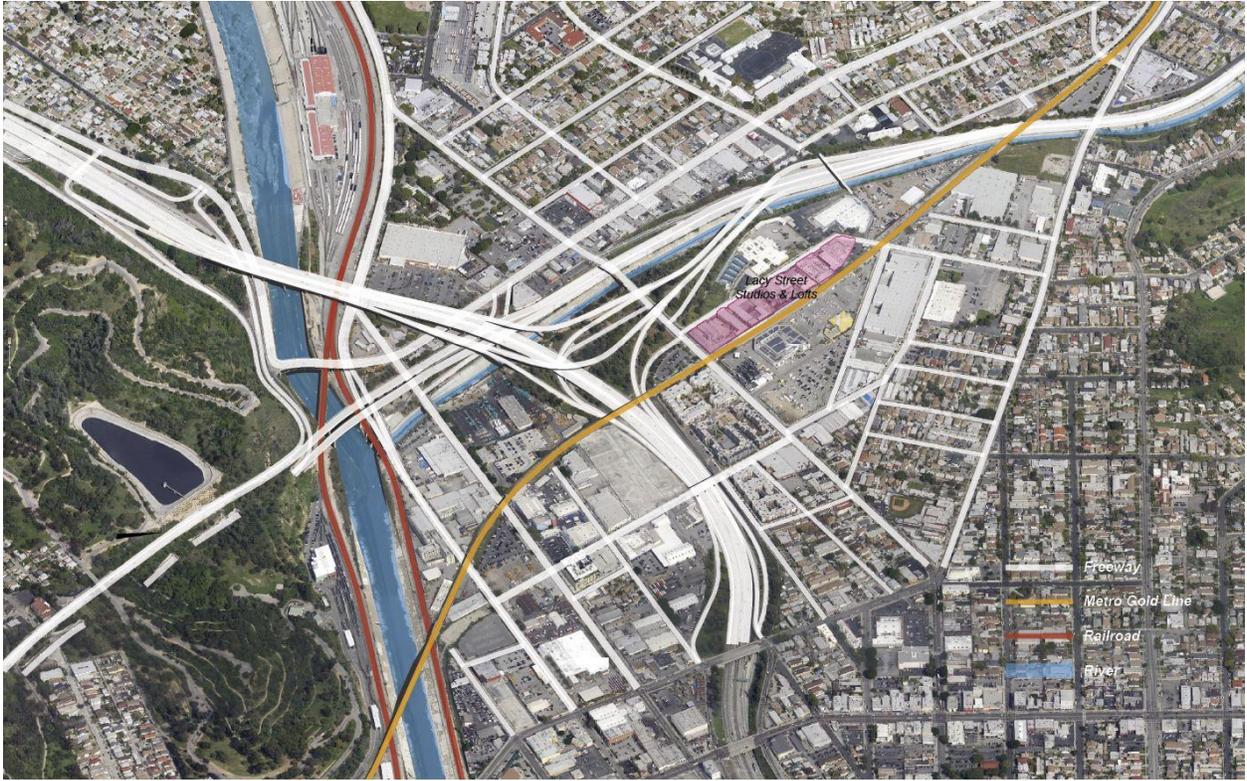


Figure 5-27 Lacy Street Studio location



Figure 5-28 Lacy Street Studio



Figure 5-29 Old buildings (Los Angeles Lofts)

5.1.6 Thornton Creek Water Quality Channel, Washington

The Thornton Creek Water Quality Channel project [Figure 5-30] uses a tiered system to treat stormwater flows. All flows pass through a series of channels, sediment pools, and planted bioswale terraces that provide flow attenuation and water quality treatment.⁴⁸ The Water Quality Channel is a modified biofiltration swale [Figure 5-31]. Water quality treatment [Figure 5-32] occurs when stormwater flows through the Wet Bioswale Terraces, slowing the water down and allowing sediments and associated pollutants to settle out. The Water Quality Channel receives year round base flow and the majority of storm flows from the two upstream basins (680 acres total). Higher flows bypass the facility and continue through the existing 60-inch diameter storm pipe.⁴⁹



Figure 5-30 Thornton Creek Water Quality Channel project⁵⁰

⁴⁸ <http://www.lafoundation.org/research/landscape-performance-series/case-studies/case-study/137/>

⁴⁹ *Thornton Creek Water Quality Channel Final Report*, 7, http://www.seattle.gov/util/groups/public/documents/webcontent/spu01_006146.pdf

⁵⁰ <http://www.lafoundation.org/research/landscape-performance-series/case-studies/case-study/137/>

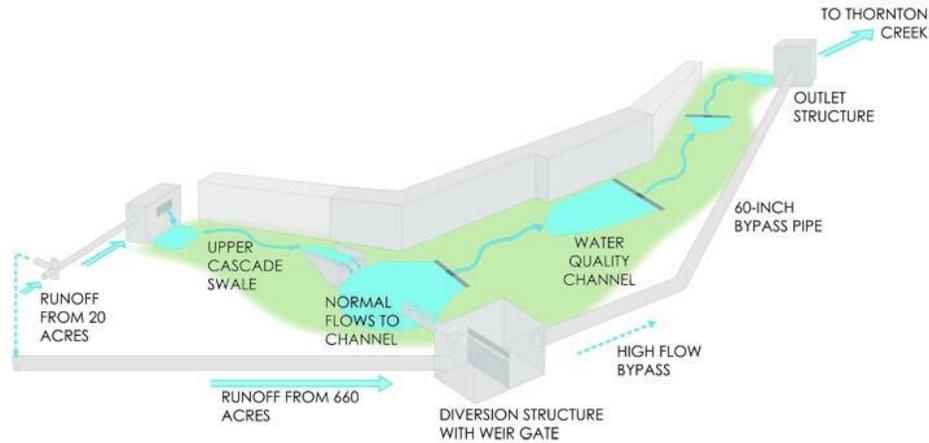


Figure 5-31 Schematic of stormwater treatment facility function⁵¹

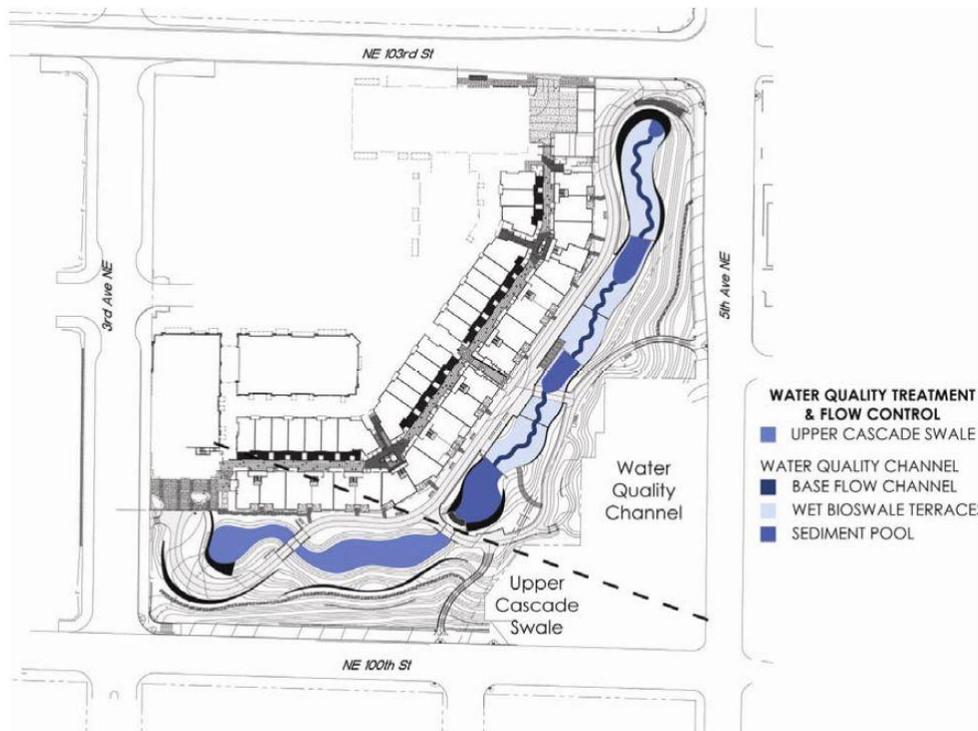


Figure 5-32 Water quality treatment and flow control elements⁵²

Basing on the existing condition of the Lower Arroyo Seco (looking urban runoff pipes layout [Figure 5-33] and the Arroyo Seco Channel existing typical section [Figure 5-34]), stormwater from adjacent neighborhoods, streets and freeways directly flows into Arroyo Seco without purification and

⁵¹ Thornton Creek Water Quality Channel Final Report, 7, http://www.seattle.gov/util/groups/public/documents/webcontent/spu01_006146.pdf

⁵² Thornton Creek Water Quality Channel Final Report, 8, http://www.seattle.gov/util/groups/public/documents/webcontent/spu01_006146.pdf

never be used. Trash, bacteria, metals and various chemicals all find their way into the Arroyo Seco via storm drains that pass through Arroyo neighborhoods. Reference to the Thornton Creek Water Quality Channel project, in the Arroyo Seco Confluence, we should design some wetlands and vegetative swales for slowing the flow of stormwater and filtering it through plant material and soil in order to improve water quality. Beyond that, wetlands provide some rooms for storing rainwater.

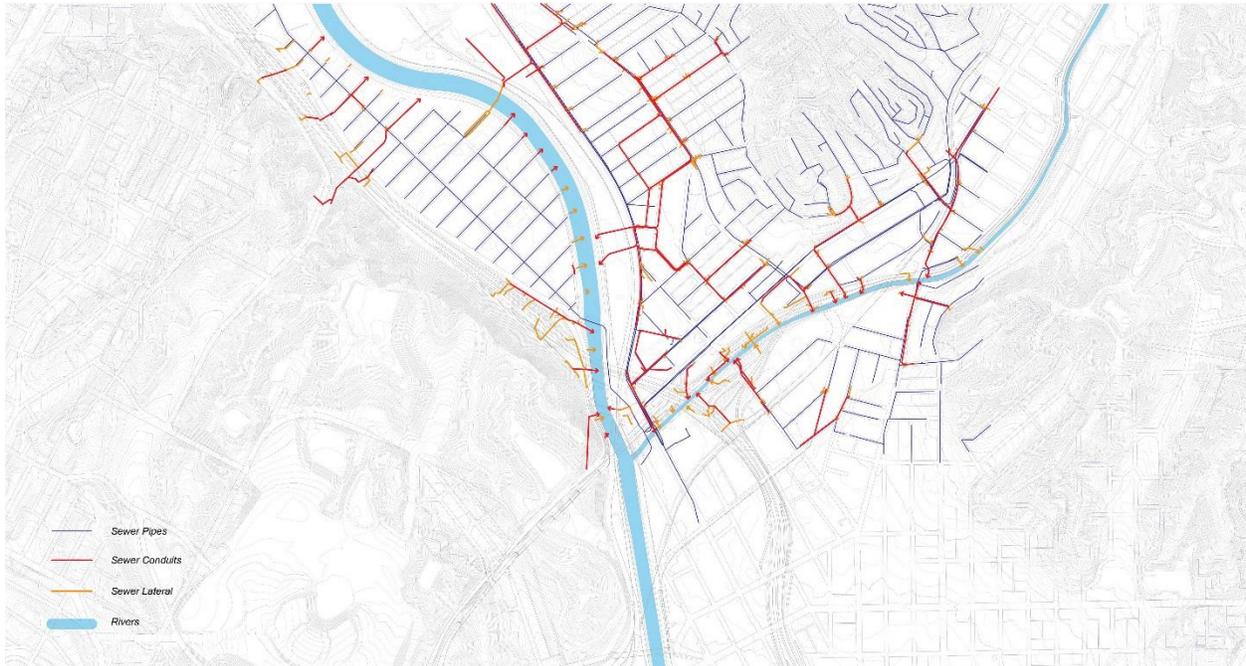


Figure 5-33 Urban runoff pipes layout

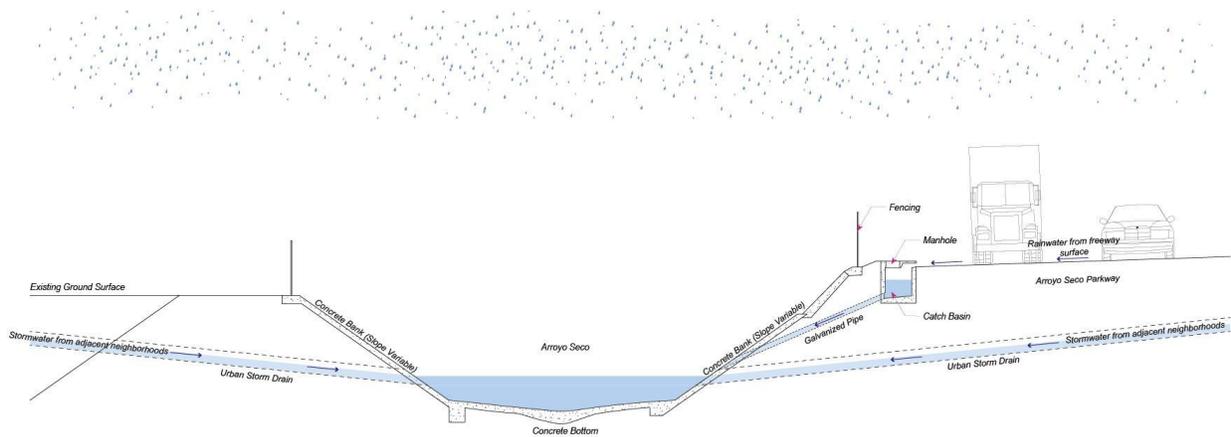


Figure 5-34 The Arroyo Seco Channel existing typical section

5.2 Design Studies

5.2.1 Los Angeles Watershed

The Los Angeles River and the Arroyo Seco are two of the principal rivers that drain the central Transverse Ranges and transport sediment across the coastal plain to the Pacific Ocean. The confluence of these two rivers occurs along the uplifted margin of the Los Angeles basin [Figure 5-35]. The Los Angeles River drains 634 mi² of the San Fernando Valley and coastal plain of Los Angeles. The Arroyo Seco has a drainage area of 46 mi² and originates in the San Gabriel Mountains.⁵³ The Arroyo Seco and the Los Angeles River meet at the Elysian Valley [Figure 5-36].



Figure 5-35 L.A. River Watershed⁵⁴



Figure 5-36 Topography of the Arroyo Seco Confluence

5.2.2 The Lower Arroyo Seco

(1) Infrastructure

Freeways and rail infrastructure meet at the Arroyo Seco Confluence, and rivers are tightly intertwined with them [Figure 5-37].

