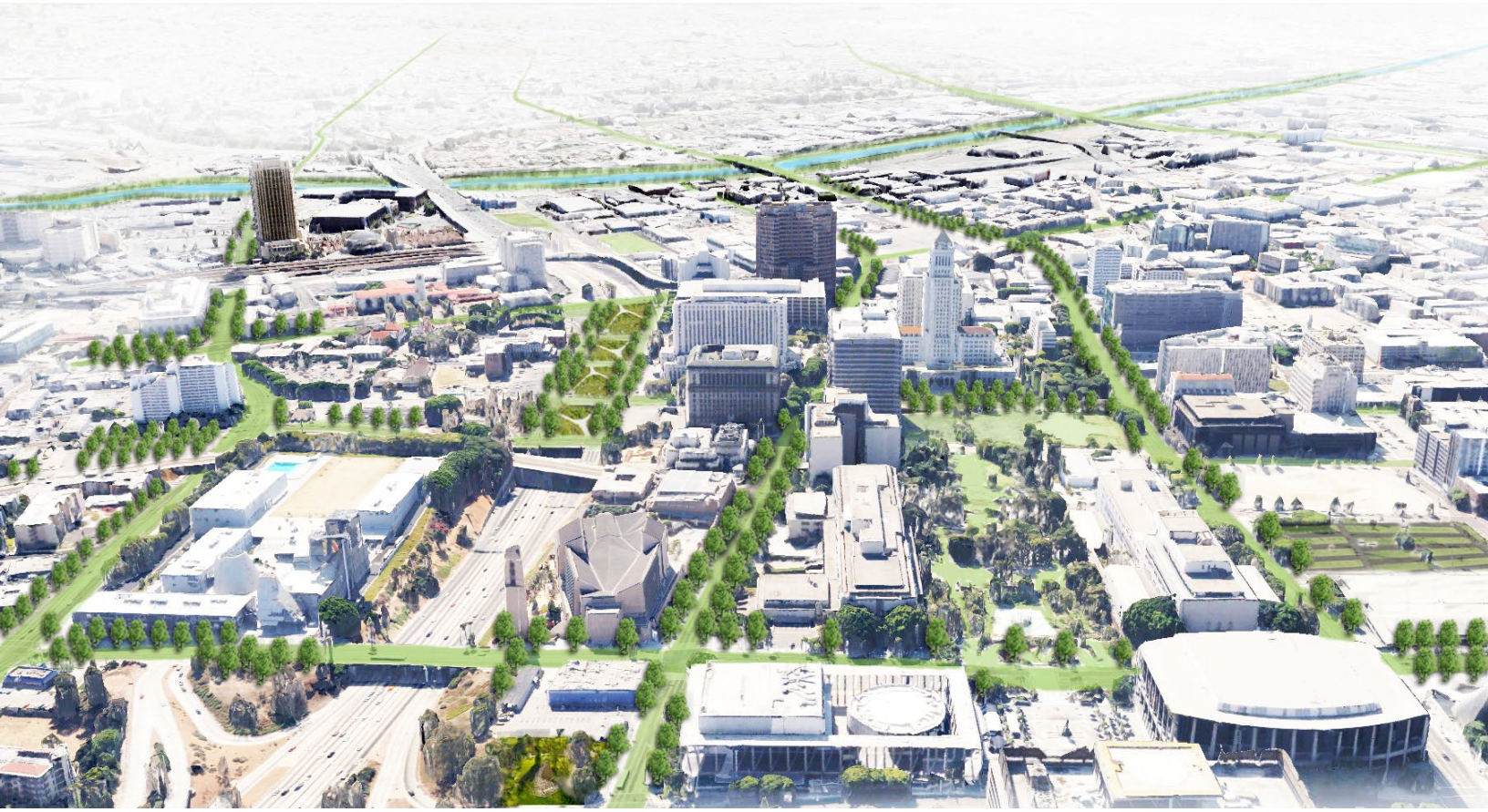
• SUMMARY REPORT •

GRASS

GREENWAYS TO RIVERS ARTERIAL STORMWATER SYSTEM

PHASE 1



the collaborative effort of:

Bureau of Sanitation - Watershed Protection Division
City of Los Angeles Department of Public Works

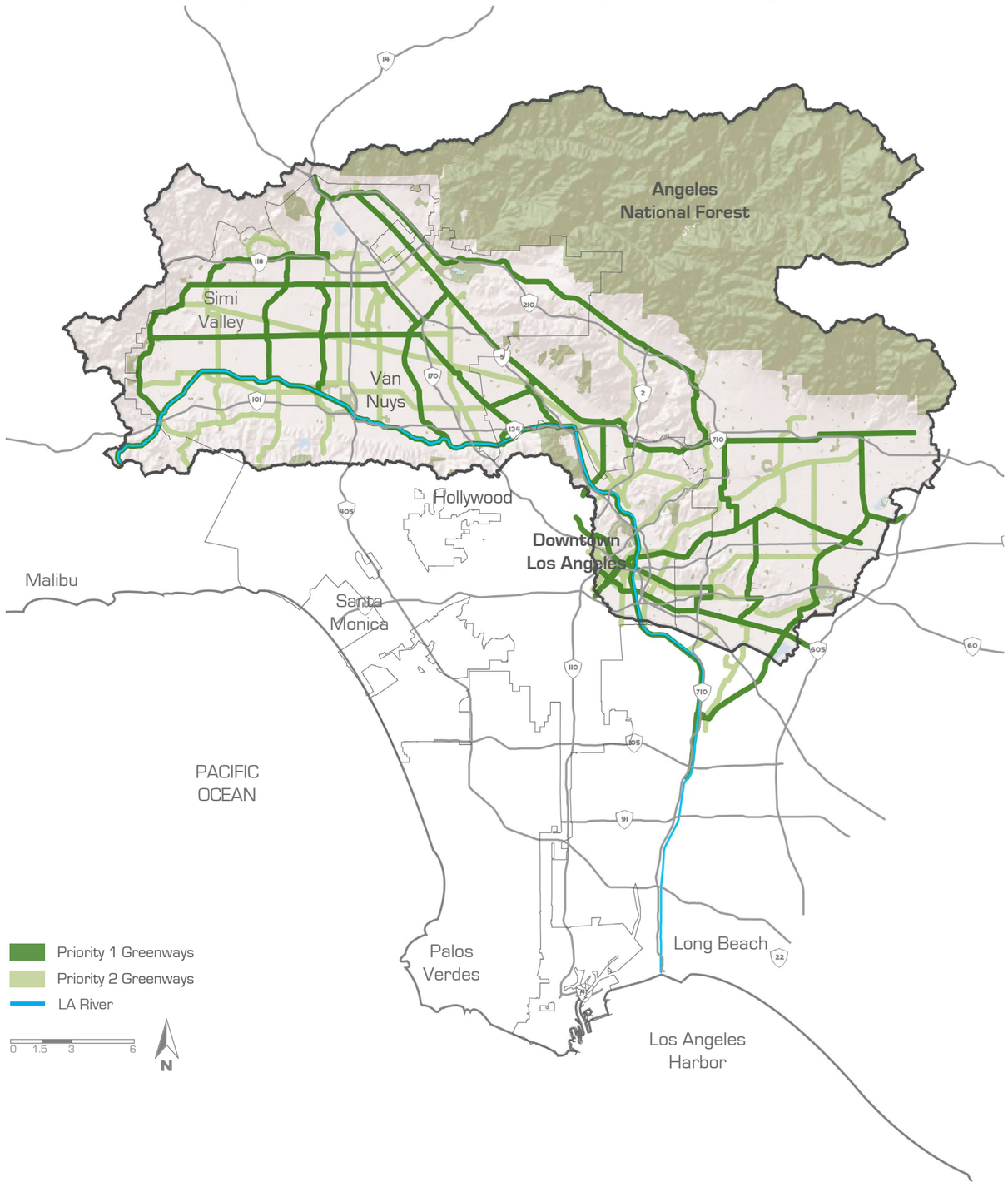
Department of Landscape Architecture - 606 Studio
California State Polytechnic University, Pomona

