SANTA MONICA MOUNTAINS CONSERVANCY

GRANT APPLICATION

Project Name: Maximizing Ecological Benefits for Upper Los Angeles River Parks and Projects

Applicant Name: Heal the Bay

Amount of Request: $250,000 (over 24 months)

Total Project Cost: $250,000 (over 24 months)
Matching Funds: $50,000
Lat/Long: 51.333050/-124.269740

Applicant Address:

1444 9th St.
Santa Monica, CA 90401

Phone: (310) 451-1500
Email: sluce@healthebay.org

Project Address:

Multiple locations (parks/open space) in along Upper Los Angeles River

Lewis MacAdams Riverfront Park (adjacent)
2944 Gleneden St.
Los Angeles, CA 90039

County	Senate District	Assembly District
Los Angeles	26	50

Tax ID: 95-4031055

Grantee's Authorized Representative:

Name and Title	***Phone***
Dr. Shelley Luce	*(310) 451-1500 Ext. 108*

Overhead Allocation Notice:

X Any overhead costs will be identified as a separate line item in the budget and invoices.

X The Conservancy encourages grantees to reduce overhead costs including vehicle and phone expenses.

X The overhead allocation policy has been submitted prior to, or with, the grant application.

Outreach and Advertising Requirement:

X Applicant has read the staff report and board resolution regarding contract policies.

X Applicant has adopted contract policies for the purpose of increasing outreach and advertising to disadvantaged businesses and individuals.

All check boxes must be checked

Brief Project Description:

The Los Angeles River (LA RIVER) is the major waterway in the Los Angeles Basin, draining an area of over 800 square miles and traveling for over 50 miles from its headwaters to the ocean. The L.A. River was and continues to be an important cultural, ecological, and historic feature of the area. However, the waterbody has experienced significant changes over the last 100 plus years, most notably with the hardening and straightening of its banks to prevent flooding beginning in the 1930s. Today, the baseline condition of the L.A. River is poor water quality, with concrete river bottom and banks that are virtually devoid of plant and animal life, and little natural ecological function. Through the proposed project, Heal the Bay will assess the characteristics of current riverfront parks and open space that best predict and maximize ecosystem function and services to inform future riverfront projects with ecological benefits.

Tasks / Milestones:

Analyze current riverfront parks along the L.A. River and major tributaries for ecosystem health and services.

Determine attributes of riverfront parks that benefit ecosystem health and services the most, using statistical analysis

Create a toolkit of criteria and metrics for developing/planning new riverfront parks that provide ecosystem benefits

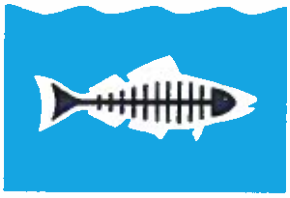
Budget: $250,000 **Completion Date:** June 2021

For Acquisition Projects: **APN(s):** N/A
Acreage: N/A

I certify that the information contained in this Grant Application form, including required attachments, is accurate.

Signature of Authorized Representative

2/28/19
Date



Heal the Bay

A detailed scope of work, including a list of specific tasks, a detailed budget, and timeline for project implementation (including a completion date for each task)

Focus: Assessing characteristics of current riverfront parks and open space that best predict and maximize ecosystem function and services to inform future riverfront projects with ecological benefits.

Project Description: The Los Angeles (L.A.) River is the major waterway in the Los Angeles Basin, draining an area of over 800 square miles and traveling for over 50 miles from its headwaters to the ocean. The L.A. River was and continues to be an important cultural, ecological, and historic feature of the area. However, the L.A. River has experienced significant changes over the last 100 plus years, most notably with the hardening and straightening of its banks to prevent flooding beginning in the1930s. Today, the baseline condition of the L.A. River is poor water quality, with concrete river bottom and banks that are virtually devoid of plant and animal life, and little natural ecological function. Major planning efforts by municipalities and NGOs for the L.A. River revitalization focus on increasing access, improving river-adjacent lands for parks and development, and the potential to capture runoff for local water supply. There is minimal planning for increasing the ecological value of the river itself. This represents a missed opportunity to bring back the River's natural ecological functions which would substantially improve watershed health, climate resilience, and quality of life in Los Angeles.

Heal the Bay has a long history of work on the Los Angeles River; we have advocated for improved habitat, water quality, and recreation by weighing in on numerous policies and permits concerning the Los Angeles River such as TMDLs, the Recreational Use Reassessment (RECUR) study, permits for dredging and clearing vegetation (Clean Water Act Section 401 permits), and many more. Over the last year, Heal the Bay was appointed to the Steering Committee of the County's L.A. River Master Plan Update and we have been working on developing ecological goals and criteria to help inform this planning process. Heal the Bay has completed extensive background research on the L.A. River and has a good understanding of the reports, studies, and documents available. Through a recent grant from Resources Legacy Fund (RLF), we developed a report on ecological goals for urban river restorations (Appendix A). A current grant from RLF is allowing us to expand this report to research other urban river restorations in the U.S to better understand what they entail and how successful they have been. Further, we are adding specific ecological criteria to be used in L.A. River restoration projects along with monitoring recommendations to assess ecological success. This work will help inform our proposed Prop 1 project. Our project will also complement previous work that has been done to identify park locations by helping design parks to maximize the ecological benefits specifically. Additionally, this project is novel from a scientific perspective. River health has been widely studied[1], and there are guidelines for designing waterfront parks[2], but there has not been a scientific study of the ecological health and ecosystem services that river adjacent green spaces provide in a highly urbanized watershed. In L.A. specifically, there is a recent 2018 Biodiversity Report[3], which assesses and scores biodiversity for the entire city, but it is not at the level of detail we are proposing and which is most useful for managers.

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[1] Boulton, Andrew. "An overview of river health assessment: philosophies, practice, problems and prognosis." Freshwater Biology. 41 pp 469-479. 1999

[2] http://wedg.waterfrontalliance.org/wp-content/uploads/delightful-downloads/2018/03/WEDG_Extended-Manual_Small.pdf

[3] https://www.lacitysan.org/cs/groups/public/documents/document/y250/mdi0/~edisp/cnt024743.pdf

We propose to quantify the ecosystem functions and services of current parks and open spaces along the Upper L.A. River and tributaries though field studies as well as Geographic Information System (GIS) analyses. Following data collection, we will utilize statistics to understand which park components provide the most ecological and ecosystem benefits. From this analysis we will develop a toolkit, consisting of criteria and metrics for assisting in future riverfront-park planning to ensure that new parks maximize ecological benefits. The ecosystem health and services that will be analyzed will include:

- Ecosystem Health:
  - Biodiversity of native and non-native plant and animal species
  - Buffers around habitat
  - Connectivity along entire L.A. River for fish, birds, mammals, amphibians, reptiles, and invertebrates
- Ecosystem Services:
  - Reduced urban heat island effect

We have chosen to focus on ecosystem health because having healthy river-adjacent green spaces will help improve the River's function, stability, and resiliency to stressors. Additionally, ecosystem services are an increasingly important and recognized part of healthy ecosystems. Reducing the urban heat island effect is an ecosystem services that is a natural function of a river and healthy riparian habitat in an urban area. In fact, there is a synergistic cooling effect due to bluespace and greenspace that rivers and river adjacent habitat can provide (see Appendix A for more information on different ecosystem health and ecosystem services).