⁵³ USGS, *Geological, Hydrological, And Biological Issues Related to the Proposed Development of a Park at the Confluence of the Los Angeles River and the Arroyo Seco, Los Angeles County, California* (2004), 4

⁵⁴ USGS, *Geological, Hydrological, And Biological Issues Related to the Proposed Development of a Park at the Confluence of the Los Angeles River and the Arroyo Seco, Los Angeles County, California* (2004), 2

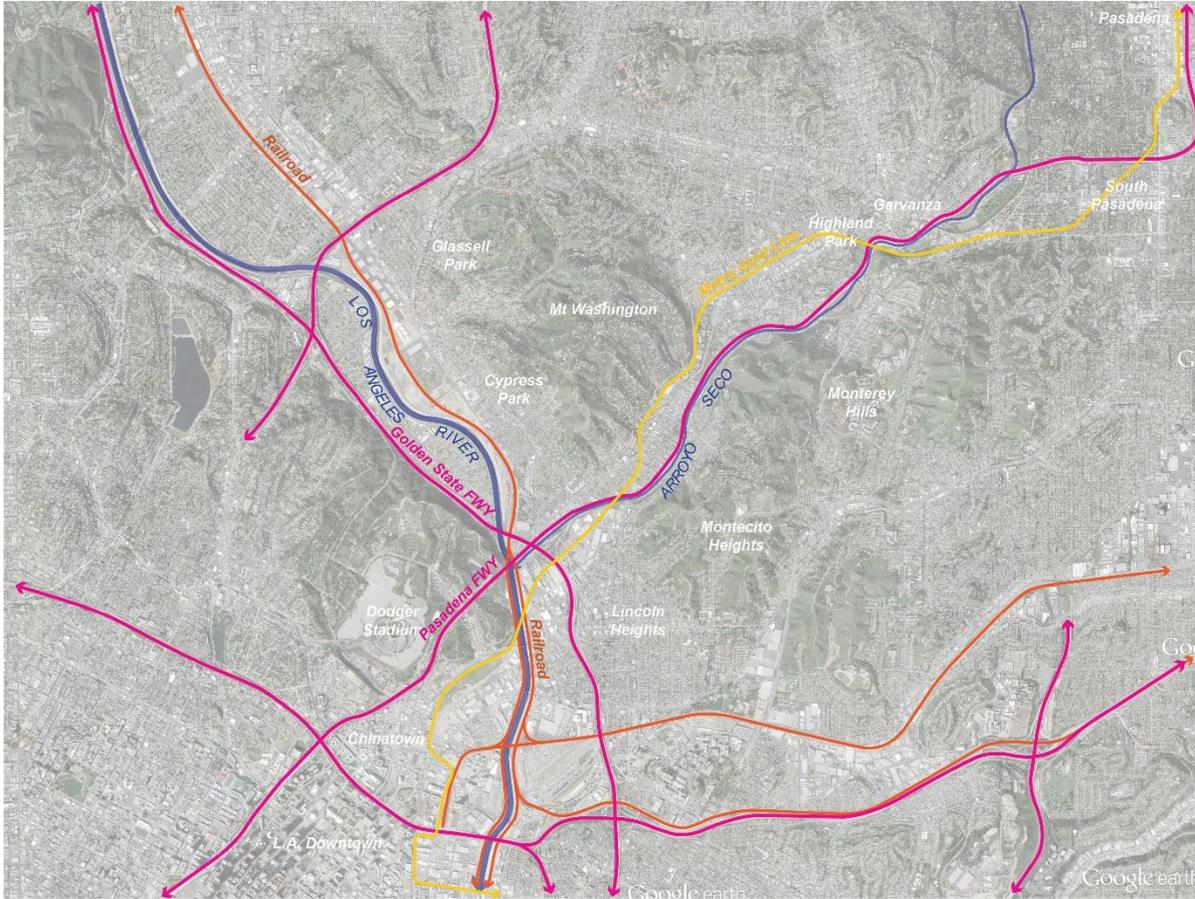


Figure 5-37 Infrastructure at the Lower Arroyo Seco

(2) Open Space

Basing on the existing environment, from San Gabriel Mountain to Ave. 43, the Arroyo Seco is continuous open space. But from Ave. 43 to the Los Angeles River, the Arroyo Seco is discontinuous open space [Figure 5-38]. We should build a continuous open space for accessibility, entertainment and recreation, and also should build a continuous river corridor for biodiversity, habitat quality and water quality.

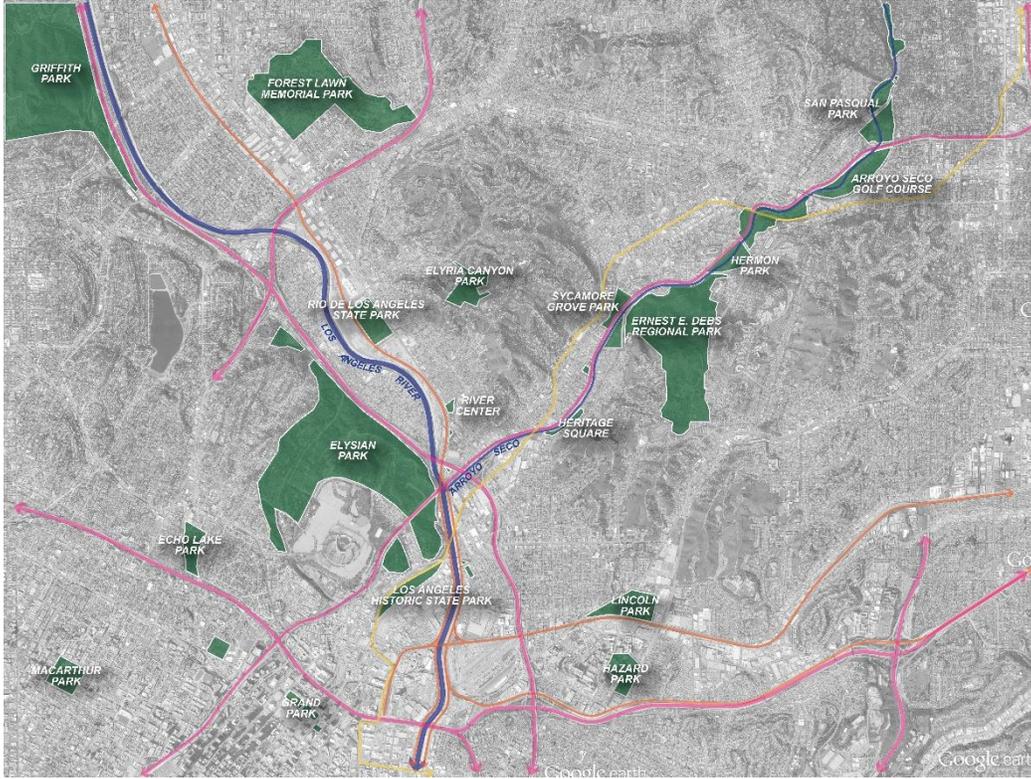


Figure 5-38 Discontinuous open space at the Lower Arroyo Seco

(3) Aerial Views of Lower Arroyo Seco are as follows [Figure 5-39, 40, 41, 42]:

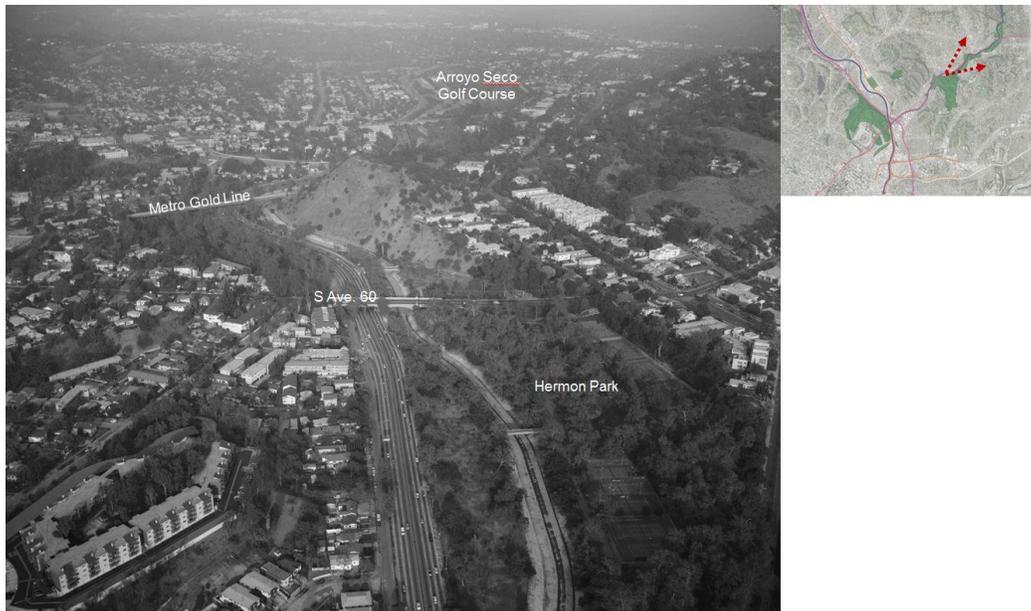


Figure 5-39 Aerial view of Arroyo Seco parkway: Avenue 60 Bridge at center, pedestrian footbridge over Arroyo Seco at lower right of center, retaining some rooms for habitat and active recreation area.⁵⁵

⁵⁵ <http://www.loc.gov/pictures/item/ca2755.photos.382720p/>

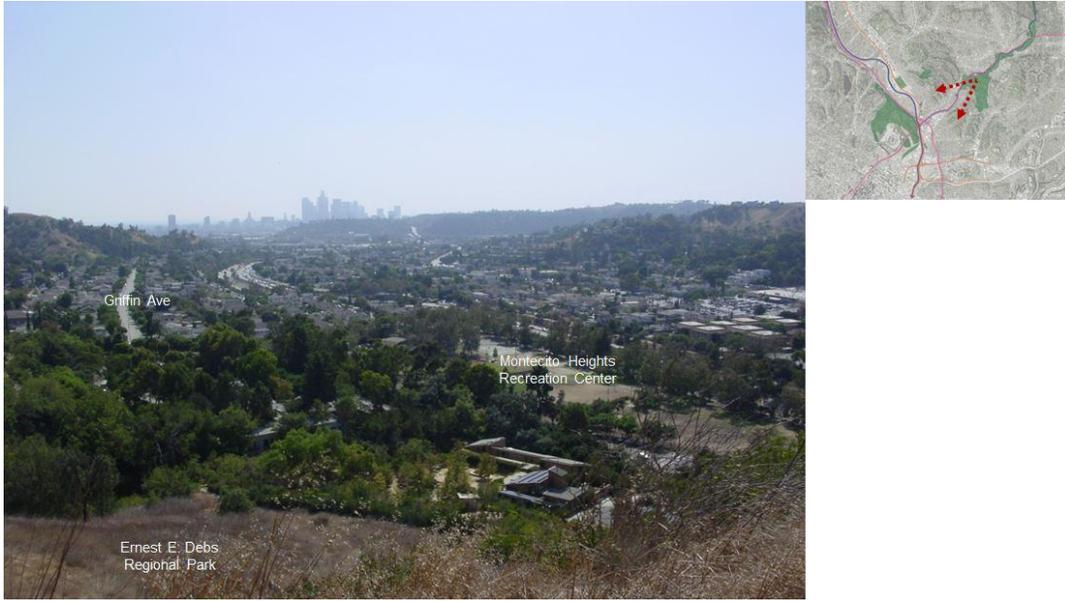


Figure 5-40 Aerial view from Ernest E. Debs Regional Park: Montecito Heights Recreation Center at lower right.⁵⁶

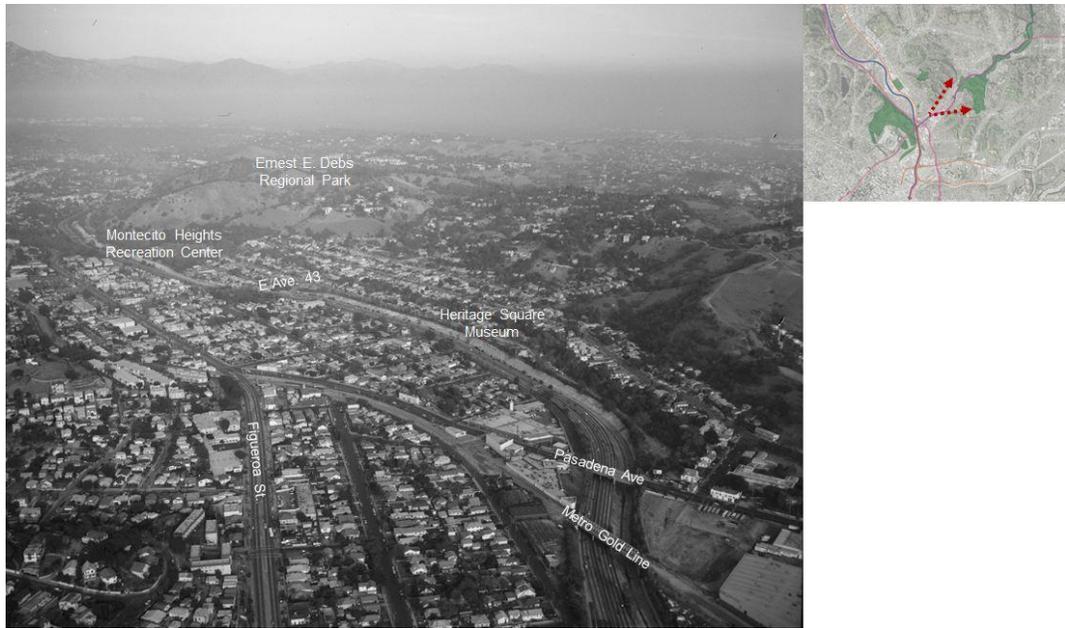


Figure 5-41 Looking northeast to Ernest E. Debs Regional Park: Montecito Heights Recreation Center at left, Heritage Square Museum at center, freeway and houses close to Arroyo Seco, no room for river.⁵⁷

⁵⁶ <http://mw2.google.com/mw-panoramio/photos/medium/55102766.jpg>

⁵⁷ <http://www.loc.gov/pictures/item/ca2755.photos.382716p/>

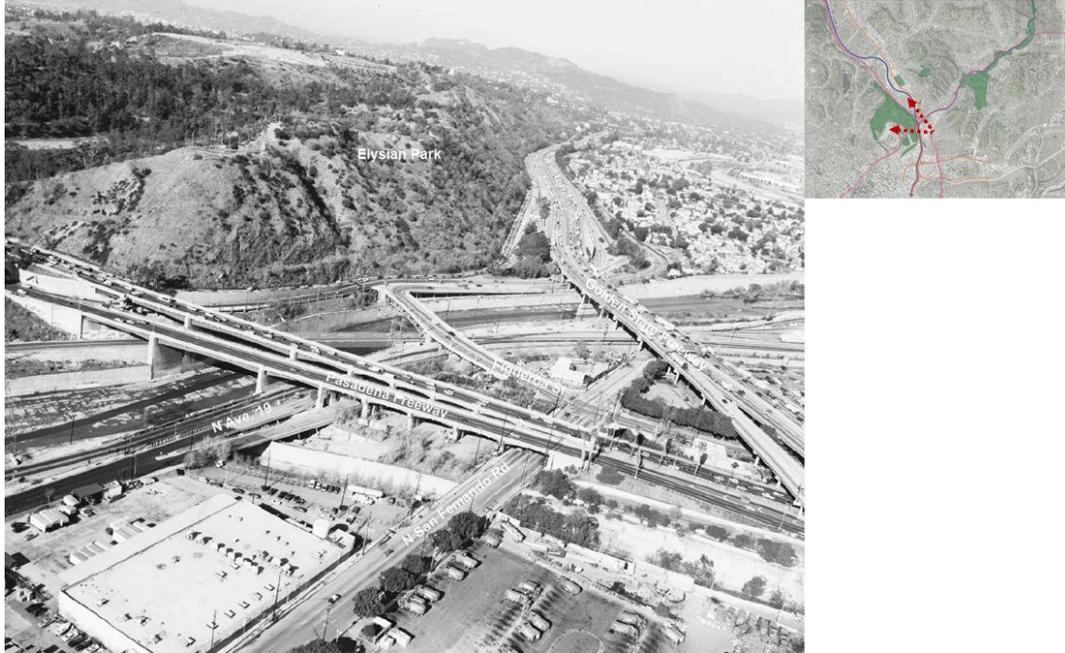


Figure 5-42 Looking northwest to the Arroyo Seco Confluence and Elysian Park: rivers, freeways and railroads tightly intertwine together.⁵⁸