Department of Landscape Architecture
University of California, Los Angeles Extension

2013

GRASS:

GREENWAYS TO RIVERS ARTERIAL STORMWATER SYSTEM



PROJECT STATEMENT:

Drought, water supply reliability and pollution have sparked political action within the City of Los Angeles (LA). The Low Impact Development **(LID)** Ordinance seeks to capture the first ¾" of any rain event for infiltration to LA's drinking water aquifers. Since **88%** of LA's water is currently imported from hundreds of miles away, this represents a shift to local water use. This project followed a scientific method to develop a system of **multifunctional greenways** that address **park poverty** while capturing **stormwater** through a variety of **BMPs**. The client for this project is the City of LA **Dept. of Public Works Bureau of Sanitation (LADPW BOS).**

PROJECT NARRATIVE:

Local Policy:
Both the City and County of LA have considered and passed various policies to **address pollution and water supply issues.** The City has already installed several demonstration projects that **capture and infiltrate stormwater** with a list of additional pending projects. The GRASS project establishes a method acceptable to both engineers and politicians to **implement appropriate LID infrastructure** within the upper LA River watershed, while addressing the issue of **park poverty**.

Background:
LA is a unique city, known for its vast **imperviousness,** dependence on **imported water supply** and concrete **channelization of the LA River**. The City of LA is 75% impermeable, resulting in **higher stormwater volumes and greater pollution levels.** Also, portions of the city have no stormwater infrastructure, which lead to **localized flooding.**

Method:
The GRASS Team began at the regional scale of the Upper LA River Watershed, looking at existing street classifications with **wide corridors, bike routes, bus routes, and existing storm drains.** These streets make up a **Regional Green Network,** which also include utility and tributary easements.

Further examination of major destinations like **schools, parks, and civic institutions** helped determine **priority areas** of the Green Network. **Priority 1** is composed of a grid of greenways spaced 5 miles apart that provide major connections to popular destination points. **Priority 2** is a smaller 2-3 mile grid that further connects the remaining corridors to these major destination points.

BMP Selection:

Overlapping the 2 priority areas are a series of 5 classes which respond to issues such as:
- soil type (infiltration rates),
- depth-to-groundwater levels greater than 10 feet (capable of infiltration),
- local pollution inputs, and
- connections for gaps in the existing bicycle network.

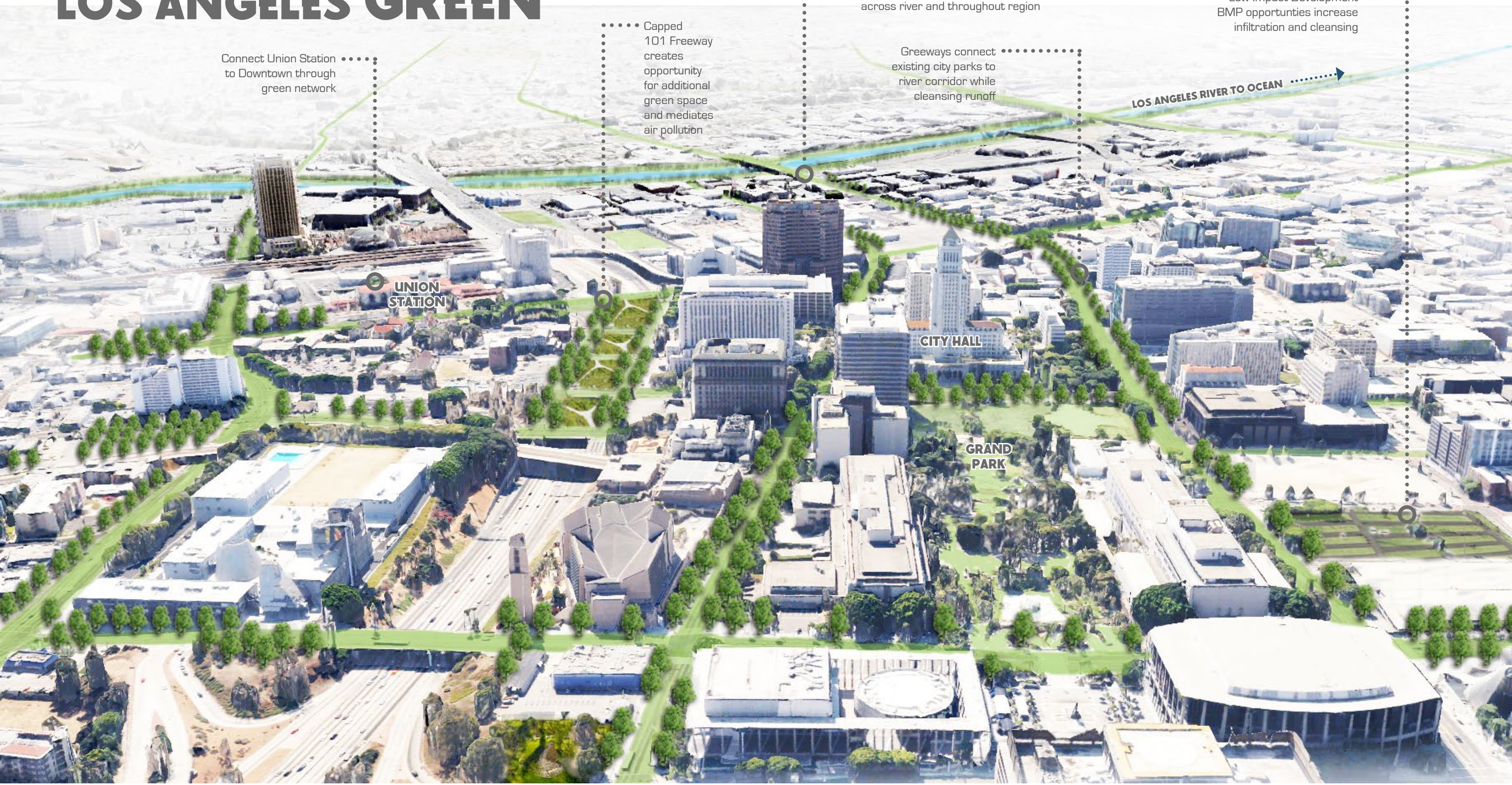
Class 1: potential greenways that infiltrate stormwater in areas of high park poverty **AND** industrial land use.
Class 2: potential greenways that infiltrate stormwater in areas of high park poverty **OR** industrial land use.
Class 3: potential greenways with Infiltration only.
Class 4: potential greenways which capture & re-use stormwater.
Class 5: non-infiltrating greenways that provide connections **between gaps** within the Green Network.