Tasks:

1) Analyze current riverfront parks along the L.A. River and major tributaries for ecosystem health and services. This will be done with in depth field work, Geographic Information System (GIS) analysis, and a study of previous reports and literature across at least 7 riverfront parks. Site selection will be determined in part by accessibility as well as to ensure a range of park types and sizes, potentially starting with MRCA Greenway Parks: Elysian Valley Gateway Park, Rattlesnake Park, River Garden Park, Marsh Park, Oso Park, Steelhead Park, and Egret Park. Additional sites may include the in-stream riparian regions in the Sepulveda Basin and the Glendale Narrows.

    a. Field studies will include:
        i. Biological surveys – birds counts, pollinator counts, camera trapping for small mammals and reptiles, invertebrate sampling (nets, malaise traps, pitfall traps), plant assessment (through transects, percent cover, and canopy cover)
        ii. California Rapid Assessment Method (CRAM) Analysis (Riparian Zone) –CRAM is a diagnostic tool that can be used to assess the condition of a riparian site using visual indicators. Users can consider indicators from the following attributes: landscape context and buffer, hydrology, physical structure, and biotic structure. This would be used to assess applicable sites.
        iii. Urban Heat Island effect – temperature and general weather data collection, tree cover

    b. GIS analysis will include:
        i. NDVI (Normalized Difference Vegetation Index) – used to assess the health of green vegetation
        ii. Wildlife connectivity – using available aerial imagery to understand wildlife corridors on a small scale
        iii. Parks assessment – analysis of park size, shape, surrounding land use

2) Determine attributes of riverfront parks that benefit ecosystem health and services the most, using statistical analysis
    a. Possible statistical analysis to include:
        i. Regression analysis
        ii. Classification and Regression Tree (CART) analysis
        iii. Principal Components analysis

    b. We will utilize statistical analyses to examine which attributes of a park are associated with improved ecological benefits and ecosystem services. For instance, we will analyze the factors which best explain biodiversity, such as park size, park shape, plant composition, park connectedness to greenways/open space, and surrounding land use. From the results of this analysis we can make recommendations for park design to maximize biodiversity. We will conduct similar analyses for additional ecological and ecosystem benefits that we want to maximize, such as urban heat island effect.

3) Create a toolkit of criteria and metrics for developing/planning new riverfront parks that provide ecosystem benefits. Criteria and metrics will be specific for both ecosystem health and ecosystem services functions of a riverfront park, directly based on analysis of existing parks and analyses done in tasks 1 and 2. This toolkit can used by planners to maximize ecosystem benefits when planning a new park.

Project Budget

Category	**Unit**	**Costs (Years 1 and 2)**
Heal the Bay Personnel		
• Watershed Research Fellow	40hrs/week @ $33/hr for 2 years (52 weeks/year)	$137,280
• Science & Policy Director	4hrs/week @ $50/hr for 2 years (52 weeks/year)	$20,800
• President/CEO	1hrs/week @ $109/hr for 2 years (52 weeks/year)	$11,336
• Field assistants (4 positions)	20hrs/week @ 17/hr for 24 weeks for 4 positions (52 weeks/year)	$32,640
Consulting		
• Consulting for plant, insect, bird identification		$10,000
Fees		
• CRAM training for 2 staff	$1650/person	$3300
• CDFW scientific collecting permit	1	$200
• ArcGIS license upgrade	1	$400
Supplies		
• Insect nets	4 @ $30	$120

• Supplies for constructing malaise and pitfall traps		$300
• Wildlife cameras	4 @ $100	$400
Travel		
• Mileage to field sites	30 miles @ $.50/mile for 200 trips	$3000
Indirect costs	~15%	$30,000
TOTAL		**$249,776**

Timeline for project implementation (including a completing date for each task)

Date	Task/Deliverable
June – Sept 2019	Task 1 • Obtain necessary permits • Hire field assistants and consultants
Sept 2019-Sept 2020	Task 1 • Conduct field studies • Conduct GIS analysis
Sept 2020-Jan 2021	Task 2 • Conduct statistical analyses
Jan 2021-June 2021	Task 3 • Create report and toolkit for use by planners • Disseminate toolkit to stakeholders/relevant parties

Any preliminary project plans as required

Since this is a planning project, we do not have specific project plans. However, we have completed extensive background research on the L.A. River and have a good understanding of the reports, studies, and documents available. Through a recent grant from Resources Legacy Fund (RLF), we developed a report on ecological goals for urban river restorations (Appendix A). A current grant from RLF is allowing us to expand this report to research other urban river restorations in the U.S to better understand what they entail and how successful they have been. Further, we are adding specific ecological criteria to be used in L.A. River restoration projects along with monitoring recommendations to assess ecological success. This work will help inform our proposed project. The proposed planning project will also build upon work that has been done to identify potential field park/open space locations by Esther Feldman[4] and others. Our project will complement that work by helping design the parks to maximize the ecological benefits specifically.

Heal the Bay is well equipped to conduct a project of this size and scope. Heal the Bay has and continues to conduct multi-year monitoring projects in the Malibu Creek Watershed[5] and in the L.A. River[6]. Heal the Bay has scientific expertise and

[4] http://www.conservationsolutions.org/wp-content/uploads/2018/05/CCS-GreenSolutionProject2016-PhaseIV_FullReport.pdf
[5] Sikich S et al. (2013) Malibu Creek Watershed: An Ecosystem on the Brink. Heal the Bay, Santa Monica, CA.
[6] Heal the Bay (2016) Assessing Microbial Water Quality of the Los Angeles River Recreation Zones. Available at: https://healthebay.org/sites/default/files/LA-RIVER-STUDY-FINAL-FOR-RELEASE.pdf

has successfully conducted water quality and ecological field monitoring of streams. Heal the Bay has been specifically conducting water quality monitoring in the L.A. River since 2015.

During the summer, we hire and train students from Los Angeles Trade Technical College to sample the recreation zones for fecal indicator bacteria, making the results available to the public through our River Report Card. This work was funded in the past by a U.S. EPA Urban Waters grant. Additionally, Heal the Bay has experience with other projects of this scale. For example, our NowCast project which models beach water quality was funded through a multi-year grant from the State Water Board to develop novel scientific research with applied, public education implications.[7] NowCast is now being used to predict beach water quality at 20 beaches during the summertime and 5 beaches during the winter.