5.2.3 The History of Arroyo Seco

(1) Natural river (Before 1900s)

As a tributary of the Los Angeles River, the Arroyo Seco ends at its confluence. One postcard [Figure 5-43], which shows the view northeast from Elysian Park, demonstrates that infrastructure, such as railroad bridges, were built before the Arroyo and the Los Angeles River were channelized. The Arroyo Seco is the watercourse that passes beneath the rail bridge. Other postcard [Figure 5-44] shows the pigeon farm near Elysian Park was a popular destination for residents and visitors to the area. Located on the eastern bank of the lower reach of the Arroyo Seco, one can see the floodplain of the Arroyo and the toe of Mt. Washington in the background.⁵⁹

⁵⁸ <http://www.loc.gov/pictures/collection/hh/item/ca2896.photos.193823p/resource/>

⁵⁹ <http://lacreekfreak.files.wordpress.com/2008/10/nela-back-draftmap.jpg>



Figure 5-43 Bird's eye view of the Arroyo Seco Confluence⁶⁰

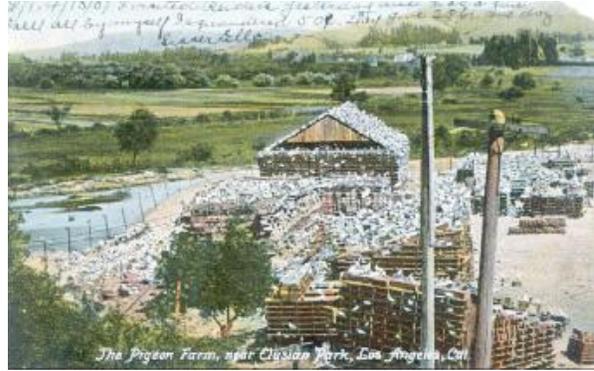


Figure 5-44 The pigeon farm near Elysian Park⁶¹

(2) Flood (1910s)

The name “Arroyo Seco” translates from Spanish to English as “dry creek”. During the dry season, little water would have been observed in the channel. However, during the winter, storms could quickly release several inches of water, causing rivers and streams to rapidly swell [Figure 5-45]. In the flood of 1914 [Figure 5-46], three bridges spanning the Arroyo Seco were washed out. Many homes in the Highland Park area were constructed within the floodplain of the Arroyo, subjecting them to flood damage during large storms. In the photo, which is looking northwest from present-day Montecito Heights, the newly completed Southwest Museum can be seen in the background.⁶²



Figure 5-45 The flood in Arroyo Seco⁶³



Figure 5-46 In the flood of 1914⁶⁴

(3) Channelization (1934-1947)

Before channelization, the Arroyo Seco had natural river bank and river bottom, some vegetation

⁶⁰ <http://lacreekfreak.files.wordpress.com/2008/10/nela-back-draftmap.jpg>

⁶¹ <http://lacreekfreak.files.wordpress.com/2008/10/nela-back-draftmap.jpg>

⁶² <http://lacreekfreak.files.wordpress.com/2008/10/nela-back-draftmap.jpg>

⁶³ <http://lacreekfreak.files.wordpress.com/2008/10/nela-back-draftmap.jpg>

⁶⁴ <http://lacreekfreak.files.wordpress.com/2008/10/nela-back-draftmap.jpg>

grew in the river [Figure 5-47, 48, 49].

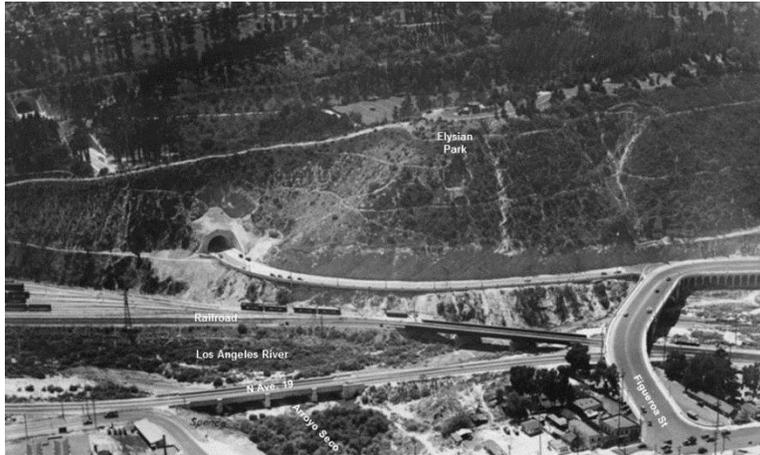


Figure 5-47 Bird's eye view of the confluence of Arroyo Seco and the Los Angeles river, 1931⁶⁵



Figure 5-48 View of Arroyo Seco at Avenue 52 before installation of channel (1930) & now⁶⁶



Figure 5-49 San Pascual Avenue Bridge over Arroyo Seco in 1939 & now⁶⁷

⁶⁵ <http://bridgehunter.com/photos/19/05/190500-L.jpg>

⁶⁶ Left: <http://digitallibrary.usc.edu/assetserver/controller/view/CHS-42230>

⁶⁷ Left: <http://digitallibrary.usc.edu/assetserver/controller/view/CHS-42221>

With the strong storms came periodic floods, and with urbanization, there was less permeable soil to soak up rainfall, causing more rainfall to run off than had happened historically. So it made sense at one time to line the streams with concrete, creating engineered channels and storm drains.⁶⁸



Figure 5-50 View of the excavation of Arroyo Seco Drive south of Avenue Forty-Nine, March 6, 1934⁶⁹

Figure 5-51 Arroyo Seco storm drain showing excavation in the main channel east of Sycamore Grove Park, February 15, 1937⁷⁰

(4) Arroyo Seco Parkway (1938-1953)

During the constructed period of the channelization of the Arroyo Seco, the first freeway, the Arroyo Seco Parkway (formerly known as the Pasadena Freeway) in California and the western United States was planned to be built – in the bed of the Arroyo Seco. Gone were the streamside vegetation and wildlife. With this, our relationship with the stream also changed. The levels of the aquifers dropped, and a dry land became that much drier. To alleviate this crisis, water began to be imported from distant rivers and lakes.⁷¹

⁶⁸ <http://lacreekfreak.files.wordpress.com/2008/10/nela-front-draftmap.jpg>

⁶⁹ <http://digitallibrary.usc.edu/cdm/singleitem/collection/p15799coll65/id/5410/rec/1>

⁷⁰ <http://digitallibrary.usc.edu/assetserver/controller/view/CHS-42222>

⁷¹ <http://lacreekfreak.files.wordpress.com/2008/10/nela-front-draftmap.jpg>

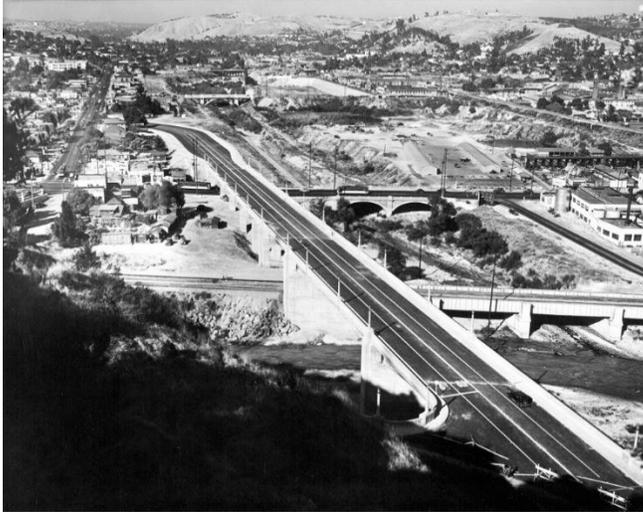


Figure 5-52 Bird's eye view of the Figueroa Street Viaduct from Elysian Park, 1937⁷²



Figure 5-53 The southbound Arroyo Seco Parkway, Feb. 4, 1941⁷³

(5) Golden State Freeway (1950s-1960s)

The Golden State Freeway (Interstate 5) is a major north–south route of the Interstate Highway System in the U.S. state of California. It was proposed by the California Highway Commission in 1953.⁷⁴ The Golden State Freeway (I-5) interchange near the Arroyo Seco completed in 1962⁷⁵.



Figure 5-54 Bird's eye view of the Golden State Freeway interchange⁷⁶

⁷² <http://bridgehunter.com/photos/19/05/190512-L.jpg>

⁷³ <http://latimesblogs.latimes.com/thedailymirror/2008/07/pasadena-freewa.html>

⁷⁴ http://en.wikipedia.org/wiki/Golden_State_Freeway#Los_Angeles_area

⁷⁵ http://en.wikipedia.org/wiki/Arroyo_Seco_Parkway

⁷⁶ Google Maps

5.2.4 The Significance of the Arroyo Seco Confluence

Firstly, there are some Arroyo Arts at the Arroyo Seco Confluence, such as inspired visual, multimedia and performance, ranging from graffiti art [Figure 5-55] to film. And also, some dance events [Figure 5-56] were produced in recent years.

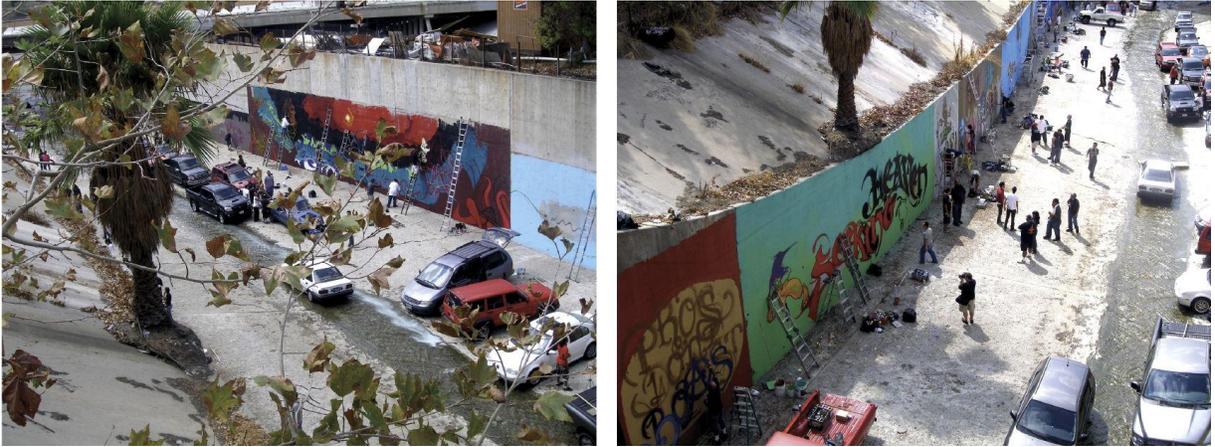


Figure 5-55 Graffiti art produced during two-day 2007 Meeting of Styles Los Angeles⁷⁷



Figure 5-56 TaskForce's Liquid Landscapes performance at the Arroyo Seco Confluence, 2009⁷⁸

⁷⁷ Left: <http://www.flickr.com/photos/auntylaurie/1464427760/sizes/o/in/photostream/>
Right: <http://www.flickr.com/photos/auntylaurie/1463576963/sizes/o/in/photostream/>

⁷⁸ John C. Arroyo, *Culture in concrete: Art and the Re-imagination of the Los Angeles River as Civic Space*, 102

Secondly, the Confluence Plaza [Figure 5-57] opened in March 30th, 2011, located on one of Los Angeles' most historical sites: the Juan Baustista De Anza National Historic Trail, which marks the Anza expedition of 1776 which led to the founding of the settlement that would later become El Pueblo de la Reina de Los Angeles.⁷⁹



Figure 5-57 Confluence Gala water spouts and night shot of fountains, 2011⁸⁰

Thirdly, basing on Los Angeles River Revitalization Master Plan, the confluence of the Arroyo Seco and the Los Angeles River has an opportunity to be a potential water quality system [Figure 5-58]. Design strategies include: storm flows from development routed through green roofs and stored in cisterns, water stored in cisterns and pumped into treatment wetlands which can be used for filtering and cleaning street runoff and storm flows from the Arroyo Seco, treated runoff infiltrates into the river and the aquifer.⁸¹ Additionally, there are some other attributes at the Arroyo Seco Confluence, such as unparalleled opportunity for habitat and stream restoration, key spot for flood management and water quality improvements, gateway to the Los Angeles River through Downtown, historical, cultural, environmental and hydrologic importance.⁸² However, at the confluence, aside from improving water quality and habitat quality, urban riverfront development and people's activities for recreation should be taken into consideration. With the restoration of the Arroyo Seco Confluence, the value of riverfront area will be promoted. Light industrial area can be changed to residential area and creative industrial

⁷⁹ <http://arroyolover.blogspot.com/2011/04/arroyo-seco-los-angeles-river.html>

⁸⁰ <http://arroyolover.blogspot.com/2011/04/arroyo-seco-los-angeles-river.html>

⁸¹ http://www.arroyoseco.org/images/Confluence_Slideshow.pdf, 8

⁸² http://www.arroyoseco.org/images/Confluence_Slideshow.pdf, 14-15

area. Finally, in the future, the Arroyo Seco Confluence will be a dynamic and wonderful place to live, work and play for people.



Figure 5-58 Potential water quality system at the Arroyo Seco Confluence⁸³

5.2.5 Existing analysis of the Arroyo Seco Confluence

(1) Transportation

At the Arroyo Seco Confluence, freeways and railroads predominate much of the area, the Metro Gold Line provides frequent access to downtown Los Angeles, and the Golden State Freeway (I-5) and the Pasadena Freeway provide excellent regional access for the project area.

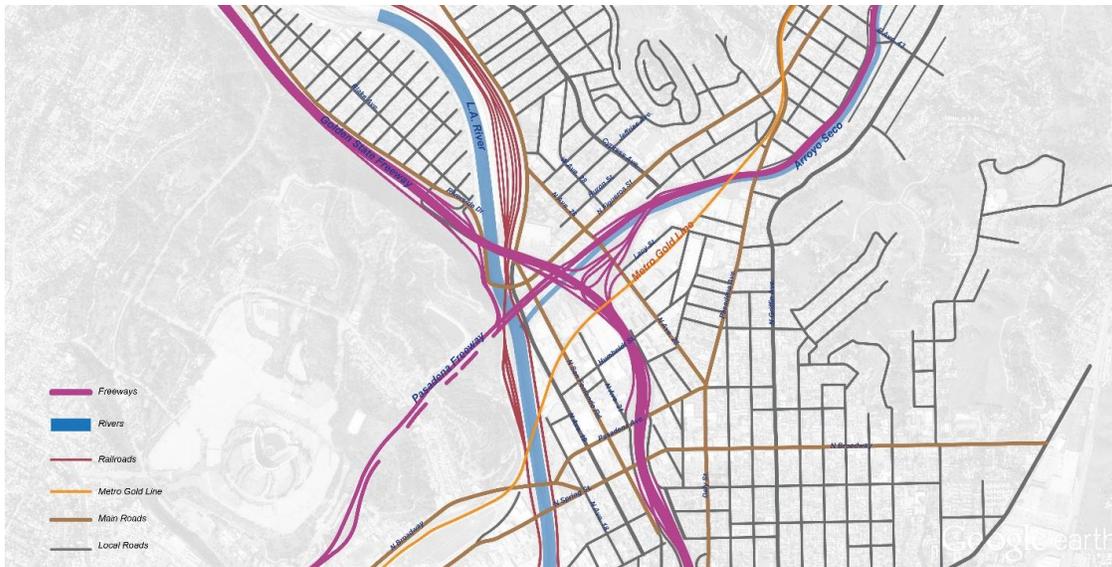


Figure 5-59 Existing transportation at the Arroyo Seco Confluence

⁸³ http://www.arroyoseco.org/images/Confluence_Slideshow.pdf, 8



Figure 5-60 Looking north to the Arroyo Seco Confluence at Spring Street bridge: railroads and electrical transmission lines are visual and physical obstacles to the future revitalization of the river.