These 5 classes indicate appropriate locations for Infiltration, Capture & Reuse as well as Cleansing BMPs. The design of such BMPs incorporates the calculated total potential storage of stormwater to treat the first ¾" of a storm.

Subwatershed Masterplan:
In order to identify a **priority subwatershed**, the GRASS Team divided the Upper LA River Watershed into smaller subwatersheds based on the storm drain network and outfalls along the LA River. The next phase of analysis looked at **stormwater volumes** of a 50-year storm event and **park poverty**. The Top 5 subwatersheds in both categories were selected, revealing 2 common priority subwatersheds in each. A **"high priority" subwatershed** was then determined based on further analysis of **surface & subsurface street drainage, public land ownership**, **diversity of land use, and current City of LA projects**. This subwatershed was furthered developed with **LID demonstration projects** and **estimated total storage capacity** of suggested **BMPs.**

How the report will be used:
LADPW BOS works very closely with the **City Council**, other City agencies, and with **granting agencies** to address its stormwater issues. The team collected data and developed a method for examination of these issues at the regional, local and site scales. The city will use the GRASS Vision Plan as a planning document to ultimately reduce pollutant loads into the LA River while curbing regional park poverty with a system of greenways throughout Greater Los Angeles.

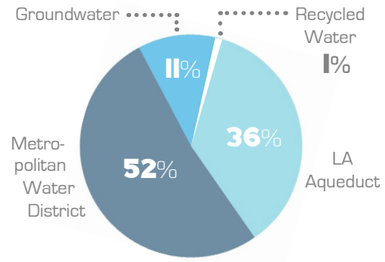