A detailed description of the need and urgency for the grant

The Los Angeles River was channelized in the '40s and '50s due to destructive and deadly flooding. Unfortunately, as a result of the channelization and the intense urbanization in Los Angeles, the L.A. River suffers from poor water quality and lack of habitat. What could be a beneficial green space for the community is instead an underutilized flood control channel. However, thanks to the work of our local Conservancies, there are some riverfront parks to provide habitat for wildlife, and a myriad of benefits for the surrounding community. The goal of this project is to understand how our current riverfront parks are benefiting/contributing to ecosystem health and services of the river and riparian area and then to develop guidelines for riverfront parks to maximize ecosystem health and services. Given the progress on the Upper LA River and Tributaries Master Plan[8] and the overall LA River Master Plan Update[9], there needs to be more science-based work to understand how we can best plan park projects to benefit both the environment (ecosystem health) and people (ecosystem services).

Additionally, this project is novel from a scientific perspective. River health has been widely studied[10], and there are guidelines for designing waterfront parks[11], but there has not been a scientific study of the ecological health and ecosystem services that river adjacent green spaces provide in a highly urbanized watershed. In L.A. specifically, there is a recent 2018 Biodiversity Report[12], which assesses and scores biodiversity for the entire city, but it is not at the level of detail we are proposing and which is most useful for managers.

A detailed description of how the project will provide multi-benefit ecosystem, water quality, water supply, and watershed protection and public benefits

The project will quantify current riverfront parks ecosystem health and ecosystem services. From this quantification, we will develop criteria and metrics to assist in developing/planning new riverfront parks. These criteria will include multi-benefit wildlife and vegetation benefits, watershed health protection, and public benefits like human health and well-being of communities. The goal of this project is to first understand how our current riverfront parks are benefiting to ecosystem health and services of the river and riparian area and then to develop guidelines for riverfront parks to maximize ecosystem health and services.

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[7] Searcy, Ryan. Taggart, Mitzy. Gold, Mark. Boehm, Alexandria. "Implementation of an automated beach water quality nowcast system at ten California oceanic beaches." Journal of Environmental Management. 223:1 pp 633-643. 2018

[8] https://www.upperlariver.org/

[9] http://larivermasterplan.org/

[10] Boulton, Andrew. "An overview of river health assessment: philosophies, practice, problems and prognosis." Freshwater Biology. 41 pp 469-479. 1999

[11] http://wedg.waterfrontalliance.org/wp-content/uploads/delightful-downloads/2018/03/WEDG_Extended-Manual_Small.pdf

[12] https://www.lacitysan.org/cs/groups/public/documents/document/y250/mdi0/~edisp/cnt024743.pdf

A detailed description of how the project achieves one or more of the purposes of Proposition 1 as stated in Water Code Section 79732(a)

The proposed project achieves the following purposes of Proposition 1 as stated in Water Code Section 79732(a)[13]:

(1) "Protect and increase the economic benefits arising from healthy watersheds, fishery resources, and instream flow" – Our project will examine and quantify ecosystem services, which are economic benefits that arise from a healthy watershed. Our project will seek to maximize ecosystem services such as reducing urban heat island effect by making recommendations for park and open space planning.

(3) "Restore river parkways throughout the state, including, but not limited to, projects pursuant to the California River Parkways Act of 2004, in the Urban Streams Restoration Program...and urban river greenways" – Our project's primary study area is riverfront parks and open spaces. These valuable urban river-adjacent green spaces will be analyzed so we can better understand how to design them to create and restore habitat that will be useful for both wildlife and humans.

(4) "Protect and restore aquatic, wetland, and migratory bird ecosystems, including fish and wildlife corridors and the acquisition of water fights for instream flow" – Our project strives to understand how river adjacent green spaces serve wildlife. One of the key ecosystem health aspects we plan to look at is how these spaces serve as wildlife corridors. We will make recommendations for projects to increase and maximize their utility as wildlife corridors for a variety of species.

(9) "Protect and restore rural and urban watershed health to improve watershed storage capacity, forest health, protection of life and property, stormwater resource management, and greenhouse gas reduction" – The L.A. River is an urban watershed and our project aims to better understand how to improve watershed health using river adjacent green spaces.

(12) "Assist in the recovery of endangered, threatened, or migratory species by improving watershed health, instream flows, fish passage, coastal or inland wetland restoration, or other means, such as natural community conservation plan and habitat conservation plan implementation" – The goal of our project is to improve river adjacent parks' ability to serve important ecological functions and ultimately, to improve the overall health of the L.A. River watershed.

A detailed description of how the project promotes and implements one or more of the objectives of the California Water Action Plan as stated in Section 1.3 of this guideline

The proposed project promotes and implements the following objectives of the California Water Action Plan:

"Restoration of important species and habitat" – Our project aims to increase the ecosystem health of river adjacent green spaces by understanding the components of parks and open space which contribute most to ecological benefits. We will also improve ecosystem health by making recommendations for future park planning and restoration efforts to maximize ecological benefits. Recommendations will include measures to increase biodiversity which is part of restoring species and habitat. Additionally, by supporting the building and planning process for riverfront parks we hope to encourage more riverfront habitat creation via parks and open space creation.

"More resilient and sustainably managed water infrastructure" – By supporting river adjacent green spaces, our project will simultaneously be supporting water infiltration at these sites. Water infiltration in river adjacent green spaces helps reduce pollution, improve groundwater supplies, and helps decrease reliance on non-local sources of water.

A detailed description of how the project helps meet the State's greenhouse gas emissions reductions targets, including a quantification of the metric tons of CO_2 or CO_2e removed or avoided, and an explanation of the methodology used to quantify this figure

River adjacent green spaces have the ability to sequester carbon through plants and soil. While this project will not physically remove CO_2, our recommendations will promote ecologically functioning river adjacent parks which will be able to sequester more CO_2 and mitigate impacts of climate change such as urban heat island effects.

[13] http://leginfo.legislature.ca.gov/faces/codes_displaySection.xhtml?lawCode=WAT&sectionNum=79732.

A detailed description of how the project promote and implements other relevant regional and state plans and policies

The proposed project promotes and implements the L.A. County L.A. River Master Plan Update[14], the L.A. City Sustainability pLAn[15], and the California 2030 Natural and Working Lands Climate Change Implementation Plan[16].

The L.A. County L.A. River Master Plan Update, although not yet complete, has a goal to support healthy, connected ecosystems and provide equitable, inclusive, and safe parks, open space, and trails. Our efforts will directly support those two goals. The L.A. City Sustainability pLAn calls for an urban ecosystem in which we all have access to parks. The pLAn even calls out the revitalization of the L.A. River Watershed specifically. The California 2030 Natural and Working Lands Climate Change Implementation Plan, although still in draft form, applies to land including riparian areas and urban green space. The Plan promotes multi-benefit projects that consider GHGs, public health, and biodiversity. Our science-based research directly supports the goals and actions called for in these plans.