Figure 5-61 Physical structures of freeways create obstacles to pedestrian and bikeway.⁸⁴

(2) Bikeway system

Basing on the existing bikeway system, the Los Angeles River bicycle path parallels the Los Angeles River for approximately 7 miles⁸⁵ and ends at the confluence of Arroyo Seco, and the Arroyo Seco Bike Path is in the bottom of Arroyo Seco [Figure 5-63, left photograph] from the York Boulevard Bridge to the exit near Avenue 43. Around the Arroyo Seco Confluence, bike paths are far away from the river. Although there are some bicycle friendly roads in the light industrial area [Figure 5-63, right photograph], it is unsafe for people to bike in this area, and just seeing a few of cyclists on the weekend.

⁸⁴ Left: <http://www.loc.gov/pictures/resource/hhh.ca2765.photos.382754p/>

⁸⁵ <http://www.trailink.com/trail/los-angeles-river-trail.aspx>

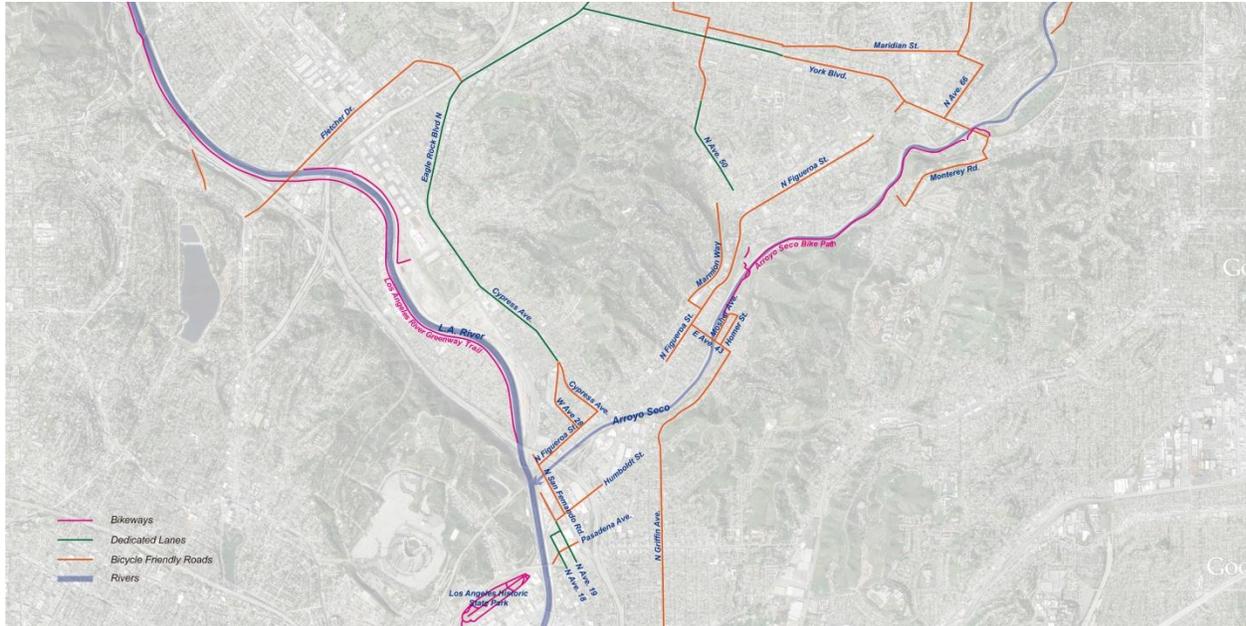


Figure 5-62 Existing bikeway system



Figure 5-63

Left photograph: looking north in the bottom of Arroyo Seco at the north of Montecito Heights Recreation Center - Arroyo Seco Bike Path in the bottom of Arroyo Seco.

Right photograph: looking north at the crossing of N Ave. 19 and Humboldt Street - bicycle friendly road in the light industrial area, but just seeing a few of cyclists on weekend.

(3) Neighborhoods & Land Use

Due to industrial warehouses, freeways and railways which are located along the river, it is difficult for residents who live in the surrounding neighborhoods to access the riparian area.

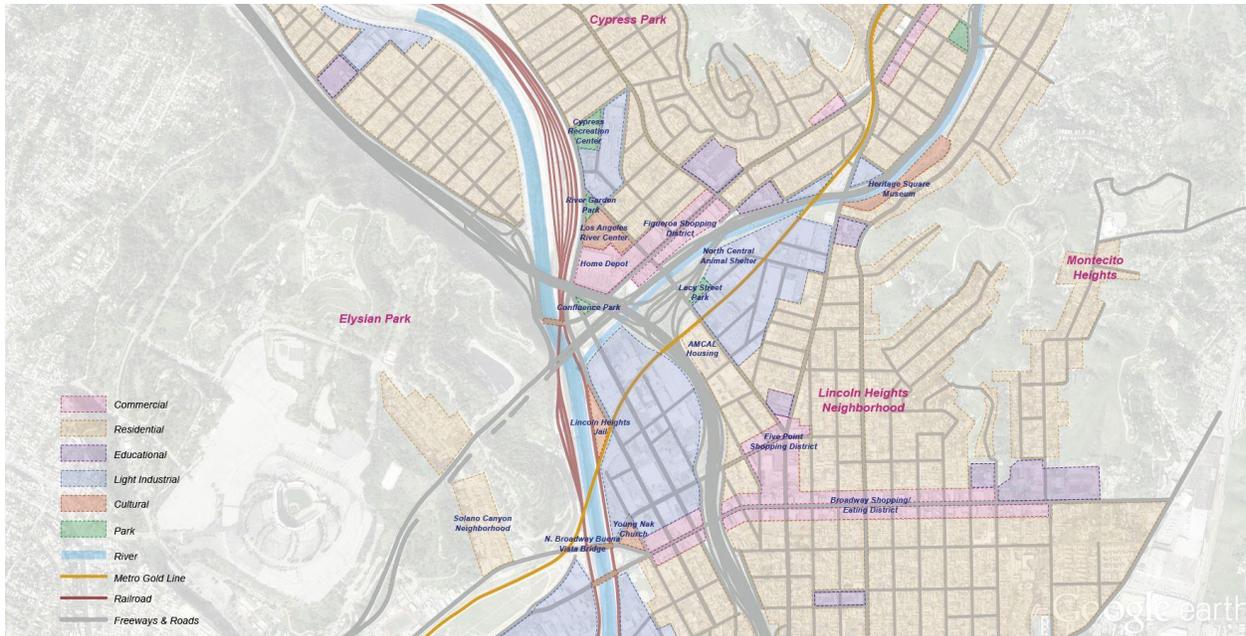


Figure 5-64 Neighborhoods & Land Use at the Arroyo Seco Confluence



Figure 5-65

Left photography: looking south at N San Fernando Road - just a few of people walk on the street on the weekend.
Right photography: looking south near the crossing of N San Fernando Road and Barranca Street - some repair shops at the east side of N San Fernando Road.



Figure 5-66

Left photography: looking east to Humboldt Street at the crossing of N Ave. 19 and Humboldt Street - light industrial area.

Right photography: looking west to wasteland - wasteland at the crossing of Pasadena Ave. and E Ave. 35.

(4) Hydrology

Most of urban runoff from adjacent neighborhoods, streets and freeways directly flows into the Arroyo Seco without purification [Figure 5-67,68].

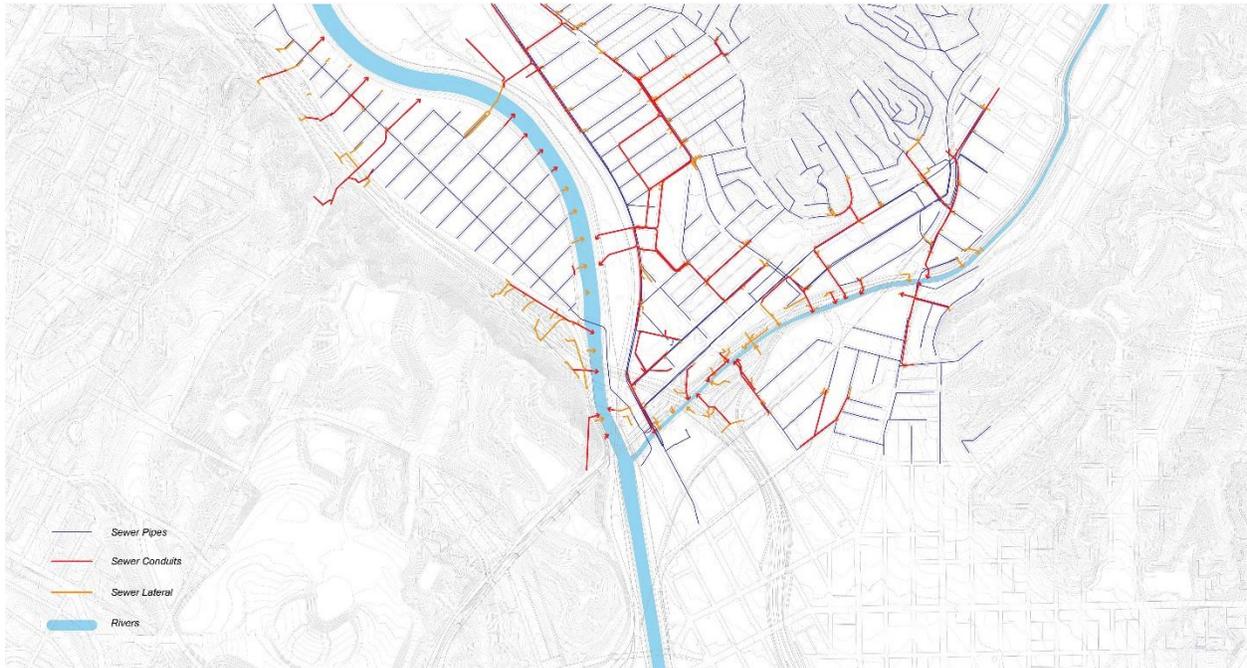


Figure 5-67 Existing urban runoff pipes layout



Figure 5-68 Untreated urban runoff flows into the Arroyo Seco

5.3 Design Proposal

Urban rivers and riverfront areas are commitments to multi-purpose, multi-use spaces, in which residents and visitors can interact with and experience their new surroundings in a multitude of ways.⁸⁶ Therefore, design proposals of this project are to re-transform the Arroyo Seco from a channelized and single-functional channel to a multi-functional corridor of significant natural and cultural value, to reuse stormwater and improve ecological environment of the Los Angeles River and the Arroyo Seco, to create green infrastructures which place an emphasis on balancing the restoration of habitat and watershed with the accessibility and recreation for people within the maze of pre-existing infrastructure, to create a synergy that elevates an urban riverfront landscape to a thriving and harmonious balance of complex systems, and to regenerate for developing to bring new life and investment to nearby urban settlements.

⁸⁶ Skidmore, Owings & Merrill LLP, *SOM City Design Practice*, <http://www.som.com/books/citydesign/index.html>



Figure 5-69 Vision Plan

5.3.1 Concept

The concept framework [Figure 5-70] includes three points: recovering, integrating, and regenerating.

(1) Recovering

Recovering the river corridor for providing an outline and structure for the infrastructure of green space.

(2) Integrating

Integrating natural system and building green streets for linking with the mountain and the river, and reconnecting the city and people to the river. Give the people access to a new green natural water's edge.

(3) Regenerating

Regenerating for developing to bring new life and investment to nearby urban settlements.

5.3.2 Detail Design

5.3.2.1 Recovering

(1) Recovering strategy

At present, the Arroyo Seco is a linear channel by channelized with concrete, just as a single-functional river for urban runoff drainage. From Pasadena Avenue to North Central Animal Shelter, this section is a wide area, includes wasteland, parking space, warehouse, an abandoned pedestrian bridge, can be keep the north straight retaining concrete wall for Pasadena Freeway, can be widened and deepened the channel to south for expanding floodplain and increasing flood capacity, and be designed a recreational park for providing activities for people. From North Central Animal Shelter to Golden State Freeway interchange, this section is a narrow area between two freeways, can be replaced the concrete slope wall with gabion wall system and terraces. From Golden State Freeway interchange to the Los Angeles River, basing on historical conditions (some important elements on the historic pictures [Figure 5-71, 72] show double barrel on San Fernando Street Bridge and additional span and supporting pillars on the Avenue 19 Bridge before the channelization of the Arroyo Seco in the late 1930s⁸⁷), this section can be opened up the mouth of the Arroyo Seco.

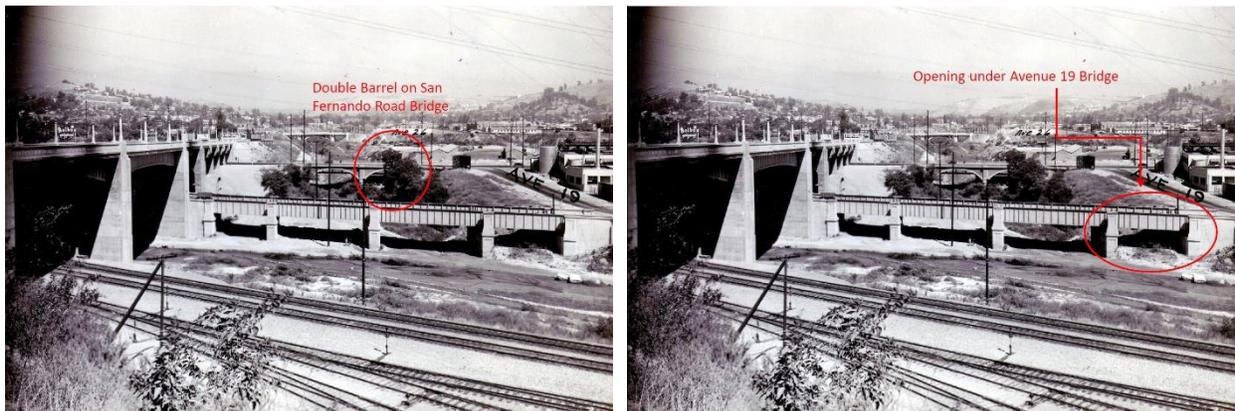


Figure 5-71 Double Barrel on San Fernando Street Bridge and additional span on the Avenue 19 Bridge⁸⁸