RENDERING
LOS ANGELES GREEN

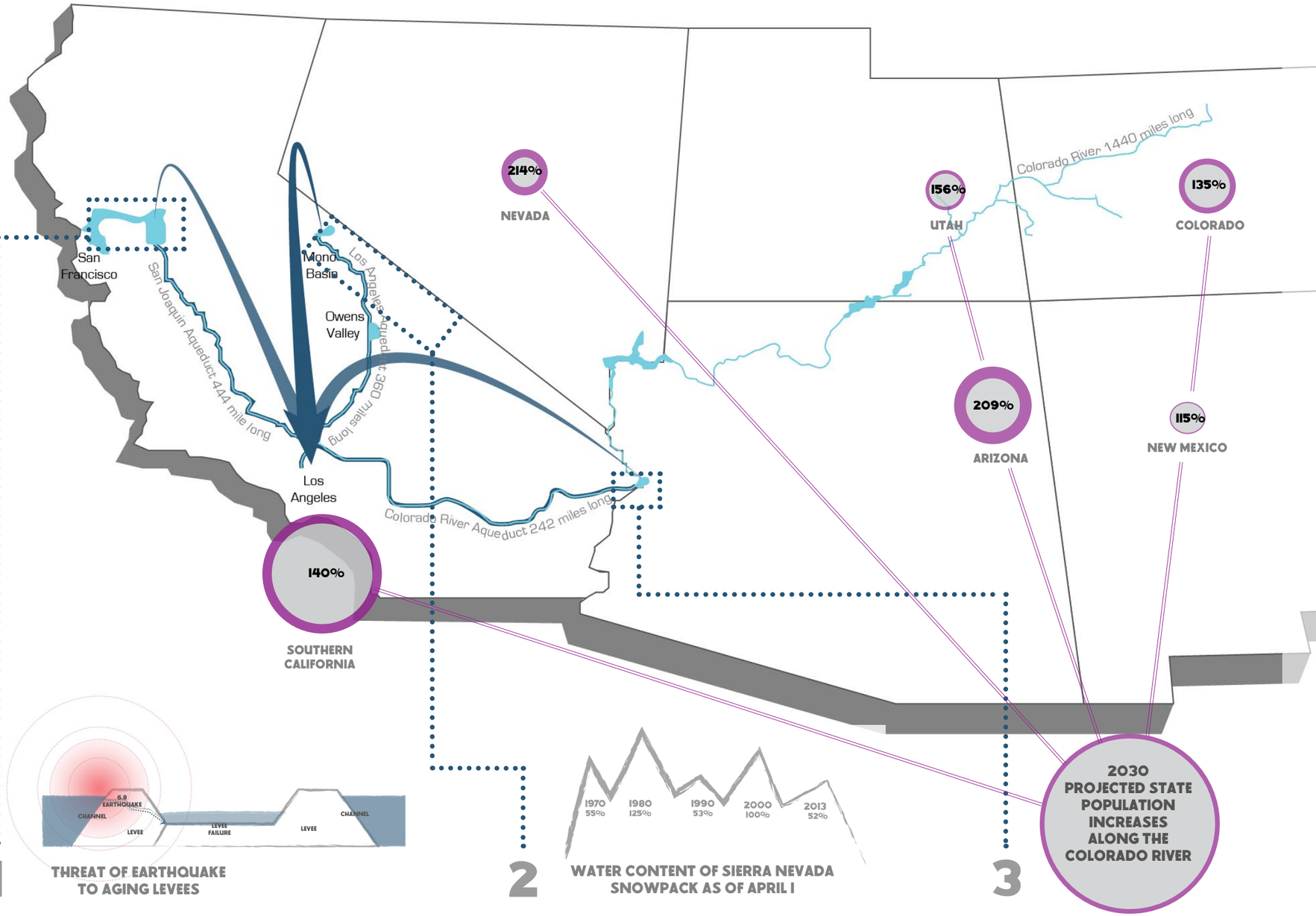


LOS ANGELES WATER SOURCES UNDER THREAT

LA's dry arid climate creates a thirsty population of over 10 million. As a result, **88%** of potable water is imported from **3** different faraway **locations**, with each source threatened by unique circumstances. **Dependence on imported water could leave millions of people without** access to clean drinking water if one of the City of Los Angeles' sources were to be compromised.

LOS ANGELES WATER SUPPLY SOURCES 5 -YEAR AVERAGE





3 MAJOR WATER SOURCES

1

THREAT OF EARTHQUAKE TO AGING LEVEES

2

WATER CONTENT OF SIERRA NEVADA SNOWPACK AS OF APRIL 1

3

SACRAMENTO - SAN JOAQUIN DELTA

The aging levees of the delta are at risk of failure should a 6.8 magnitude earthquake occur. This could cause salt water contamination of the fresh water delta, which would compromise the potable water supply for millions of Californias. In addition, upstream pollution, urbanization, and rising sea level are some of the issues threatening the delta (Restore the Delta 2012).

SIERRA NEVADA MOUNTAINS

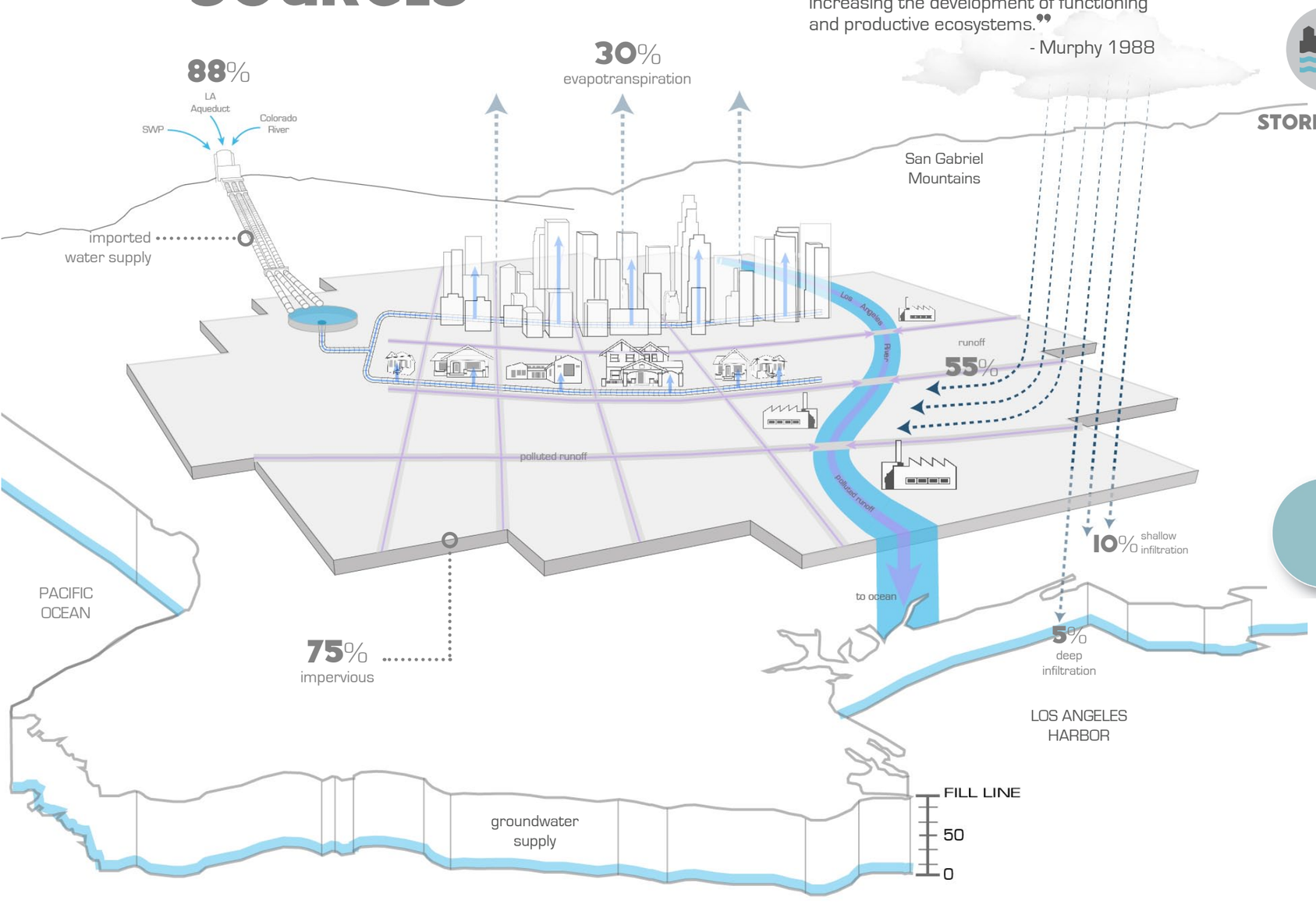
Reduced snowpack on the Sierra Nevada Mountains directly impacts water availability in the Mono Basin and Owens Valley - the primary sources of water diverted via the Los Angeles Aqueduct to the City of Los Angeles. In April of 2013 the water content of the snowpack was 52% of its historical average. This is the lowest reading since 2007, which marked the start of a three year drought (Rogers 2013).