This proposed project is also directly related to AB 466, the Upper LA River and Tributaries Working Group. Although in the early phases, the working group is assembling a master plan for revitalizing the Upper LA River and its major tributaries. Our study would be complementary to the Water and Environment Committee goal to balance the utilization of available space and resources for the environment and the community as well as the goal to create equitable opportunities to enhance the ecosystem and watershed health. Although our study will not identify specific project sites, the resulting toolkit will be an asset when organizations are planning riverfront parks in the Upper LA River. Organizations will be able to make informed design decisions that help to implement these relevant regional and state plans.

Indicate whether the project will have matching funds from private, local, or federal sources, and if so, to what extent

Components of this project is currently supported by a grant from the Resources Legacy Fund.

Indicate whether the project will benefit a disadvantaged community.

The proposed project will benefit disadvantaged communities. The proposed parks in which we will conduct our work score high on CalEnviroScreen 3.0[17] (table below), indicating that these communities are heavily burdened by both environmental pollutants and socioeconomic factors.

Park/Open Space Site	Community CalEnviroScreen 3.0 Percentile
Oso Park	75-80%
Elysian Valley Gateway Park	50-55%
Rattlesnake Park	90-95%
River Garden Park	95-100%
Marsh Park	90-95%
Steelhead Park	90-95%
Egret Park	95-100%
Sepulveda Basin	>55% (depending on the specific location)
Glendale Narrows	95-100%

[14] http://larivermasterplan.org/
[15] http://plan.lamayor.org/
[16] http://resources.ca.gov/climate/natural-working-lands/
[17] https://oehha.ca.gov/calenviroscreen/report/calenviroscreen-30

Green spaces, such as riverfront parks, can provide many health benefits to the local community. They can promote a healthier lifestyle by offering space for physical activity which can in turn improve mental health. Additionally, with close proximity to a river, these communities will benefit from additional increases in mental health and well-being.

Indicate whether the project will use the services of local or state conservation corps

This project will require several part-time field technicians to assist in data collection. This would be a good opportunity to use the services of our local conservation corps if feasible. Alternately, we will utilize students from local community colleges, such as Los Angeles Trade Technical College (LATTC) to provide job-training in environmental fields. Heal the Bay has partnered with LATTC since 2017 by hiring students to monitor L.A. River water quality.

A detailed description of any new or innovative technology or practices that will be applied to the project

The proposed project is innovative in the use of science and statistical analysis of ecological benefits as a basis for planning parks and open space for multiple benefits, including ecological restoration. Our project is also innovative and comprehensive in our approach of using a combination of field work with GIS analysis and literature review to improve decision making. Additionally, as stated above, this ecological survey of river adjacent green spaces is a novel idea in a highly urbanized urban watershed.

A detailed method for monitoring and reporting on the progress and effectiveness of the project during and after project implementation.

Progress of the proposed project will be assessed through our task list, timeline, and detailed work plan. This study will result in a toolkit of criteria for park planning to achieve ecosystem benefits. Effectiveness of this would be use and implementation by planners. We will make the toolkit and recommendations available to stakeholders through presentations, one-on-one meetings, public meetings, and online through Heal the Bay's website, weblog, and social media presence.

A description of how scope of work will protect or enhance and urban creek as defined in Section 7048(e)

The proposed project will protect and enhance the L.A. River and tributaries, all urban creeks, by developing guidelines for creating multi-benefit riverfront parks and open space. The goal is to understand and tease out specific attributes and design methods for riverfront parks so they can better protect and enhance the river's ecosystem while simultaneously providing recreation and green space for residents. This will directly benefit all future urban creek and river restoration or park projects in the L.A. River Watershed and beyond.

A description of how project is consistent with the Common Ground Plan

The proposed project is consistent with the Common Ground Plan in the following ways:

<u>Land: Grow a Greener Southern California</u>

"Promote Stewardship of the Landscape" – Our project will showcase the beneficial aspects of riverfront parks and will therefore promote stewardship of the landscape.

"Create, Expand, and Improve Public Open Space Throughout the Region" – Our project aims to improve public green space in the region by ensuring it is designed and implemented in a way to maximize the ecological benefits. We also hope to encourage planners to expand public green spaces, to maximize ecological benefits.

"Improve Access to Open Space and Recreation for All Communities" –We hope our work improves green spaces for all communities in the upper L.A. River Watershed.

"Improve Habitat Quality, Quantity, and Connectivity" – A key aspect of our project is to improve habitat quality and connectivity. Our work can also be used to promote improved quantity as well.

Water: Enhance Waters and Waterways

"Establish Riverfront Greenways to Cleanse Water, Hold Floodwaters and Extend Open Space" – As our project promotes and improves riverfront green spaces, a natural benefit will be to improve water quality and extend open space.

Planning: Plan Together to Make it Happen

"Encourage Multi-Objective Planning and Projects" – A key component of our study is to understand how public park spaces can also be used as valuable habitat and how they can be designed to improve ecological benefits.

"Use Science as a Basis for Planning" – One of our project's primary objectives is to use science as a basis for planning riverfront parks with increased ecological benefits.

"Involve the Public Through Education and Outreach Programs" – At Heal the Bay we have numerous education and outreach programs, such as monthly beach cleanups and Speakers Bureau, and we will work to integrate the project findings into those programs. This may include giving talks to local schools or educating beach clean-up participants about the importance of watershed health.