⁸⁷ <http://arroyoseco.org/lar/asfcom2alt/laraltasfcom.htm>

⁸⁸ <http://arroyoseco.org/lar/asfcom2alt/laraltasfcom.htm>

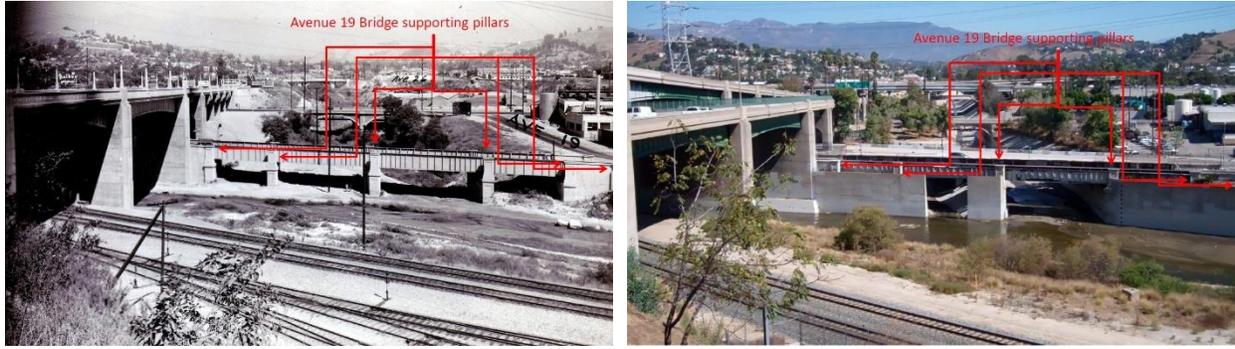
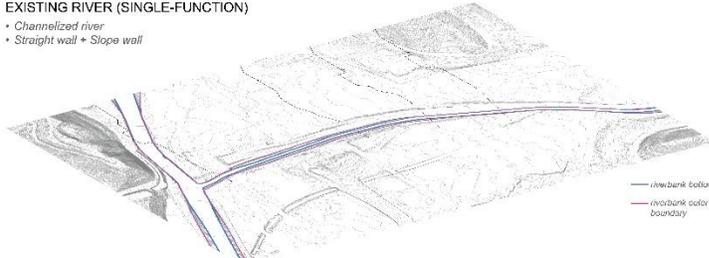


Figure 5-72 Supporting pillars on the Avenue 19 Bridge and the reconstructed Avenue 19 Bridge⁸⁹

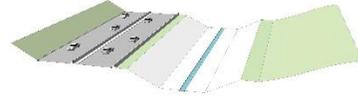
EXISTING RIVER (SINGLE-FUNCTION)

- Channelized river
- Straight wall • Slope wall



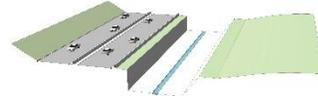
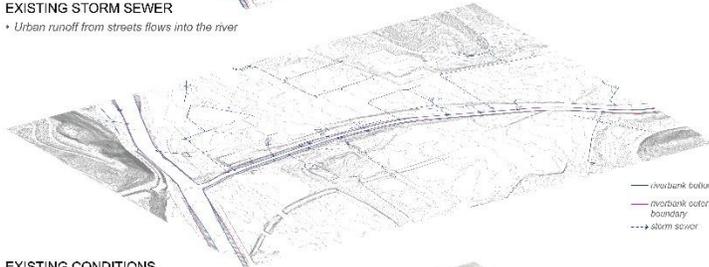
EXISTING RIVERBANK

- Three typical riverbank
- Concrete retaining wall, concrete slope wall and concrete bottom



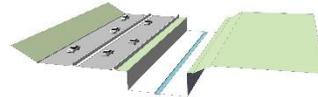
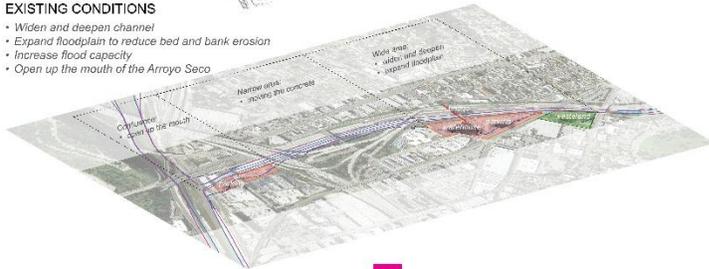
EXISTING STORM SEWER

- Urban runoff from streets flows into the river



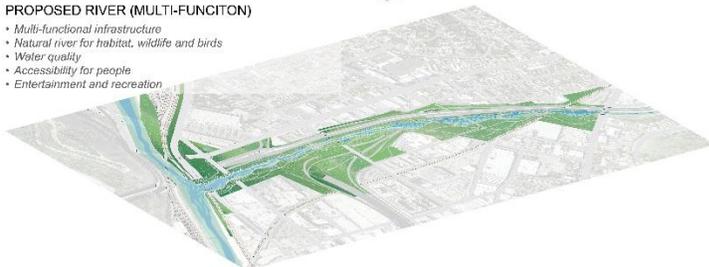
EXISTING CONDITIONS

- Widen and deepen channel
- Expand floodplain to reduce bed and bank erosion
- Increase flood capacity
- Open up the mouth of the Arroyo Seco



PROPOSED RIVER (MULTI-FUNCTION)

- Multi-functional infrastructure
- Natural river for habitat, wildlife and birds
- Water quality
- Accessibility for people
- Entertainment and recreation



PROPOSED RIVERBANK (OPTION ONE)

- Remove most of concrete
- Widen and deepen most zones for flood control
- Use ecological technology to protect the riverbank
- For water quality, habitat, biodiversity

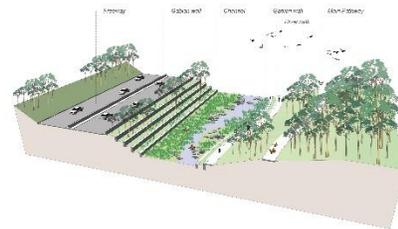


Figure 5-73 Existing River and Proposed River

⁸⁹ <http://arroyoseco.org/lar/asfcom2alt/laraltasfcom.htm>

Design Strategies [Figure 5-74] include widening and deepening the channel for expanding floodplain and increasing flood capacity, introducing new landscape elements for water quality, such as terraced remediation wetland and wetland treatment system, planting native vegetation communities for habitat and biodiversity, and creating riverwalk, bikeway and pedestrian bridge for providing access for people.

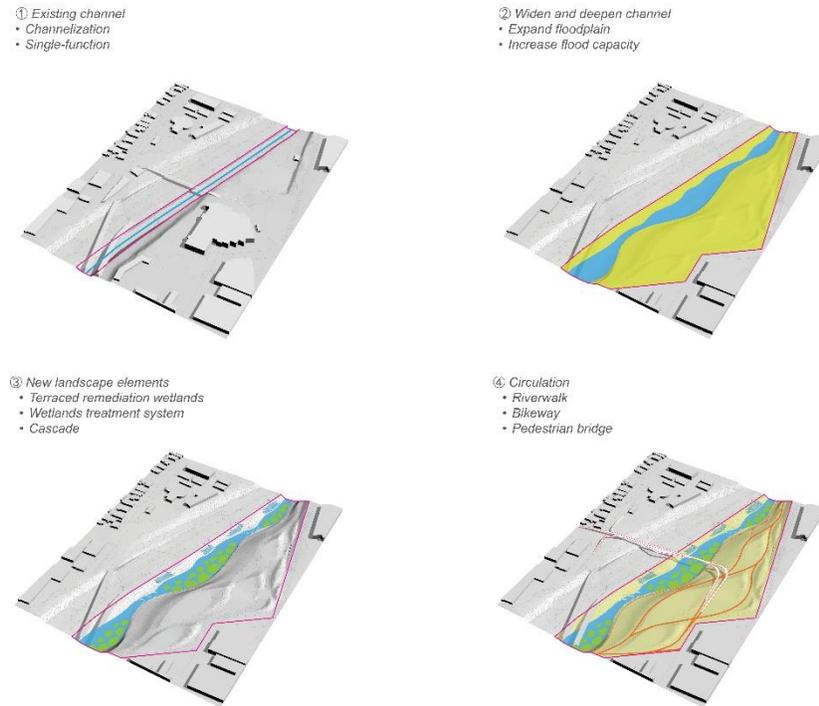


Figure 5-74 Design Strategy

(2) Water management

a) Water quality

- Creating water treatment system for improving water quality.
- Using wetlands to slow the water down and allow sediments and associated pollutants to settle out.

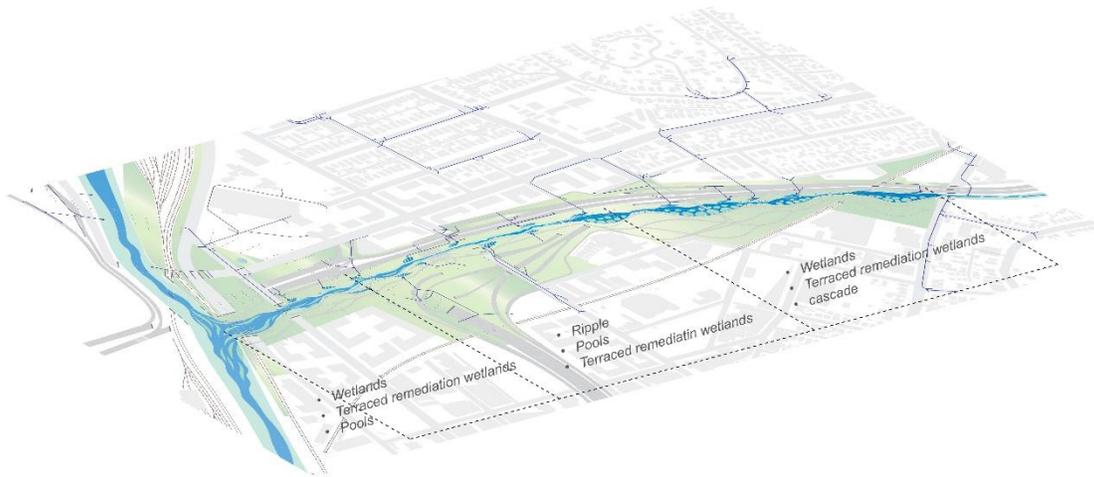


Figure 5-75 Water Quality

b) Water flow

- Creating dynamic and interesting water flow for water quality and habitat.
- The flows in the Arroyo Seco vary greatly over the course of the year. During the dry season, May to October, the stream flow consists of rising groundwater and nuisance urban runoff. During the wet season, November to April, the river maintains the same base flow components in addition to runoff from storm events.⁹⁰ In 2011, daily mean discharge from Devil's Gate Dam is 29.63 cubic feet per second, approximately 19.15 million gallons per day [Table 5-1].

CAL YEAR	MAX (cfs)	MIN (cfs)	INST MAX (cfs)	TOTAL (cfs)	MEAN (cfs)	MEAN (Acre feet/day)	MEAN (Gallons/day)
2005	8300	1.02	8910	63960.81	175.24	347.57	113257400.97
2006	827	0.55	2170	8722.94	23.90	47.40	15445981.89
2007	209	0.08	1380	2427.57	6.65	13.19	4298573.91
2008	658	0	6480	6909.73	18.93	37.55	12235274.40
2009	886	0.07	3760	3137.21	8.60	17.05	5555155.58
2010	1640	0.1	7760	12049.93	33.01	65.48	21337186.84
2011	587	1.56	3750	10813.51	29.63	58.76	19147819.39

Table 5-1 Daily mean discharge in Calendar Year at Arroyo Seco below Devil's Gate Dam
(Date from US Army Corps of Engineers Los Angeles District)

⁹⁰ Arroyo Seco Watershed Ecosystem Restoration Study, Los Angeles County, California, Feasibility Scoping Meeting Documentation (Final) (August 2011), 3-28

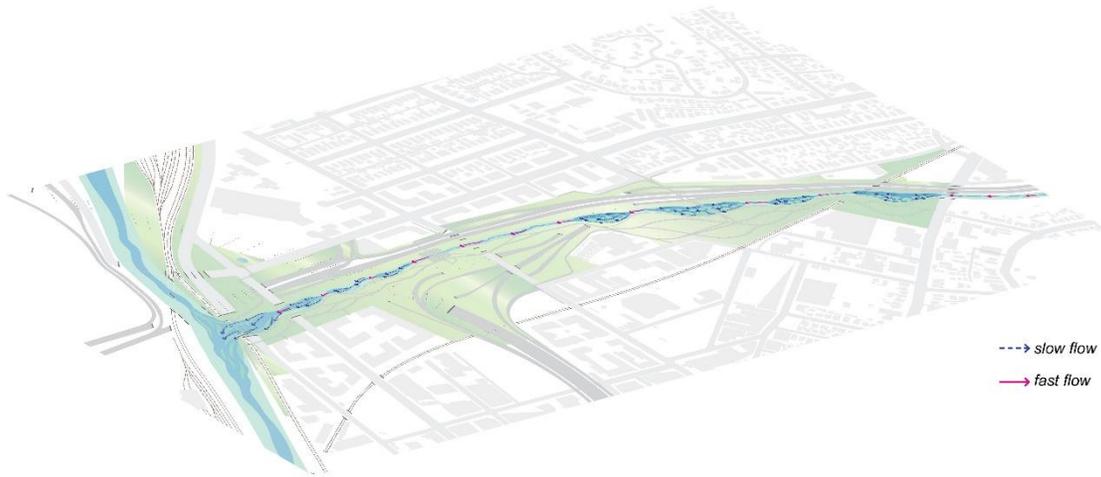


Figure 5-76 Water Flow

c) Riverbank protection

- Retaining north straight retaining concrete wall for Pasadena Freeway from Pasadena Avenue to North Central Animal Shelter
- Using gabion wall system, terraces, riprap, and less concrete to protect the riverbank.

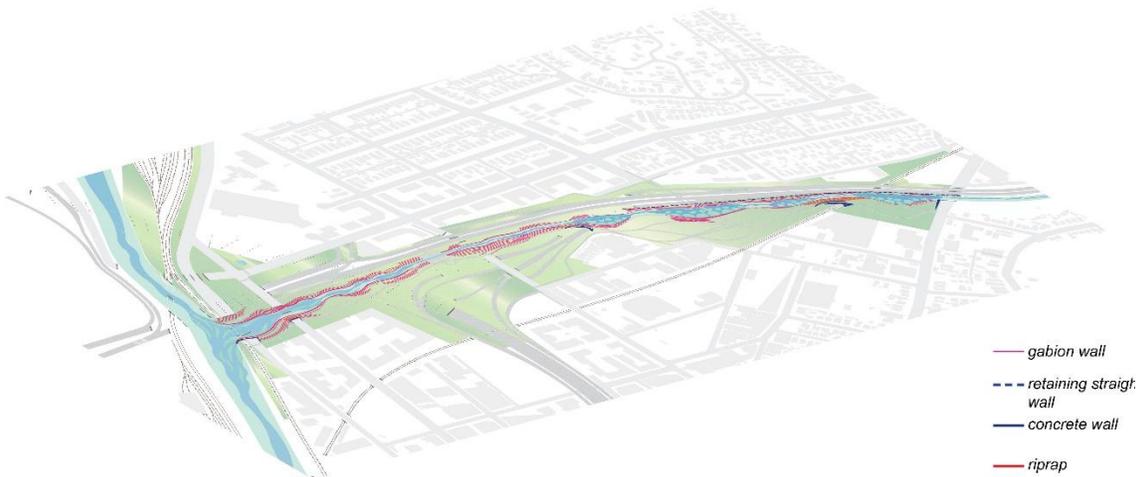


Figure 5-77 Riverbank Protection

d) Flood control

A large portion of the Arroyo Seco watershed downstream of the San Gabriel Mountains has been urbanized and is now substantially impervious. Due to the high amount of impervious surfaces within the watershed, rainwater quickly makes its way to the storm drains and the Arroyo

Seco. In addition, any rainfall in the headwaters makes its way to the Arroyo Seco quickly because of the steep mountainous stream channels in the upper watershed.⁹¹ During the wet season, half of flood comes from urban runoff, half of flood comes from upstream. The table 5-2 shows peak flows in the Arroyo Seco watershed.