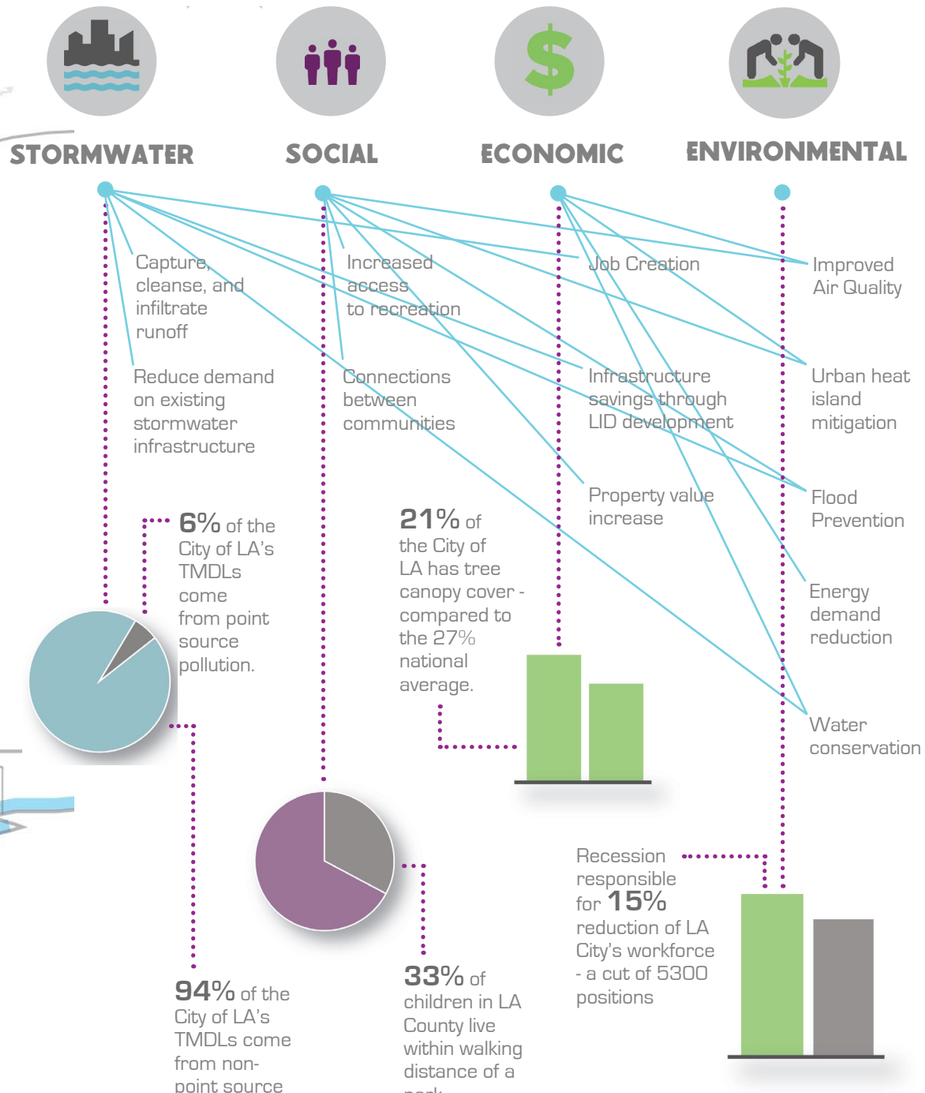
COLORADO RIVER

Climate change, invasive species, mineral extraction, and dams and diversions have negatively impacted the Colorado River. Additional population growth in the Colorado River basin states would drastically effect water supply for the City of Los Angeles. The U.S. Census Bureau expects an average of 54% increase in the Colorado River basin states by 2030. Increased popluation means higher demands on the Colorado River and its tributaries as a water source.

DISTURBED LOCAL WATER SOURCES

> "Urban areas represent a significant proportion of the footprint that human beings have on local ecosystems, and therefore, are an ideal location for increasing the development of functioning and productive ecosystems."
>
> - Murphy 1988