ECOLOGICAL GOALS FOR LOS ANGELES RIVER PROJECTS

Heal the Bay

Katherine Pease

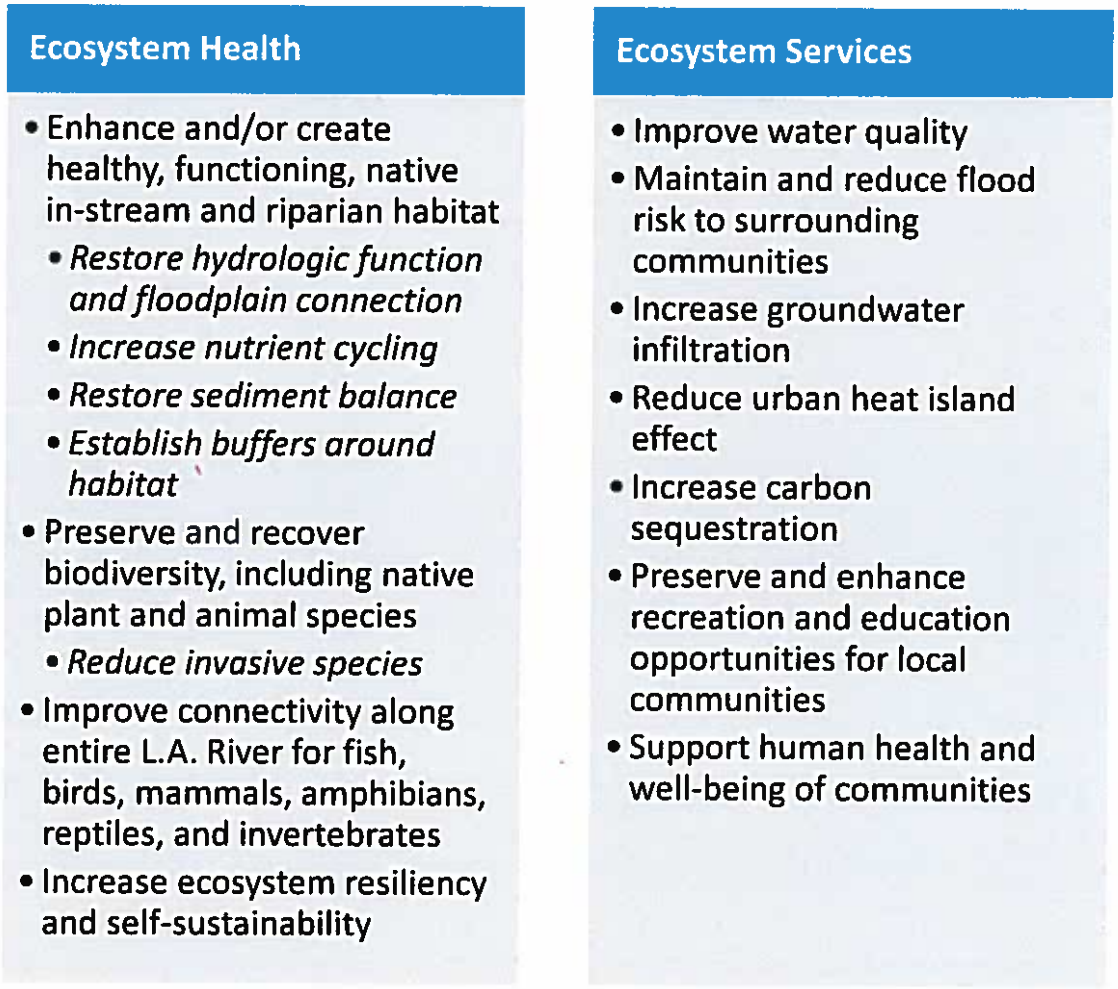
December 19th 2018

Introduction

The Los Angeles River Master Plan Update and various other planning efforts underway for the Los Angeles River create an exciting opportunity to make the L.A. River a more functional, natural river for all L.A. residents. By restoring the L.A. River to a more natural state, from its current highly altered state, we have the opportunity to improve the environment and benefit the community. Los Angeles is in a biodiversity hotspot, with unique flora and fauna that are only found locally (Brown 2018). Recent initiatives like the Mayor's Sustainability pLAn and the LA Sanitation Biodiversity Report have highlighted the importance of natural habitats and wildlife in Los Angeles (Sustainability City pLAn, Brown 2018). However, there is concern that the L.A. River revitalization planning process is focusing on development and beautification, rather than ecology. Therefore, it is crucial to consider, include, and prioritize ecology when planning for the revitalization of the L.A. River.

To better understand ecological priorities for the L.A. River, we turn to the field of restoration ecology. Historically, restoration ecologists sought to restore ecosystems to a state before degradation; but the field and way of thinking has evolved in recent years. Nowadays, when ecologists talk about restoring ecosystems, such as rivers, they talk about it in a functional sense, not necessarily restoring to a specific period of time before the degradation occurred. Current restoration ecology theory includes climate change readiness and ecosystem services, in addition to classic ecological theory (Palmer et al. 2014). Additionally, restorations are becoming more process-oriented, rather than judging success against a previous reference condition (Geist and Hawkins 2016, Dufour and Piegay 2009). Given this new lens of restoration ecology, L.A. River restoration projects should focus on ecosystem processes and function rather than restoring the river to some point in time. The goals of an L.A. River restoration project will depend on many variables such as feasibility, scale, and priorities. It is our hope that these goals and framework help guide restoration project planners and managers in focusing on the ecology of the river, including ecosystem health and the ecosystem services that a healthy river can provide.

Figure 1: Goals for L.A. River projects



Goals and Sub-Goals

Our proposed goals and sub-goals fall under two larger categories: Ecosystem Services, and Ecosystem Health. The goals are based on widely accepted restoration ecology goals, which were selected specifically for the L.A. River based on its location, abiotic environment, and stressors.

Ecosystem Health: A key focus of river restorations is ecosystem health (Geist and Hawkins 2016). Ecosystem health encompasses a variety of aspects including biological, chemical, and physical (Karr 1999). Some of the characteristics that are important for ecosystem health for rivers include taxa richness, species composition, flow regime, water quality, and physical habitat structure. Additionally, focusing on relationships between these characteristics are an important part of ecosystem health for rivers. Having diverse and numerous interactions between different species is crucial for ecosystem health (Norris and Thoms 1999). A healthy river is one that has the functional integrity to persist, is stable, and resilient to stressors (Karr 1999, Rapport et al. 1998). Thus, having the priority be on ecosystem health can in turn benefit society by providing ecosystem services and lowering operations

and maintenance over time. After reviewing the literature and discussing the goals with restoration ecologists, we selected and refined specific ecosystem health goals most relevant for the L.A. River.

Ecosystem Services: Restoration ecologists are increasingly incorporating ecosystem services into their restoration plans (Palmer et al. 2014). This is in line with an increase in the valuation of ecosystem services by society (Loomis et al., 1999). Ecosystem services, benefits society receives from ecosystems, are especially valuable in urban environments, where green spaces can benefit the population monetarily and health-wise (Elmqvist et al. 2015). Ecosystem services include services such as removing pollution, sequestering and storing carbon, nutrient recycling, habitat for wildlife, and providing recreation opportunities. In the U.S., the total ecosystem services provided by green spaces in urban areas is valued at $9,701/ha/year (Elmqvist et al. 2015). In urban cities, like Los Angeles, ecosystem services can include benefits like water supply, maintaining air quality, mental health benefits, recreation, and educational opportunities (Brown, 2017). Ecosystem services specific to rivers include water quality improvement, water supply, mitigation of flood damages, hydropower, recreation, fish and other wildlife habitat, nutrient and sediment transport to estuaries, tourism and education (Brauman et al., 2007). By focusing on restoration goals related to ecosystem services, economic and social interests can be increased, which are particularly valuable in urban settings (Everard and Moggridge, 2012). A healthy urban ecosystem can enhance the ecosystem services (Rapport et al., 1998). Given the benefits a functioning river ecosystem can provide a city, ecosystem services should be one of the main focuses of restoration projects along the L.A. River. The goals we selected and refined from the literature are most relevant for the L.A. River given the urban environment, constraints, and the climate.