Table 5-2 Peak Flows in The Arroyo Seco Watershed⁹²

LOCATION (CONCENTRATION POINT)	DRAINAGE AREA (sq mi)	DISCHARGE (cfs) FOR RETURN PERIOD (EXCEEDANCE PROBABILITY)						
		2-year (0.50)	5-year (0.20)	10- year (0.10)	25- year (0.04)	50-year (0.02)	100- year (0.01)	500- year (0.002)
USGS Gage #11098000 (BP3)	16.0	586 (570)	1,750 (1,750)	3,030 (3,030)	5,180 (5,200)	7,560 (7,580)	10,300 (10,300)	18,900 (18,900)
Explorer Rd JPL – U/S end of Devil’s Gate Dam (J88)	23.2	837	2,480	4,180	7,080	10,200	13,900	24,400
Devil’s Gate Dam (J78)	31.6	1,030 (1,100)	2,500 (2,500)	4,280 (4,300)	7,390 (7,400)	11,400 (11,500)	17,300 (17,000)	36,000 (36,000)
Seco St (J73)	36.8	678	1,520	2,270	5,600	8,450	11,200	17,000
Arbor St – South of Colorado Blvd (BP2)	37.5	791	1,720	2,550	5,680	8,580	11,800	17,800
San Pascual Ave - Hermosa St (BP1)	39.4	1,060	2,240	3,260	5,860	8,910	13,200	20,000
49 th Ave (J68)	44.5	2,110	3,910	5,430	7,720	10,400	17,800	26,600
Confluence of Arroyo Seco and Los Angeles River (Outlet1)	46.2	2,430	4,430	6,120	8,670	11,400	19,200	28,800
Discharges shown in parentheses were developed from the flood frequency analysis using HEC-FFA.								

In this project, the channel can be widened and deepened for expanding floodplain and increasing flood capacity for flood control [Figure 5-79].

⁹¹ Arroyo Seco Watershed Ecosystem Restoration Study, Los Angeles County, California, Feasibility Scoping Meeting Documentation (Final) (August 2011), 3-28

⁹² Arroyo Seco Watershed Ecosystem Restoration Study, Los Angeles County, California, Feasibility Scoping Meeting Documentation (Final) (August 2011), 3-29

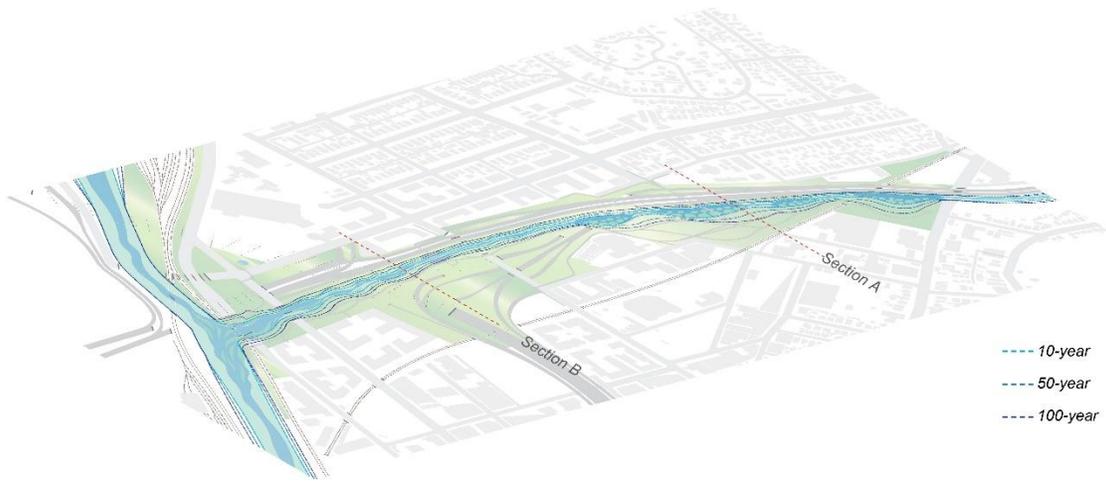


Figure 5-78 Flood Control

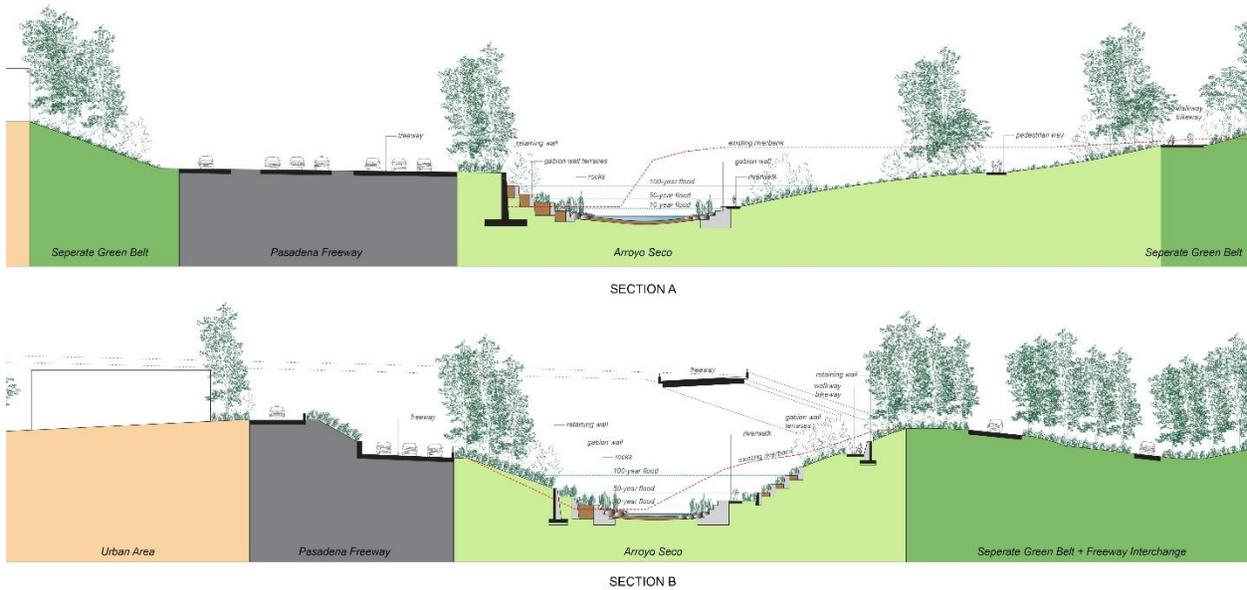


Figure 5-79 Section A and B

(3) Program

a) Circulation

Pedestrian and bikeway system will be created along the river. In the flood period, riverwalk in the low water level will be covered by river water. Two pedestrian bridges will be built for increasing access for people from the north neighborhood. One pedestrian bridge will be located in the west of Avenue 26 Bridge, the other one will be rebuilt near Cypress Ave. Additionally, Metro Gold Line provides excellent regional access from Downtown to Pasadena for this area.



Figure 5-80 Circulation

b) Recreation

Providing different open spaces along the river so that people can enjoy the rare resource of a natural river in urban area.

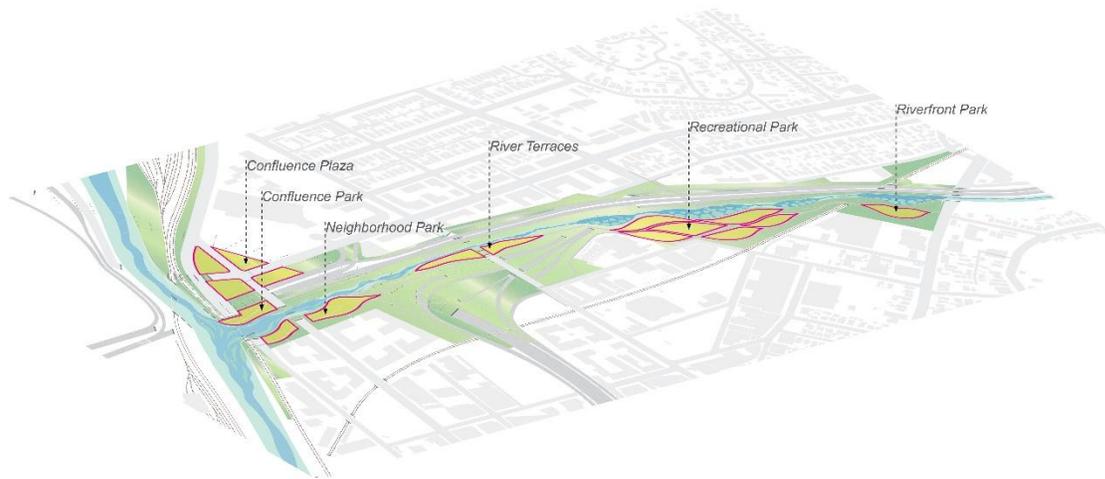


Figure 5-81 Open spaces along the river

(4) Biodiversity

a) Vegetation

Planting native vegetation patterns which are found in the Arroyo Seco watershed for improving habitat quality and biodiversity, includes coast live oak forest and woodland, coastal scrub, riparian scrub, southern sycamore-alder riverine woodland, and wetland planting system.

Each vegetation community and habitat type is showed in the following table.

Table 5-3 Native vegetation communities in this project

VEGETATION PATTERN	HABITAT	NATIVE SPECIES
Coast Live Oak Forest And Woodland	Be associated with upland areas on slopes that are often very steep or on raised stream banks and terraces. Located on north-facing slopes and shaded ravines. ⁹³	California Walnut Coast Live Oak Engelmann Oak Mexican Elderberry Toyon
Coastal Scrub	Be found on slopes and sidewalls of the Arroyo Seco watershed in areas devoid of urban influences. Be found on dry, rocky, steep, south-facing slopes and ridges with shallow or poorly differentiated soils. ⁹⁴	California Sagebrush California Buckwheat Black Sage White Sage Laurel Sumac Lemonade Berry Chaparral Yucca Bush Monkey flower Scrub Oak Holly-Leaf Cherry
Riparian Scrub	Be typically dominated by willows and cottonwood trees. The understory is variable depending on canopy coverage, disturbance history and water availability, and usually includes poison oak, wild grape, western ragweed, rushes, and a variety of other water-loving plants. ⁹⁵	Alnus Rhombifolia White Alder Baccharis Salicifolia Mulefat Platanus Racemosa Western Sycamore Rosa Californica California Rose Salix Exigua Littleleaf Willow Salix Laevigata Red Willow Salix Lasiolepis Arroyo Willow
Southern Sycamore- Alder Riverine Woodland	Favor areas of very rocky stream bottoms that are	Arroyo Willow Black Willow

⁹³ Arroyo Seco Watershed Ecosystem Restoration Study, Los Angeles County, California, Feasibility Scoping Meeting Documentation (Final) (August 2011), 6-68, 6-69

⁹⁴ Arroyo Seco Watershed Ecosystem Restoration Study, Los Angeles County, California, Feasibility Scoping Meeting Documentation (Final) (August 2011), 6-64

⁹⁵ <http://www.carlsbadca.gov/services/environmental/hmp/species-habitats/Pages/riparian.aspx>

	subject to seasonal high-intensity flooding ⁹⁶ . Often occur along seasonally-flooded banks ⁹⁷ .	Coast Live Oak Mugwort
Wetland Planting System		Bacchain Salicifolia Rosa Californica Salix Exigua Salis Lasiolepis
Open Program Lawn System		Foothill Needle Grass Purple Needle Grass California Fescue



Figure 5-82 Vegetation Communities

b) Habitat

Planting local vegetation communities for attracting native wildlife, birds [Table 5-3], butterflies and fishes, and providing different habitats for birds, animals and fishes. Species that are most commonly found in the Arroyo Seco watershed are discussed below.

⁹⁶ Arroyo Seco Watershed Ecosystem Restoration Study, Los Angeles County, California, Feasibility Scoping Meeting Documentation (Final) (August 2011), 6-66

⁹⁷ http://www.rcip.org/Documents/draft_2_mshcp_vol_2/c_19.pdf

Table 5-4 Local favorite birds of the Arroyo⁹⁸

BIRDS OF THE ARROYO	PREFERRED HABITATS	PICTURES
<i>California Quail</i>	Grasslands, foothills, woodlands, canyons and at the edge of deserts. It likes areas with lots of brush.	
<i>Killdeer</i>	Open grasslands, wetlands, fields, croplands and pastures, and short-grass prairies	
<i>Northern Mockingbird</i>	Found in residential areas, city parks, farmlands, open country with thickets, and desert brush.	
<i>Red-tailed Hawk</i>	Found in open country, woodlands, prairie groves, mountains, plains, farmlands, and roadsides.	
<i>Wrentit</i>	Chaparral, shrubs, and brush	
<i>Black Phoebe</i>	Shady areas near water, streams, ponds, and lakes; occurs in city parks and open chaparral in winter.	
<i>Yellow Warbler</i>	Edges of marshes and swamps, willow-lined streams, leafy bogs, thickets, orchards, farmlands, forest edges, and suburban yards and gardens	
<i>Great Blue Heron</i>	Lakes, ponds, rivers, and marshes	

⁹⁸ <http://www.arroyoseco.org/birds.htm>

<i>California Thrasher</i>	Chaparral, foothills, and dense shrubs in parks or gardens	
Spotted Towhee	Forest edges, thickets, gardens, and shrubby park areas	
Oak Titmouse	Live oaks and deciduous growth, including oak woodlands, streamside cottonwoods, forest edges, and oak-juniper woodlands.	
<p>Focal Species:</p> <ul style="list-style-type: none"> - Riparian: Yellow Warbler - Oak/Walnut: Oak Titmouse - Scrub: Spotted Towhee <p>These birds are key indicators of the health of various habitat zones in the Arroyo Seco.</p>		

Mammals common throughout the watershed include striped skunk (*Mephitis mephitis*), California ground squirrel (*Spermophilus beecheyi*), Botta’s pocket gopher (*Thomomys bottae*), and Audubon cottontail (*Sylvilagus audubonii*), etc.⁹⁹

Rainbow trout (*Oncorhynchus mykiss*) and arroyo chub (*Gila orcutti*) are the only native fish that are present in the Arroyo Seco watershed. The only other fish species known to be currently present in the watershed is mosquitofish (*Gambusia affinis*), which is a non-native from the eastern United States.¹⁰⁰

Two amphibians common to the area are the California toad (*bufo boreas halophilus*) and Pacific treefrog (*Hyla regilla*). Reptiles include western fence lizard (*Sceleporous occidentalis biseriatum*), California striped racer (*Masticophis lateralis*), etc.¹⁰¹

⁹⁹ *Arroyo Seco Watershed Ecosystem Restoration Study, Los Angeles County, California, Feasibility Scoping Meeting Documentation (Final)* (August 2011), 3-76

¹⁰⁰ *Arroyo Seco Watershed Ecosystem Restoration Study, Los Angeles County, California, Feasibility Scoping Meeting Documentation (Final)* (August 2011), 3-77

¹⁰¹ *Arroyo Seco Watershed Ecosystem Restoration Study, Los Angeles County, California, Feasibility Scoping Meeting Documentation (Final)* (August 2011), 3-77