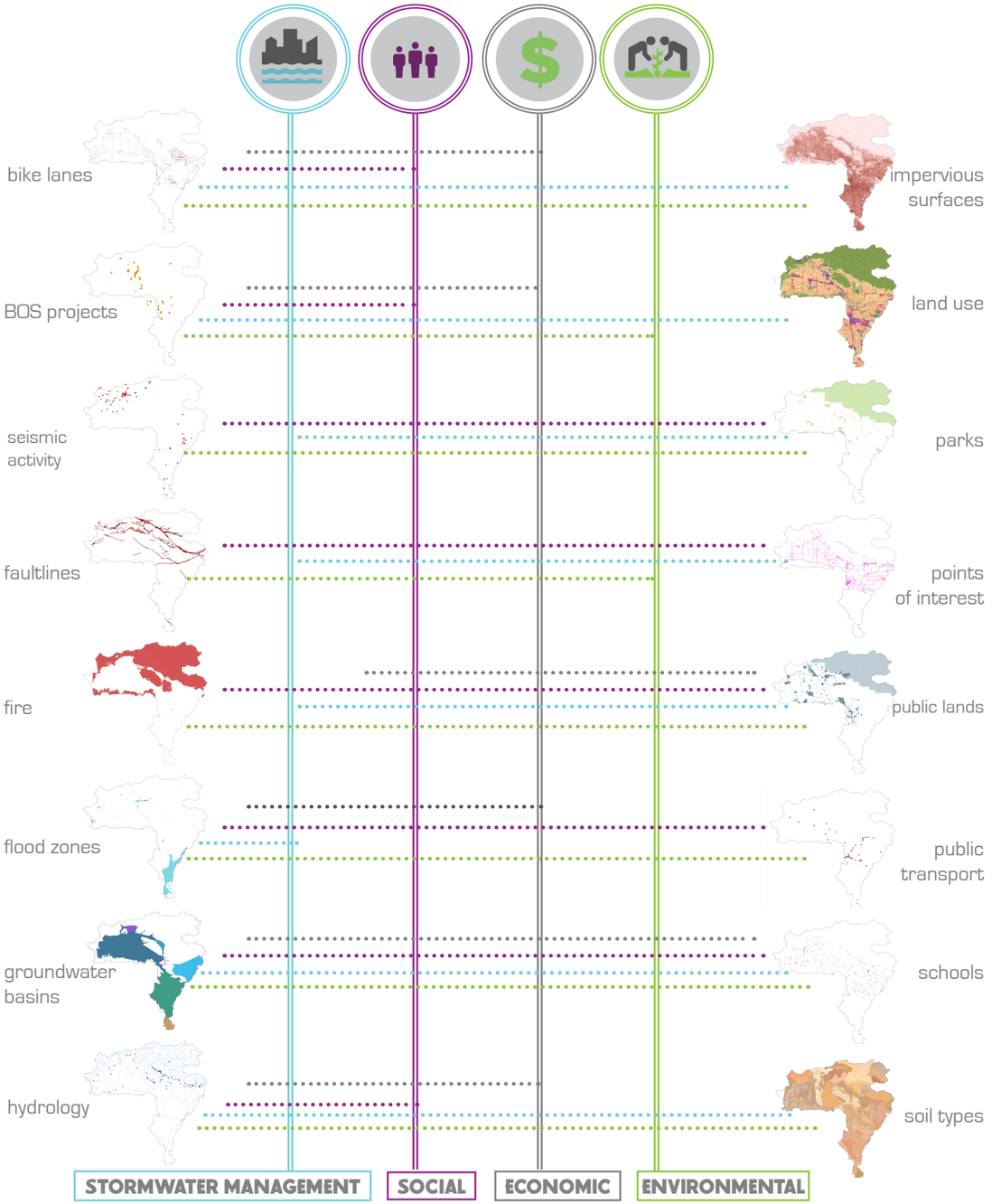
HYDROLOGICAL DISCONNECT

75% of LA's alluvial soils are covered with **impervious surfaces**, disabling signifcant groundwater recharge. Instead of natural infiltration, **55% of all precipitation becomes urban runoff** that collects oils, gas, heavy metal brake dust, animal waste and polluted factory discharge. The engineered stormwater flood control system sends these **pollutants directly to the LA River** where it is carried to the Pacific Ocean. With little local water available, 88% of LA's **water sources are imported from distant locations** to meet the needs of over 10 million people.

ISSUES & OPPORTUNITIES

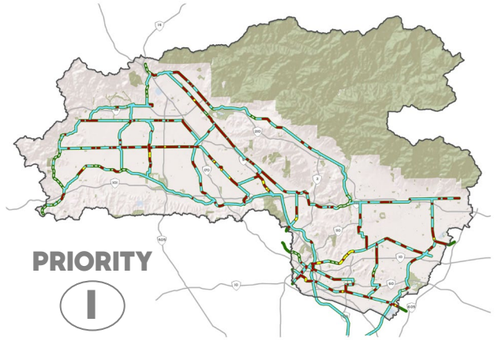
The GRASS Vision Plan provides green infrastructure solutions that manage, treat and infiltrate stormwater for the Upper Los Angeles River Watershed that also maximize social, economic and environmental benefits for the region.

FOSTERING A REGENERATIVE FUTURE

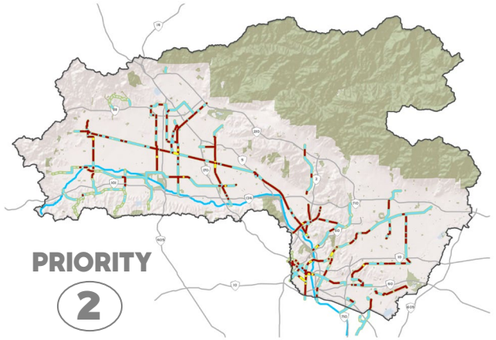


Watershed planning is based on natural resource mangagement for future generations. Above is a snapshot of just some of the inventory that was analyzed to master plan a regenerative Los Angeles.