Ecosystem Health Goals and Sub-goals:

- **Enhance and/or create healthy, functioning, native in-stream and riparian habitat** - If we want to create or enhance successful in-stream and riparian habitat, the focus must be on reestablishing functional groups of species that are key to restoration of the ecosystem (Palmer et al. 1997). Effort must be taken to ensure that those species can persist and reestablish the important interactions that occur in a functional ecological community. In certain parts of the L.A. River, creating in-stream habitat that native organisms use may require bringing in key plant species from other areas of the watershed, as the heavily concretized regions lack connection to source populations. A key question is what are these crucial species that are essential for a functional, diverse ecosystem that focuses on biodiversity? This will, of course, be different for different parts of the L.A. River. These linkages and connections will also develop over varying time scales; it will take time for certain relationships to reestablish (Palmer et al. 2017). In the Elysian Valley soft-bottom region of the L.A. River, The Nature Conservancy found that there are currently no native fish in the region, 5 native reptiles and amphibians, 89 native bird species, 10 native mammal species, and 102 taxonomic groups of insects. These species may be good starting points to bring into other areas of the river. They are native, resilient enough to survive in the L.A. River even with current degradation and stressors and can act as colonists for other parts of the river that are being restored. Long term, the presence of historically abundant species such as the steelhead trout would be a good indicator of a successful in-stream habitat restoration (Brown et al. 2018). Macrophytic plants and algae in the channel of a river provide the primary production that is required to sustain food webs (Geist and Hawkins 2016). These primary producers should be the starting points for restoration; they will also help enhance macroinvertebrate communities. Macroinvertebrate communities are healthier in rivers with

high native vegetation (Chessman and Williams 1999). In soft-bottomed areas of the L.A. River there are native cattails, sedges, rushes, and invasive arundo (U.S. Army Corps of Engineers Los Angeles District, 2013). Native plants are key to creating healthy in-stream habitat and they have been found to be diversity hotspots for insects in the LAR (The Nature Conservancy 2016). TNC found 76 native plant species in the Elysian Valley region. These plants could be used as a starting point to plant when creating in-stream habitat elsewhere in the L.A. River.

- *Restore hydrologic function and floodplain connection* – Hydrology and flow are key drivers in rivers and their floodplains. Flow determines physical habitat, supports species throughout their life cycles and connects the river laterally to the floodplain. In many urban rivers, including the L.A. River, the landscape is dominated by impervious surfaces and concrete stormwater drainage systems. This significantly alters the river and removes the natural connectivity between the river and its floodplains (Gurnell et al. 2007). In the L.A. River, current flows are higher than historical flows due to regular discharge from wastewater treatment plants into the river (TNC Study and Mika et al. 2017). The appropriate flow in the L.A. River that supports all beneficial uses is currently being investigated by the State Water Board, SCCRWP, and others. Besides flow, restoration projects can help address other aspects of hydrology, such as floodplain connection, allowing the river to flood its floodplain. A riparian habitat that is not connected hydrologically to the river will suffer ecologically (Gurnell et al. 2007). Additionally, in an ecosystem with an altered flow regime, invasive species can thrive (Bunn et al. 2002, The Nature Conservancy 2016). By restoring and hydrologically connecting land adjacent to the river, habitat function will improve.

- *Increase nutrient cycling* - Nutrient recycling is another important function of a natural river (Bernhardt and Likens 2002). Inorganic nitrogen can lead to eutrophication along the coast. Natural rivers can convert inorganic nitrogen into organic forms, usable by many organisms. Denitfitication is highest in organic debris dams, compared to stream pools and gravel bars, leading to an important NO-3 sink for urban streams (Groffman et al. 2005). Additionally, much of the natural denitficiation that occurs in a stream occurs in the hyporheic zone, the sediment at the bottom of the stream. For this reason, removal of concrete and restoration of a "soft-bottom" will allow this process to take place. Enhancing contact between the surface water and the ground water can also improve denitficiation (Hester et al. 2018). Having a healthy nutrient cycling process in an ecosystem is vital to supporting plants and the rest of the food web of an ecosystem.

- *Restore sediment balance* – In a natural river, sediment runs from the foothills to the mouth of the river. This sediment helps form and maintain the physical habitats and nutrient supply in a river. Once the sediment reaches the mouth of the river it will eventually support beach ecosystems. With urban development comes the alteration of this natural regime. Typically, sediment in a river will increase as urbanization and building increases but then drops once development is complete (Grunell et al. 2007). Additionally, the channelization of a river leads to a loss of natural erosion of the river bank and bed. In the L.A. River, projects focused on ecosystem health restoration should include a sediment balance component.

- *Establish buffers around habitat* – A buffer zone helps to protect biodiversity and habitat from human activities. It is a designated area around core habitat that has limited use (Bennett and Mulongoy 2006). Riparian buffer zones around urban rivers can help

support the health of the river ecosystem. They can lower nutrients and improve water quality (Li et al. 2008, Corell 1996). Buffers can also help maintain habitat (Norris et al. 1999). In a heavily urbanized area like Los Angeles, having a buffer zone around the river is especially important. There are different buffers of varying sizes and scale. For example, the Santa Monica Mountains Local Coastal Program has a buffer of 1000ft around habitat which includes streams (County of Los Angeles Department of Regional Planning 2018). It will be important to design a buffer that works best for the stretch of the river, sensitive species, and for the development surrounding it.

- **Preserve and recover biodiversity, including native plant and animal species** - Riverine ecosystems cover just 0.8% of the Earth yet hold 40% of fish diversity and 25% of vertebrate diversity (Dudgeon et al. 2005). Their natural flooding patterns and varying gradients of inundation are part of the reason they have such high levels of biodiversity (Ward 1998). Unfortunately, freshwater ecosystems generally have experienced a greater decline in biodiversity than terrestrial ecosystems. The five major threat categories to freshwater biodiversity are: over-exploitation, water pollution, flow modification, invasive species, and habitat degradation (Dudgeon et al. 2005). More specifically to the L.A. River, flow modification, channelization, and bank stabilization disrupt the natural processes of the river and reduce biodiversity. Biodiversity in Los Angeles is unique in that it is in a global biodiversity hotspot but is also highly urbanized. The L.A. River is uniquely positioned to play a key role in contributing and boosting the city's biodiversity. According to the 2018 Biodiversity Report for the City of Los Angeles, the L.A. River is considered one of the large "natural areas" in Los Angeles (Brown, 2018). With such potential and opportunity, increasing biodiversity should be one of the top priorities for restoration projects. There are several endangered species found in the L.A. River, especially important for local biodiversity. In areas of the river where they exist, focus should be placed on understanding their key relationships with other plants and animals.
    - *Reduce invasive species* - Invasive species have been shown to be successful in urban environments due to impervious surfaces as well as human population size and density (Gaertner et al. 2017). In aquatic environments, invasive species can decrease fish abundance, increase eutrophication, and negatively impact benthic invertebrates (Gallardo et al. 2015). In the LAR there are many invasive plant species such as arundo, the giant reed, and castor bean. They should be removed without the use of harmful herbicides.
- **Improve connectivity along entire L.A. River for fish, birds, mammals, amphibians, reptiles, and invertebrates** - Rivers traditionally serve as ecological corridors. Rivers play an especially important role in cities as corridors in an otherwise urban environment (Brown 2018). Urban rivers connect fish, birds, mammals, invertebrates, amphibians, and reptiles to habitat and create habitat within an otherwise inhospitable urban environment. To enhance the L.A. River's function as an important wildlife corridor, care must be taken to identify key species and the ranges at which they can travel. The best-case scenario for connectivity would entail all 51 miles of the LAR restored to create native in-stream and riparian habitat; however, a more feasible goal would be to create "stepping stones" for key species to use. Fish will require more connected in-stream habitat. Mammals will require riparian habitat. Taking a watershed approach will help identify where projects should be prioritized. If there are other tributaries or parts of the watershed with valuable habitat, which must be factored into the analysis of focused restoration for the goal of creating corridors or stepping stones. SCCWRP is currently conducting research to identify key flow regimes required for critical species in the L.A. River.