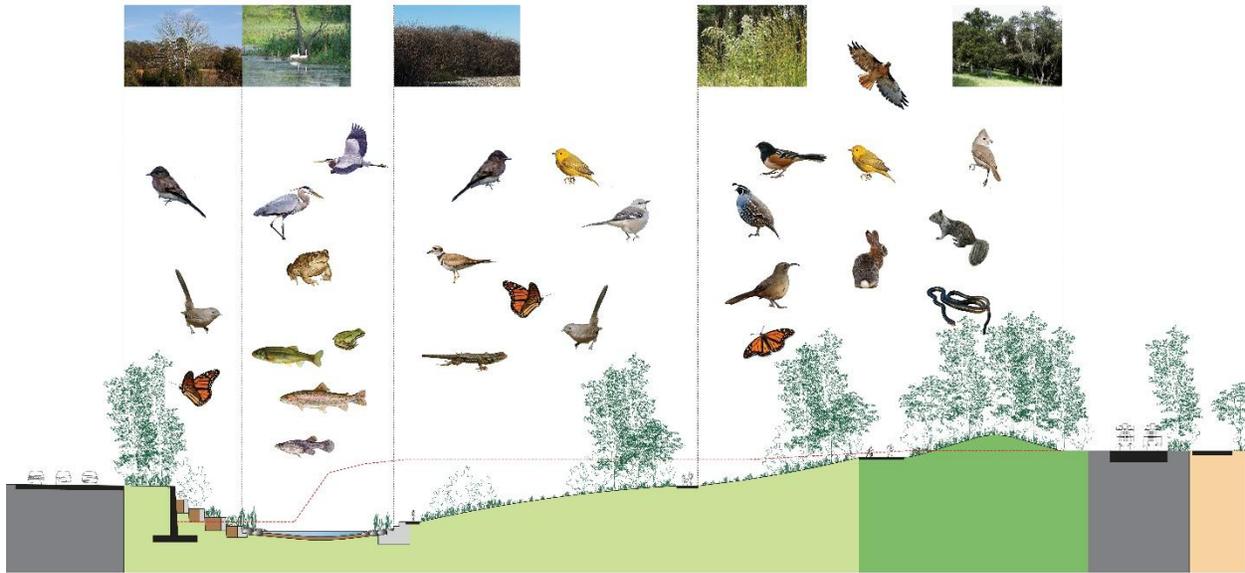


Figure 5-83 Habitat Section

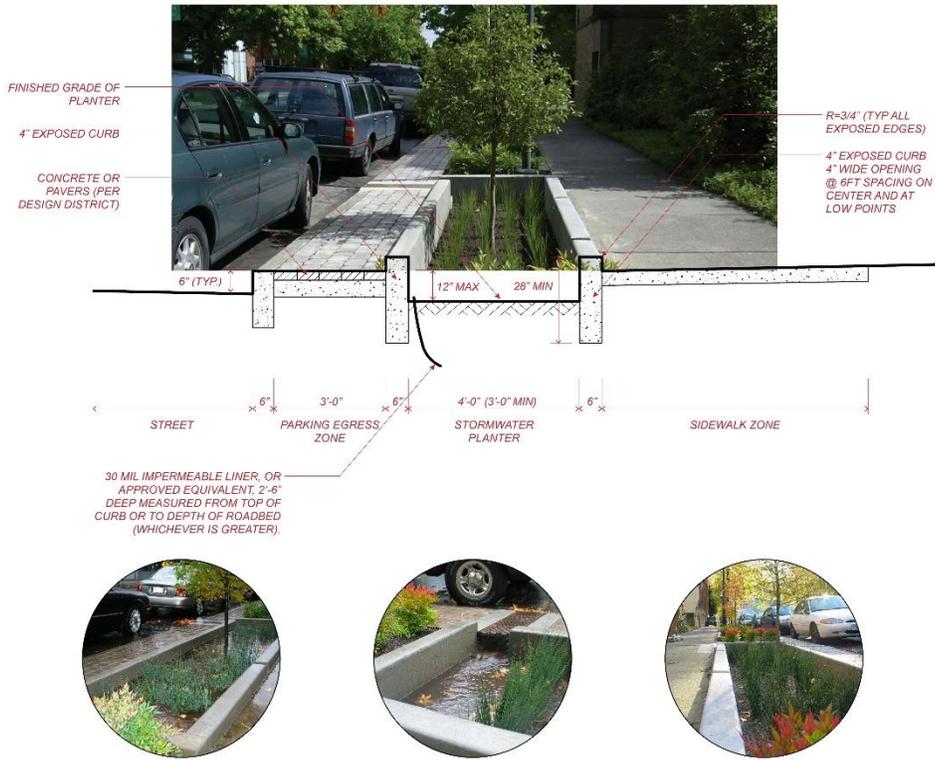


Figure 5-84 Looking east towards the Arroyo Seco at W Avenue 26 Bridge (before & after)

5.3.2.2 Integrating

(1) Green Street

Redesign sidewalks along streets and using vegetated bioswale for capturing, storing and cleaning stormwater before it flows into urban sewer pipes and rivers.



FIGUEROA STREET

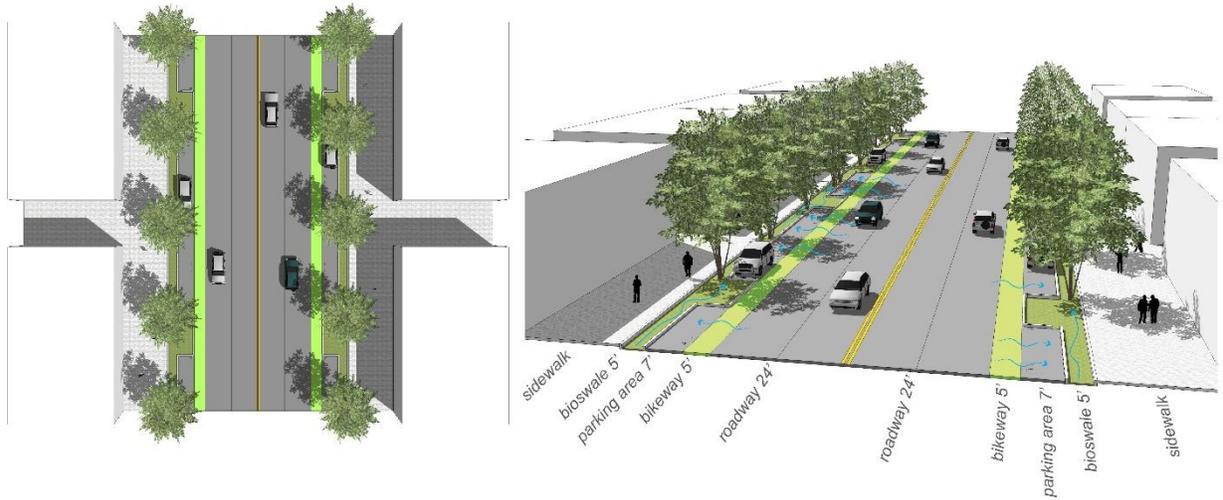


Figure 5-85 Vegetated bioswale along streets

(2) Neighborhood habitat

Creating neighborhood habitat for improving urban environment, and planting native species for attracting animals, birds and butterflies.

Table 5-5 Native species in neighborhood habitat

VEGETATION PATTERN	NATIVE SPECIES
Butterfly plants	California buckeye Western sycamore Oak Encelia Buckwheat Hollyleaf redberry California coffeeberry Yucca
Hummingbird plants	California buckeye California fuschia Epilobium
Bioswale plants	California meadow sedge Common rush Deer grass



Figure 5-86 Neighborhood Habitat

5.3.2.3 Regenerating

Regenerating for developing to bring new life and investment to nearby urban settlements, creating a dynamic environment for people to live, work and play in this better place. Redevelopment sites [Figure 5-85] include Figueroa Street, the southeast of the Confluence, Lacy Street Lofts and Studios.

EXISTING BUILDINGS



REDEVELOPMENT

- ① Figueroa Commercial Street
- ② Residential Area (Southeast of the Confluence)
- ③ Creative Cultural industry (Lacy Street Lofts & Studios)

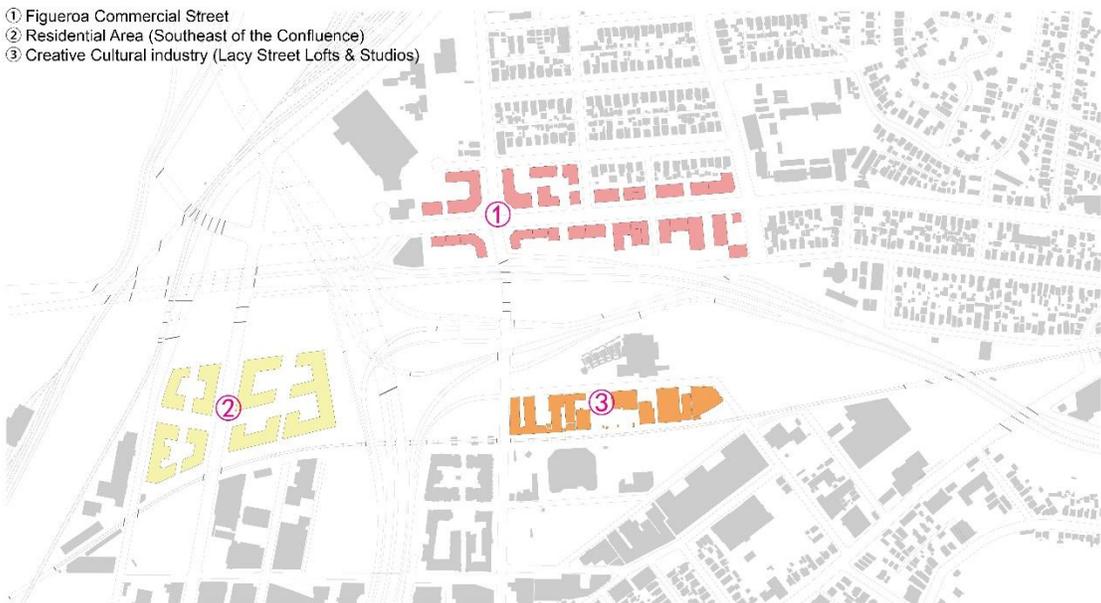


Figure 5-87 Redevelopment Sites

(1) Figueroa Commercial Street

Figueroa Street is a very important commercial street. Most of people who live and work around neighborhood come to this street for eating, shopping, talking, etc. After recovering the Arroyo Seco, this street should be redeveloped for forming a living commercial street and providing better urban

environment for people. Therefore, in the future, two to three commercial buildings can be rebuilt along the Figueroa Street. The first floor can be used for restaurant, coffee shop and retail store, and the second and third floor can be used for commercial office.



Figure 5-88 Bird's eye view of Figueroa Commercial Street and Arroyo Seco

(2) Residential Area (southeast of the Confluence)

After recovering the Arroyo Seco Confluence, light industrial area at the southeast of the Confluence can be changed to residential housing for people. So people can walk, jog, bike and play along the river, and enjoy the rare resource of a natural river.

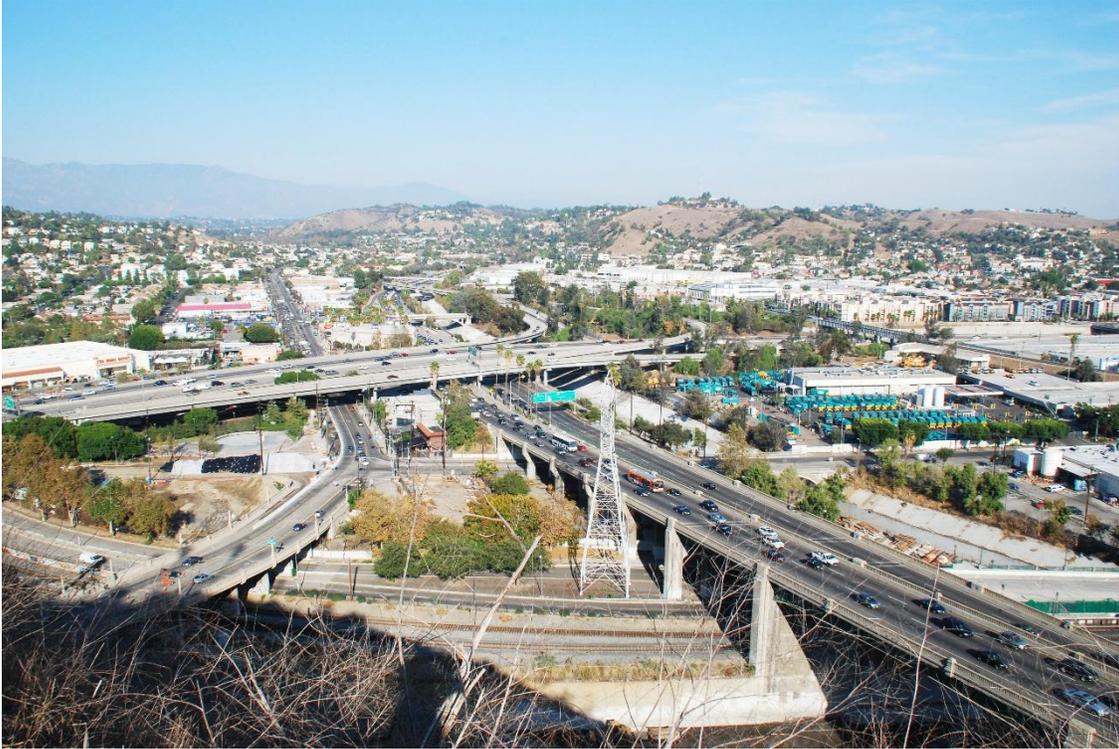


Figure 5-89 Present view of the Arroyo Seco Confluence (Looking east towards the Confluence from Elysian Park, the Confluence Plaza at left, light industrial buildings at right.)



Figure 5-90 Vision view of the Arroyo Seco Confluence (The Confluence Plaza at left is rebuilt, light industrial buildings are changed to residential housings at right.)

(3) Creative Cultural Industry (Lacy Street Lofts & Studios)

Design strategies include retaining studios and lofts, changing parking space to open space and outdoor exhibition, reusing existing buildings for office and mixed use, and building green isolation belt along Metro Gold Line.

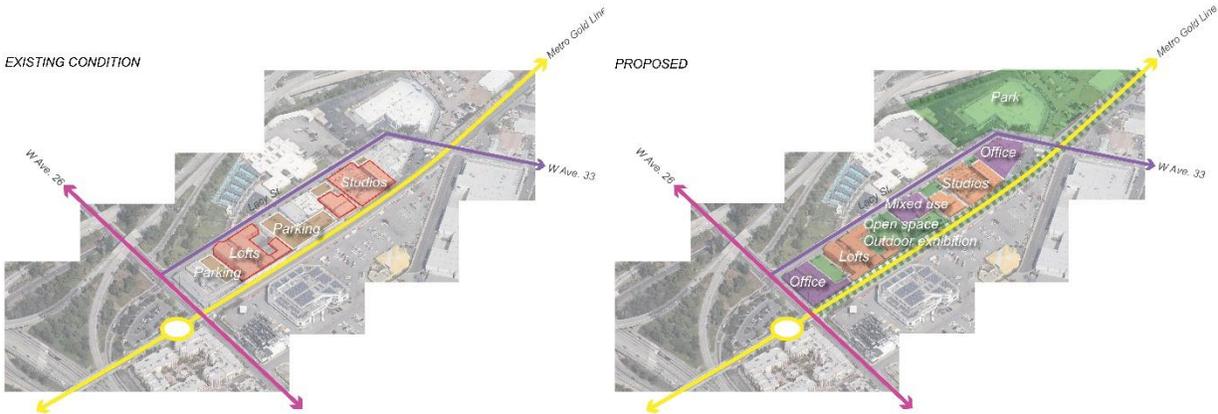


Figure 5-91 Existing conditions and proposed design of Lacy Street

Additionally, we need to improve public transit [Figure 5-92] and bikeway system [Figure 5-93] for connecting the historic site from Downtown Los Angeles to Pasadena, and provide interesting and continuous tour route for residents and visitors.