GREEN NETWORK: BRIDGING THE PEDESTRIAN GAP

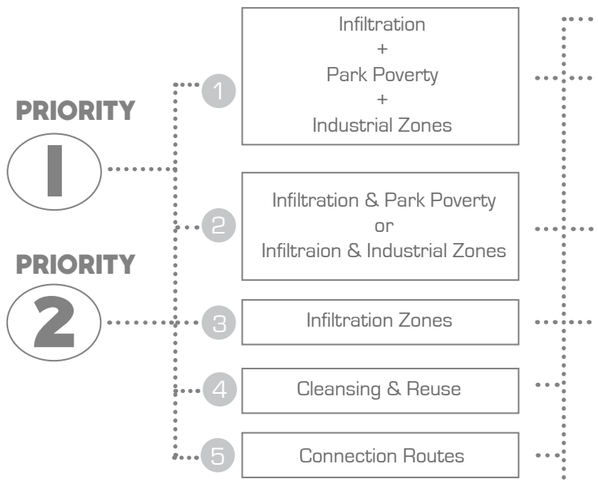


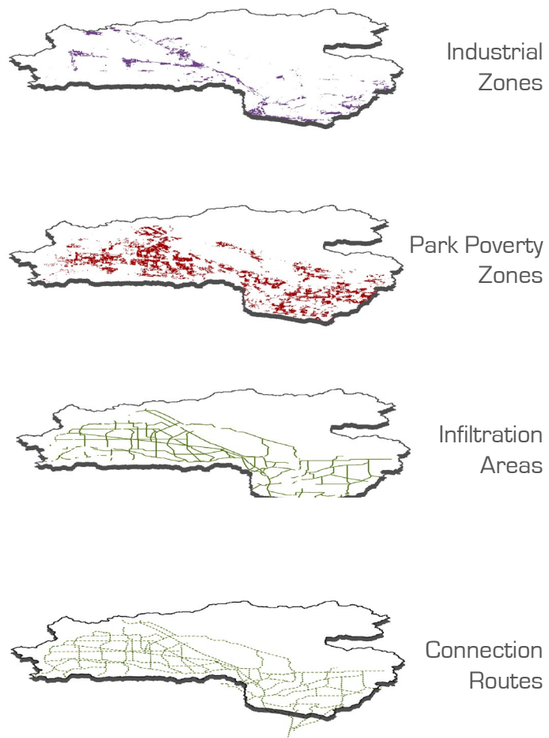
5-mile connectivity



2-mile connectivity

CLASSES

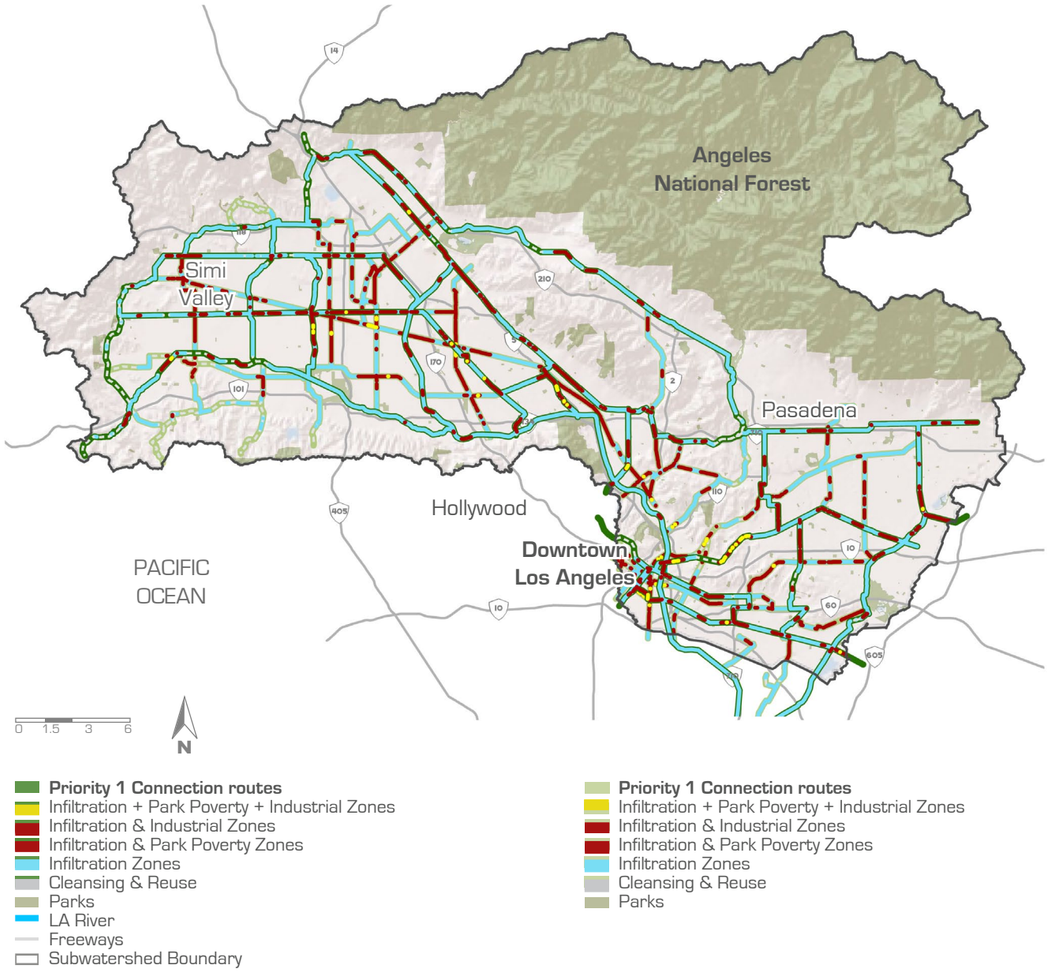




The **Green Network** bridges current pedestrian greenway gaps. **Priority One** provides major connections throughout the Upper Los Angeles River watershed. **Priority Two** connects distinct opportunities to the Priority One network. The five classes determine functions of Infiltration, Capture & Reuse as well as Cleansing through a variety of LID BMPs.

PRIORITY I & 2

CONVERGENCE OF GREENWAYS AND PEOPLE



Non-motorized Transportation

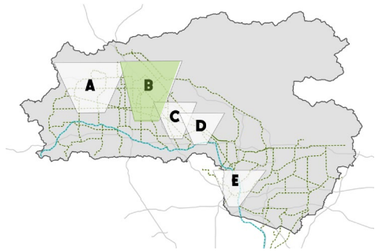
Easements

School Infrastructure Enhancement

Utility Corridors

Recreation

GREENWAY CONNECTIONS AND OPPORTUNITIES

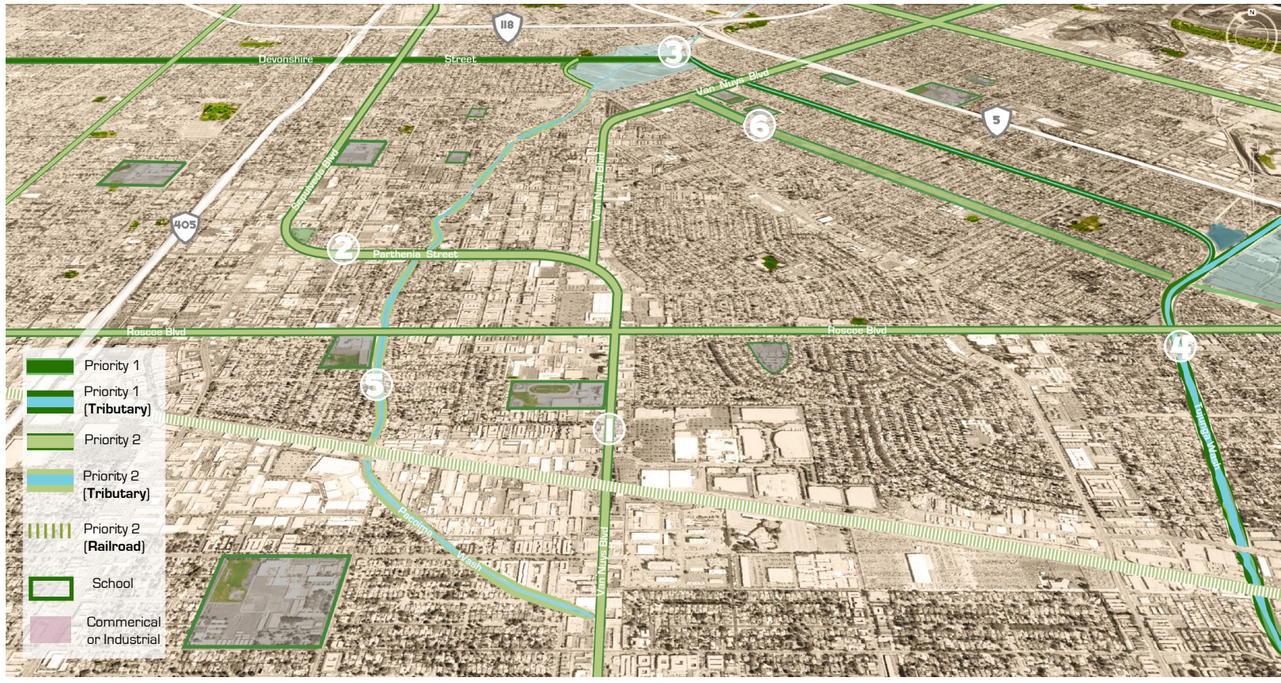


1 VAN NUYS BLVD.

Due to its excessive street width and location, Van Nuys Blvd has holds opportunities to manage stormwater and connect communities to public transportation as well as the to the Los Angeles River.