The results from that research and how the flow regime changes in the L.A. River over time will determine how flow dependent species can use the river as a corridor.

- **Increase ecosystem resiliency and self-sustainability** – A healthy and functioning river has the capacity to survive normal temporal cycles and fluctuations based on season and climate. The ecological activity in a river influences hydrologic processes, and vice versa, and creates a system of resiliency which allows physical and ecological processes to push and pull over time (Attkinson et al. 2017). To increase river ecosystem resiliency, researchers recommend looking to the biogeochemical cycling within a river as an indicator that the balances between hydrology and ecology are healthy (Attkinson et al. 2017). Since nutrients are at the bottom of the food chain, essential for the health of the plants and animals of the system, ensuring they are at proper levels will help ensure ecosystem health. Another way to increase resiliency is by focusing on supporting keystone species and organisms (Duffy et al. 2018). A resilient and self-sustaining river will be able to better stand fluctuations in climate and disturbances and require less operation and maintenance. In Los Angeles specifically, we can expect to see more extreme fluctuations in rain events and drought events, so it is important that we make the river as resilient as possible to withstand these events (Swain et al. 2018).

Ecosystem Services:

- **Improve Water Quality** – L.A. River projects should focus on nature-based solutions to improve water quality. For example, riparian vegetation plays a crucial role in removing pollutants in-stream as well as before runoff even enters the stream. Riparian vegetation improves water quality by uptaking pollutants such as heavy metals, excess nutrients, and other elements, through its roots (Dosskey et al. 2010). The vegetation sequesters pollutants out of the water and into their tissues. Healthy riparian and in-stream soils will also naturally filter water as it infiltrates deeper into the soil. Synthetic organic chemicals and metals can also bind to soil organic matter, get buried, and then degraded by microbes (Dosskey et al. 2010). Additional watershed focuses should be to reduce impermeable surfaces and increase permeable surfaces to help reduce pollutants running into the river via stormwater or runoff (Bernhardt and Palmer 2011). Even in this Mediterranean climate, natural biofiltration systems such as bioswales and rain gardens can effectively remove pollutants, thereby improving water quality (Burkhard 2018).

- **Maintain and Reduce Flood Risk to Surrounding Communities** – In the past, flood risk has been handled using hard engineering solutions. Those solutions have been effective, but damaging. Hard engineering solutions remove the natural substrate and sediment on the bottom and on the banks of the river and therefore most of the vegetation and habitat. Nature-based solutions are increasingly being used in order to take advantage of the multiple benefits those projects can offer. For example, nature-based solutions can decrease flood risk *and* improve water quality *and* provide green space for communities. Specifically, from the flood risk perspective, nature-based solutions are viable solutions and are becoming increasingly popular worldwide (World Bank, 2017). The World Bank report on implementing nature-based flood protection details how to use a systems-based approach to designing nature-based flood risk mitigation. For example, increasing infiltration in the upper watershed can lessen pressure on the lower watershed. Additionally, there should be increased consideration for local climate change impacts to flood risk needs. The local region is expected to experience a precipitation whiplash,

with alternating dry and wet periods of time (Swain et al. 2018). The 100-year flood will likely become more frequent. This must be considered when planning projects that hope to reduce flood risk.

- **Increased Groundwater Infiltration** – Groundwater infiltration is a natural function of rivers and can be enhanced in the L.A. River by removing concrete from the bottom of the channel to allow the river to make contact with soil where it can infiltrate naturally into the groundwater. Over the 51 miles there are certain areas where this is better suited than others. For example, the San Fernando Basin has about 600,000 acre ft. of available storage (Los Angele River Master Plan Update 2018). Those areas should have increased priority for in-stream habitat improvement and concrete removal. Groundwater infiltration depends on infiltration capacity but generally, in areas where there is surface water, the water will infiltrate down into the aquifer where possible (Sen 2015). In the face of climate change and sea level rise, it is particularly important to increase groundwater infiltration to maintain our groundwater supplies and prevent saltwater intrusion (Sen 2015). Additional consideration should be given to biofiltration projects within the L.A. River Watershed. Bioswales and rain gardens can also infiltrate water (Burkhard 2018).

- **Reduce Urban Heat Island Effect** – Rivers can cool the air temperature around them, alleviating the urban heat island effect (UHI) (Murakawa et al. 1991, Gunawardena et al. 2017). Rivers and riparian habitat in urban areas both help mitigate the urban heat island effect. In fact, there is a synergistic cooling effect due to the bluespace and greenspace that the river and riparian habitat provide (Gunawardena et al. 2017). Temperatures in urban environments are highly variable; they depend on building density, wind, and many other factors. The L.A. River is situated in the middle of a highly urbanized area that experiences an urban heat archipelago due to its size.[1] Projects should quantify the impact they will have on the UHI and aim to alleviate the impacts as much as possible. This means including riparian habitat with in-stream restoration projects to utilize their synergistic effects on lowering temperatures associated with the UHI effect.

- **Increase Carbon Sequestration** – Various parts of a watershed have the ability to sequester carbon from the atmosphere. Carbon that enters the river system, typically as dead vegetation, can be buried in the floodplains, sequestered in riparian vegetation and stored or transported to the ocean where it is buried in the ocean sediment. The riparian zone has been recently recognized as having the potential to sequester carbon (Maraseni and Mitchel 2016). Specifically, the soil and vegetation in a healthy riparian habitat have the ability to sequester carbon. Restoring riparian vegetation within the L.A. River would remove carbon from the atmosphere, helping to curb greenhouse gases and climate change impacts.