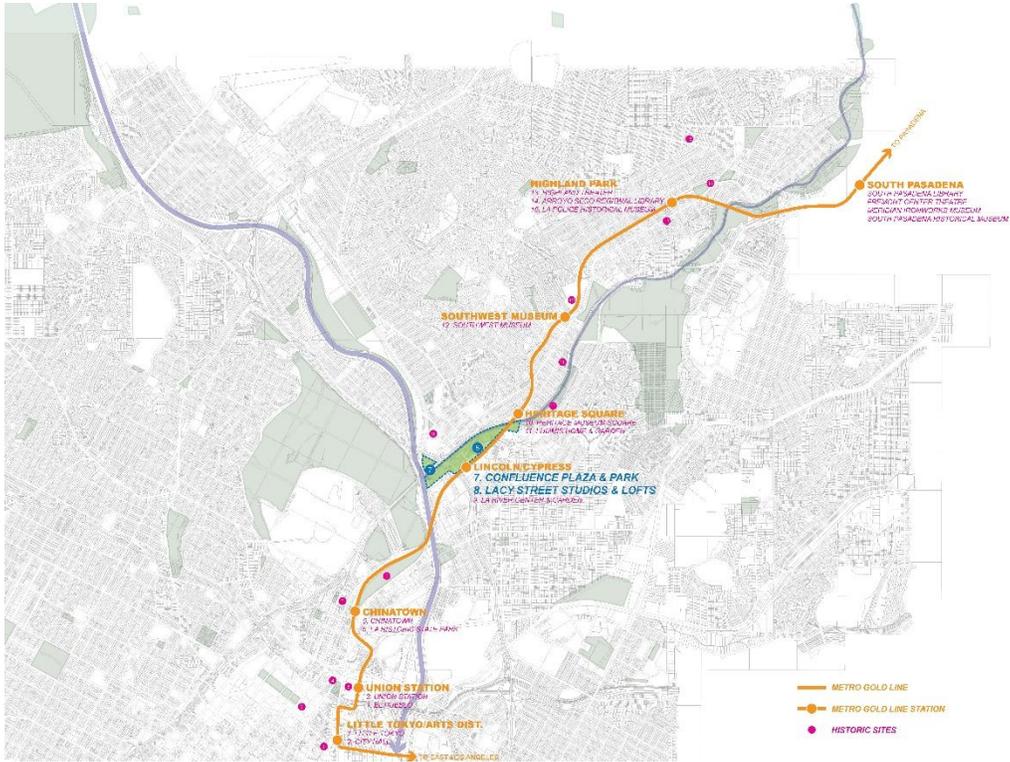


Figure 5-92 Metro Gold Line and historic sites

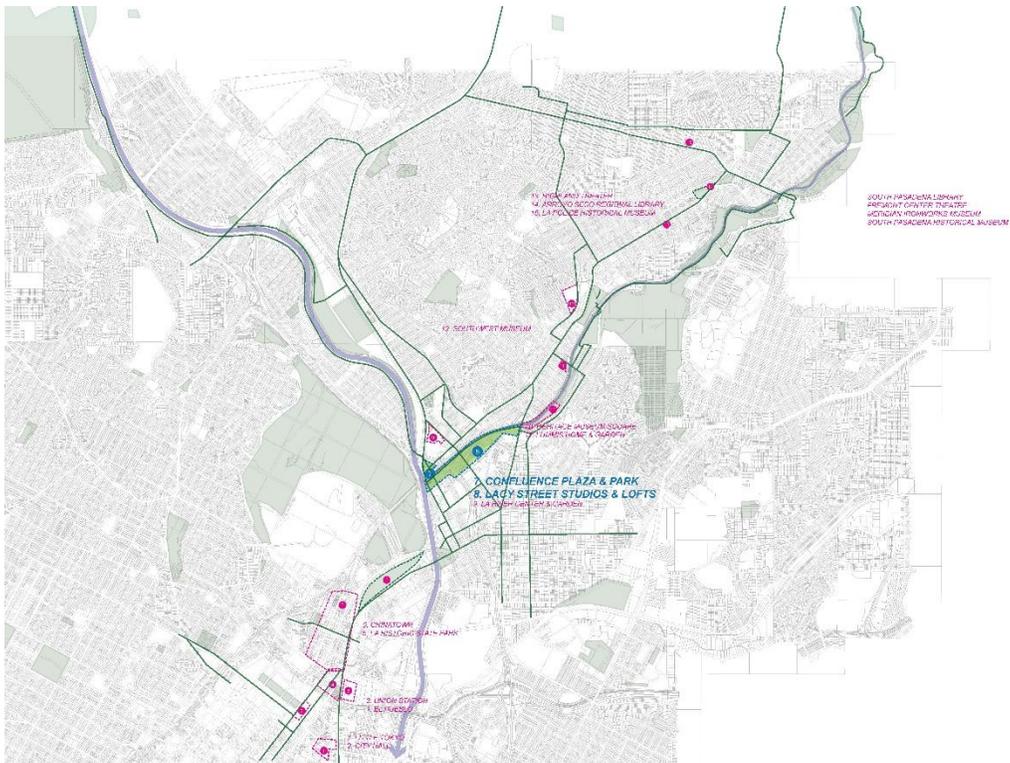


Figure 5-93 Bikeway system and historic sites

VI. SUMMARY OF FINDINGS

The confluence of Arroyo Seco and the Los Angeles River is a very important and immense potential site. It has a lot of unbeatable attributes:

- Opportunity to rebuild the ecological riverbank with native and local plants for the river restoration and improving habitat quality;
- Key spot for flood management and water quality improvements¹⁰²;
- Opportunity to use the limited land for providing a safety pedestrian system and bikeway and creating recreational areas for accessibility, especially the land under freeways and bridges;
- Gateway to the Los Angeles River through Downtown¹⁰³;
- Opportunity for creating a healthy dynamic landscape between the river and adjacent development area;
- Opportunity for introducing creative industry into the light industrial area, renew and redevelop the light industrial area, and promote sustainable development.

Above all, we should primarily take into account the main function of the drainage channel and the management of flood control at the Arroyo Seco. Only meeting the flood control requirements, we can use some ecological methods to change the concrete riverbank and improve water quality and habitat quality at the Arroyo Seco, such as using wetlands and vegetative swales for slowing the flow of stormwater and filtering it. What is more, we need to plant native vegetation communities which are found in the Arroyo Seco watershed for biodiversity. After that, we can create some open spaces for residents and visitors. Therefore, the Arroyo Seco can be changed from a channelized and single-functional channel to a multi-functional corridor of significant natural and cultural value.

However, there are some issues in this project need to be solved in the future:

- How to take all things into consideration the restoration of the whole Arroyo Seco watershed?
- How to improve urban environment in big scale, from the Confluence to the San Gabriel Mountains?

¹⁰² http://www.arroyoseco.org/images/Confluence_Slideshow.pdf, 14

¹⁰³ http://www.arroyoseco.org/images/Confluence_Slideshow.pdf, 14

- Recovering native habitats in the river and nearby urban settlements is very important and challenging issue. We cannot just only plant more native plants for restoring native habitats, need to find other methods to address this issue.

VII. COMPLETE BIBLIOGRAPHY AND REFERENCE SOURCES

1. *Arroyo Seco Watershed Management and Restoration Plan Final Report* (March 1st, 2006), 28
2. *Arroyo Seco Watershed Ecosystem Restoration Study, Los Angeles County, California, Feasibility Scoping Meeting Documentation (Final)* (August 2011), 3-28, 3-76, 3-77, 3-29, 6-64, 6-66, 6-68, 6-69
3. *Cornfield Arroyo Seco Specific Plan and Redevelopment Plan: Draft Environmental Impact Report* (September, 2009), 1-4,
http://planning.lacity.org/eir/CornfieldArroyo/DEIR/CASP_DEIR_Index-file.html
4. *Guadalupe River Park Master Plan* (2002), 1, 17
5. John C. Arroyo, *Culture in concrete: Art and the Re-imagination of the Los Angeles River as Civic Space*, 102
6. Kazys Varnelis, *The Infrastructural City: Networked Ecologies in Los Angeles* (Actar Barcelona/New York, 2009), 36
7. *Los Angeles River Revitalization Master Plan* (April, 2007), 6
8. Skidmore, Owings & Merrill LLP, *SOM City Design Practice*, 55, 77
<http://www.som.com/books/citydesign/index.html>
9. *Thornton Creek Water Quality Channel Final Report*, 7, 8
10. USGS, *Geological, Hydrological. And Biological Issues Related to the Proposed Development of a Park at the Confluence of the Los Angeles River and the Arroyo Seco, Los Angeles County, California* (2004), 2, 4
11. Ying-Yu Hung, Gerdo Aquino, Charles Waldheim, Julia Czerniak, Adriaan Geuze, Alexander Robinson, Matthew Skjonsberg, *Landscape Infrastructure: Case Studies by SWA* (Birkhauser Press, 2010), 42, 46, 51
12. <http://www.savelariveropenspace.org/background.html>
13. http://you-are-here.com/location/la_river.html
14. <http://www.som.com/books/citydesign/index.html>
15. http://www.arroyoseco.org/images/Confluence_Slideshow.pdf, 8-10, 14, 15
16. <http://www.asla.org/2009awards/104.html>
17. http://www.asla.org/2009awards/images/largescale/104_00.jpg

18. <http://landscapeurbanism.com/strategy/buffalo-bayou-promenade/>
19. http://www.asla.org/2009awards/images/largescale/104_06.jpg
20. http://www.asla.org/2009awards/images/largescale/104_11.jpg
21. http://www.asla.org/2009awards/images/largescale/104_12.jpg
22. <http://cdn.archinect.net/images/1200x/kx/kx4l0rm9z4p6eoez.jpg>
23. http://www.asla.org/2009awards/images/largescale/104_16.jpg
24. <http://www.asla.org/2009awards/104.html>
25. <http://www.asla.org/2009awards/104.html>
26. <http://www.flickr.com/photos/jade001/3712309416/>
27. <http://landscapeurbanism.com/strategy/buffalo-bayou-promenade/>
28. http://v8.cache7.c.bigcache.googleapis.com/static.panoramio.com/photos/original/53051194.jpg?redirect_counter=1
29. <http://www.sjredevelopment.org/grp/Guadalupeplan.pdf>
30. <http://bikesiliconvalley.org/files/styles/grid-12/public/images/111.JPG>
31. <http://rhorii.com/GRPG/GRPG2.html>
32. <http://rhorii.com/GRPG/GRPG2.html>
33. http://4.bp.blogspot.com/_B_A5okO8k5E/Tb7lgSYL38I/AAAAAAAAABqw/UPoS6bJyho4/s1600/-12.jpg
34. <http://newsroom.ch2mhill.com/pr/ch2m/cities-of-the-future-an-urban-230859.aspx>
35. <http://assets.inhabitat.com/wp-content/blogs.dir/1/files/2012/10/bishan-park-before-and-after.jpg>
36. http://www.detail-online.com/uploads/pics/landscape_of_the_year_2012_bishan_park_30.jpg
37. <http://www.treehugger.com/urban-design/bishan-park-kallang-river-restoration-singapore.html>
38. <http://www.toposmagazine.com/blog/new-river-park-in-singapore.html>
39. <http://www.asla.org/2011awards/309.html>
40. http://www.asla.org/2011awards/images/largescale/309_01.jpg
41. http://www.asla.org/2011awards/images/largescale/309_06.jpg
42. http://www.asla.org/2011awards/images/largescale/309_12.jpg
43. http://www.asla.org/2011awards/images/largescale/309_13.jpg
44. http://www.asla.org/2011awards/images/largescale/309_03.jpg
45. <http://bridgehunter.com/photos/19/05/190512-L.jpg>
46. <http://static.panoramio.com/photos/original/32733840.jpg>
47. <http://798-art-district.com/book-about-beijing-798/>
48. <http://celladdition.files.wordpress.com/2011/02/798map3-568x356.jpg>
49. <http://celladdition.files.wordpress.com/2011/02/p11906732.jpg>

50. <http://celladdition.files.wordpress.com/2011/02/798-art-zone-3.jpg>
51. <http://celladdition.files.wordpress.com/2011/02/1.jpg>
52. http://media.photobucket.com/image/798%20art%20zone%20map/Miss_Asphyxia_/photodump/bei3.jpg
53. http://v8.cache4.c.bigcache.googleapis.com/static.panoramio.com/photos/original/23103335.jpg?redirect_counter=1
54. http://upload.wikimedia.org/wikipedia/commons/8/87/Space-gallery_798-art-district.jpg
55. http://celladdition.files.wordpress.com/2011/02/1_1255099399_798-art-district.jpg
56. <http://celladdition.files.wordpress.com/2011/02/80874d1c875d0db31f18cb0bb6c4b68d.jpg>
57. http://1.bp.blogspot.com/_SZWzsGwkzps/TIz-G0r3nul/AAAAAAAAAXM/ID2ejbpDqe4/s1600/IMG_3314.JPG
58. http://3.bp.blogspot.com/_AHRXR9-G31c/S9vS3EpJbXI/AAAAAAAAAcU/4yqDUF_4ApA/s1600/DSC_0398.JPG
59. <http://www.lafoundation.org/research/landscape-performance-series/case-studies/case-study/137/>
60. http://www.seattle.gov/util/groups/public/documents/webcontent/spu01_006146.pdf
61. <http://www.lafoundation.org/research/landscape-performance-series/case-studies/case-study/137/>
62. <http://www.loc.gov/pictures/item/ca2755.photos.382720p/>
63. <http://mw2.google.com/mw-panoramio/photos/medium/55102766.jpg>
64. <http://www.loc.gov/pictures/item/ca2755.photos.382716p/>
65. <http://www.loc.gov/pictures/collection/hh/item/ca2896.photos.193823p/resource/>
66. <http://lacreekfreak.files.wordpress.com/2008/10/nela-back-draftmap.jpg>
67. <http://bridgehunter.com/photos/19/05/190500-L.jpg>
68. <http://digitallibrary.usc.edu/assetserver/controller/view/CHS-42230>
69. <http://digitallibrary.usc.edu/assetserver/controller/view/CHS-42221>
70. <http://lacreekfreak.files.wordpress.com/2008/10/nela-front-draftmap.jpg>
71. <http://digitallibrary.usc.edu/cdm/singleitem/collection/p15799coll65/id/5410/rec/1>
72. <http://digitallibrary.usc.edu/assetserver/controller/view/CHS-42222>
73. <http://lacreekfreak.files.wordpress.com/2008/10/nela-front-draftmap.jpg>
74. <http://bridgehunter.com/photos/19/05/190512-L.jpg>
75. <http://latimesblogs.latimes.com/thedailymirror/2008/07/pasadena-freewa.html>
76. http://en.wikipedia.org/wiki/Golden_State_Freeway#Los_Angeles_area
77. http://en.wikipedia.org/wiki/Arroyo_Seco_Parkway
78. <http://www.flickr.com/photos/auntylaurie/1464427760/sizes/o/in/photostream/>
79. <http://www.flickr.com/photos/auntylaurie/1463576963/sizes/o/in/photostream/>

80. <http://arroyolover.blogspot.com/2011/04/arroyo-seco-los-angeles-river.html>
81. <http://www.loc.gov/pictures/resource/hhh.ca2765.photos.382754p/>
82. <http://www.traillink.com/trail/los-angeles-river-trail.aspx>
83. <http://arroyoseco.org/lar/asfcom2alt/laraltasfcom.htm>
84. <http://www.carlsbadca.gov/services/environmental/hmp/species-habitats/Pages/riparian.aspx>
85. http://www.rcip.org/Documents/draft_2_mshcp_vol_2/c_19.pdf
86. <http://www.arroyoseco.org/birds.htm>