- **Preserve and Enhance Recreation and Education Opportunities for Local Community** – Urban rivers play an important role in providing ecosystem services to the community. One of those roles is cultural services such as providing recreation and educational opportunities (Everard and Moggride 2012). Recreation and education increase community value and provide opportunities for community members to enjoy natural space within an urban environment. By restoring the river with ecology in mind, these ecosystem services will come as well. For example, by prioritizing native fish species and recovering them to a healthy abundance, recreation such as

[1] https://calepa.ca.gov/climate/urban-heat-island-index-for-california/understanding-the-urban-heat-island-index/

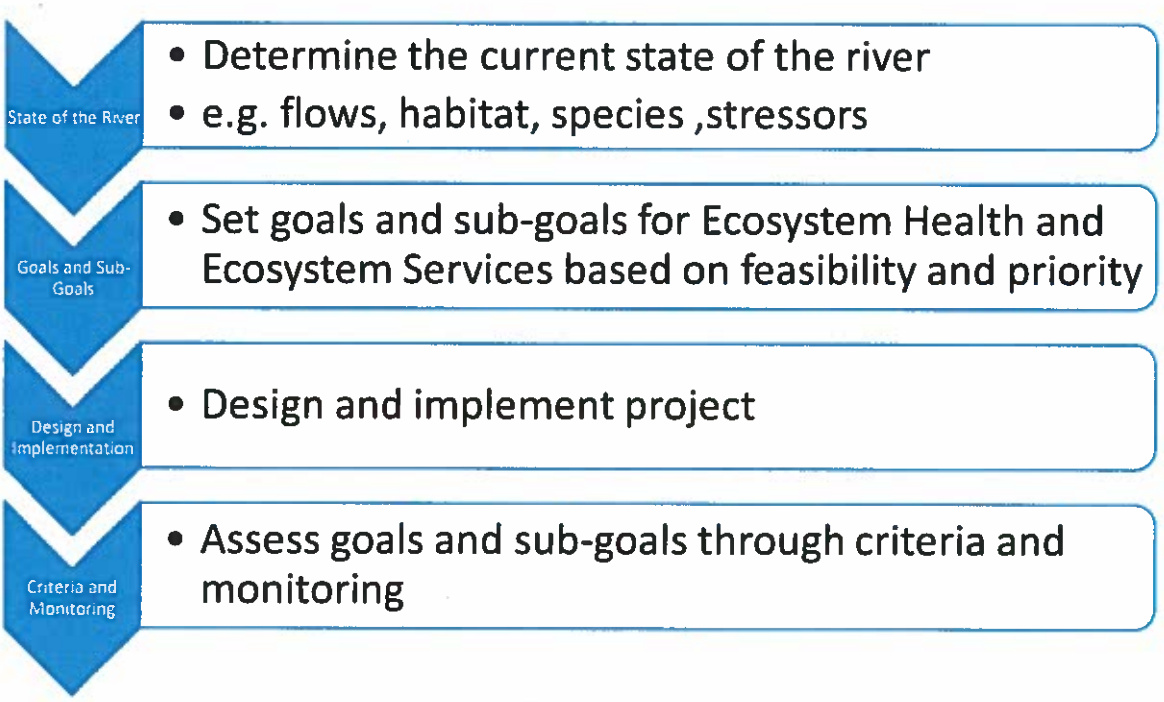
fishing can occur. An example of educational opportunities may include using the river to teach students about water quality monitoring or biodiversity.

- **Support Human Health and Well-being of Communities** – Rivers in urban environments can benefit the health of the surrounding community. They can promote a healthier lifestyle and improve physical and mental health (Jackson 2015[2]). Rivers promote physical activity such as running, bicycling, and kayaking. The physical activity improves mental health, but the river itself as a bluespace also has inherent mental health benefits (Gascon et al. 2017). Several studies have shown the association of outdoor blue space, aka a river, with improved mental health and well-being and increased physical activities which can also improve overall community health and social relationships (Gascon et al. 2017).

Framework

The below framework offers a way to integrate the goals into a restoration project. Beginning with assessing the state of the river, then deciding on specific goals and sub-goals, and finally establishing criteria and monitoring for the project.

Figure 2: Framework for applying ecological goals and criteria to L.A. River restoration projects and planning



State of the River

To understand which goals a particular project should focus on, it is important to understand the current state of the river where the project is proposed. In the L.A. River, some of the key aspects of the current

[2] https://ehs.ph.ucla.edu/news/item?item_id=8764

state of the river include the dry and wet flow regime, water quality impairments, physical alterations, pollution, the kind of habitat available (i.e. in-stream only or in-stream plus riparian habitat), and any endangered species or other species of interest. For example, there are several bird species of concern along the L.A. River (City of Los Angeles). Knowing the habitat that is available to work with and any legal considerations (i.e. the Endangered Species Act) will help guide the rest of the project. Additionally, feasibility such as floodplain buyback should be considered to fully understand how much potential in-stream and riparian land could be available. It will also be important to have a complete historical ecology study for the L.A. River watershed done, which does not currently exist. It will be useful, not because restoration should aim for a specific mark in the past, but because historical information allows us to know what used to be able to thrive in the L.A. River, why certain organisms are no longer there, and set ecologically appropriate goals.

Criteria and Monitoring – It is essential to understand if the goals of the project have been met; this can be done through monitoring and assessment of criteria associated with goals. Successful restoration plans should induce changes that project managers can measure (Palmer et al. 2005). Unfortunately only about 10% of restoration projects set aside money for assessment and monitoring (Bernhardt et al. 2005). For each goal project managers select as their target, they should determine the ecological components that will change as their project progresses. For the L.A. River Master Plan Update, a multiple Before-After Control-Impact (mBACI) should be used. This assessment design would require coordinated monitoring of the major projects under the restoration plan using the classic Before-After Control-Impact design at each site (Roni et al. 2018). The BACI design monitors before and after a restoration project and at a control site; if no control site is identified then it becomes a BA study, only monitoring before and after the restoration project. Monitoring a restoration project should address the effect on local habitat conditions or biota, watershed conditions, and regional biota populations (Roni et al. 2018). An example of potential criteria and monitoring is the Stream Visual Assessment Protocol (SVAP) which measures 15 different elements like hydrologic alteration, invertebrate habitat, instream fish cover, riparian habitat, nutrient enrichment etc., using physical and biological characteristics (Bjorkland et al. 1999).

Specific criteria and monitoring options for the provided goals will be added in the next phase of this report

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Grading Criteria Sheet for WAYS Park Proposals

The following criteria will be used for rating WAYS Park Proposals. Please grade the proposal criteria on a numeric scale from 1 to 5.

- Comprehension of project concept–Proposals will be evaluated based on the level of understanding of the multiple benefits the project is intended to provide.

  1 (poor) 2 (fair) 3 (good) 4 (very good) 5 (excellent)

- Comprehension of project philosophy—Proposals will be evaluated based on the level of understanding regarding community outreach and input into the project development.

  1 (poor) 2 (fair) 3 (good) 4 (very good) 5 (excellent)

- Team experience–Proposals will be evaluated based upon the qualifications, experience, and composition of the project team members, as well as the team's experience on similar multi-benefit type projects.

  1 (poor) 2 (fair) 3 (good) 4 (very good) 5 (excellent)

- Cost proposal—Proposals will be evaluated based on the completeness and competitiveness of the cost information provided.

  1 (poor) 2 (fair) 3 (good) 4 (very good) 5 (excellent)

- Qualitative impression—Proposals will be evaluated on based the team's ability to deliver a quality project.

  1 (poor) 2 (fair) 3 (good) 4 (very good) 5 (excellent)

Other comments: _____

_____

Proposal Name: _____

Total Points: _____