2 PARTHENIA ST.

Also excessively wide, this is an ideal street to manage stormwater, as it connects to North Hills Park and a major arterial street, Sepulveda Blvd.



3 SPREADING GROUNDS

Located between two parks, Pacoima Spreading Grounds were designed to infiltrate stormwater and ideal for recreation as well as educating the public about stormwater management.

4 TUJUNGA WASH

This wash is also a major connection in the Green Network, with a right-of-way ideal for recreation, stormwater managment, and non-motorized tranportation.

5 PACOIMA WASH

The Pacoima Wash is a major connection in the Green Network, its right-of-way ideal for pedestrians, cyclists and stormwater

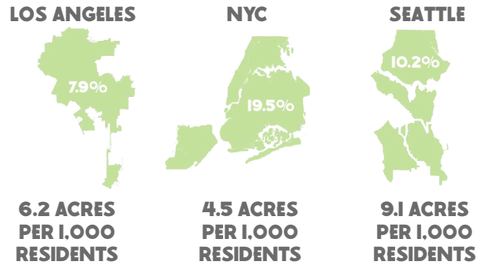
6 WHITNALL HWY

This utility corridor is ideal for recreational spaces as well as stormwater infiltration. There are also opportunities for non-motorized transporation.

Green infrastructure in these areas would generate numerous opportunities for **stormwater management and recreation.** LID stormwater projects create new, or enhance existing, **green space**, increase recreational space and **promote non-motorized forms of transportation** that improve public health.

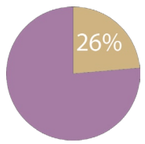
LOS ANGELES NEEDS PARKS

% OF PARK SPACE WITHIN THE CITY

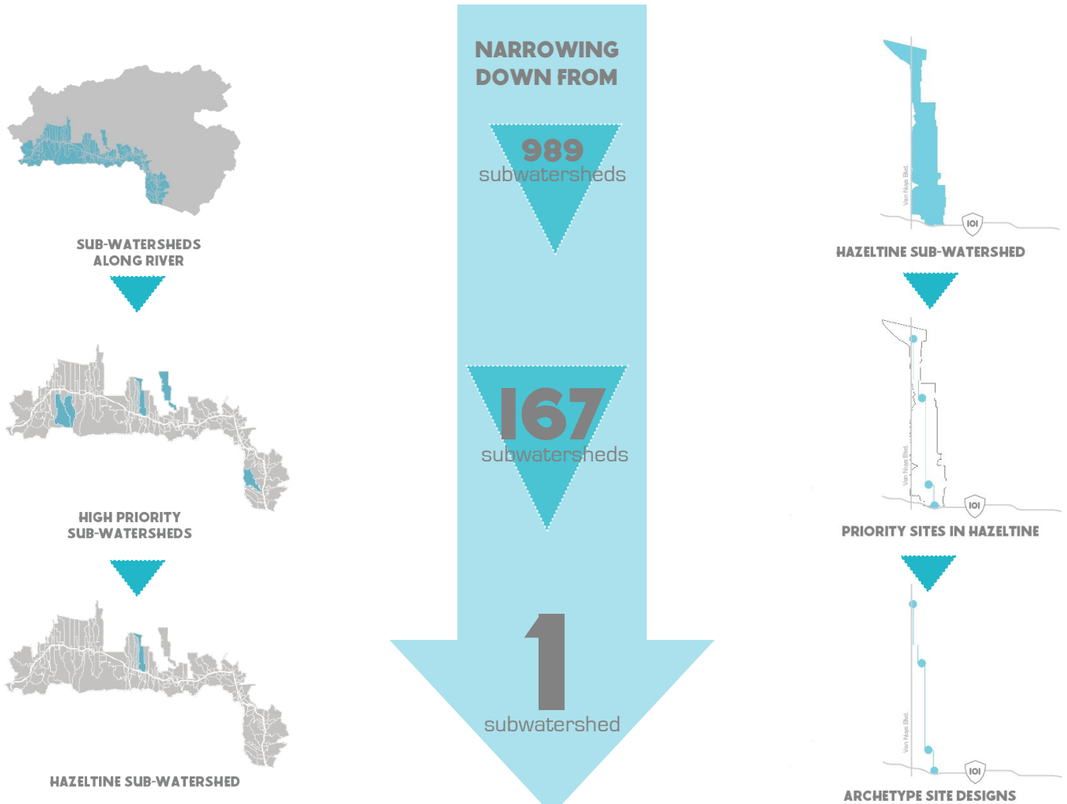


26% the adults in LA County are obese.

Less than **1/3** of children in LA County live within walking distance of a park or playground.

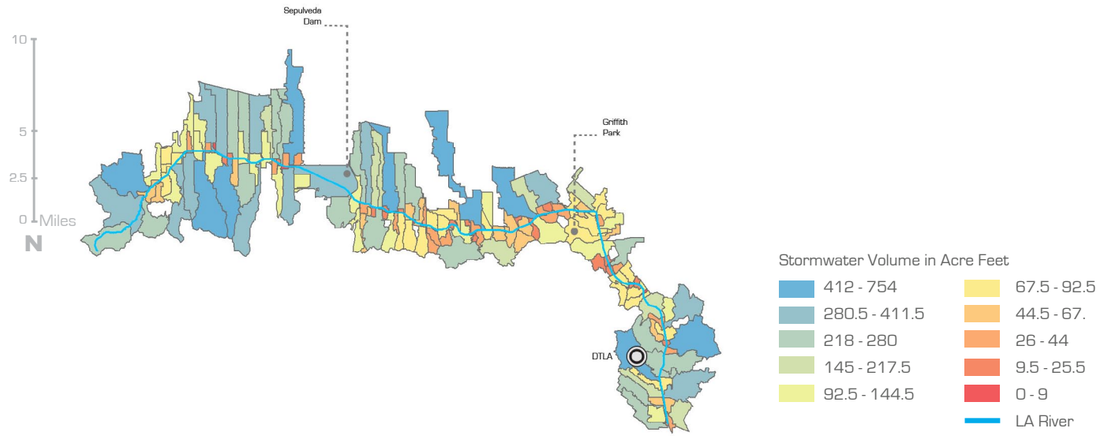


HOW TO LOCALIZE THE GREEN NETWORK



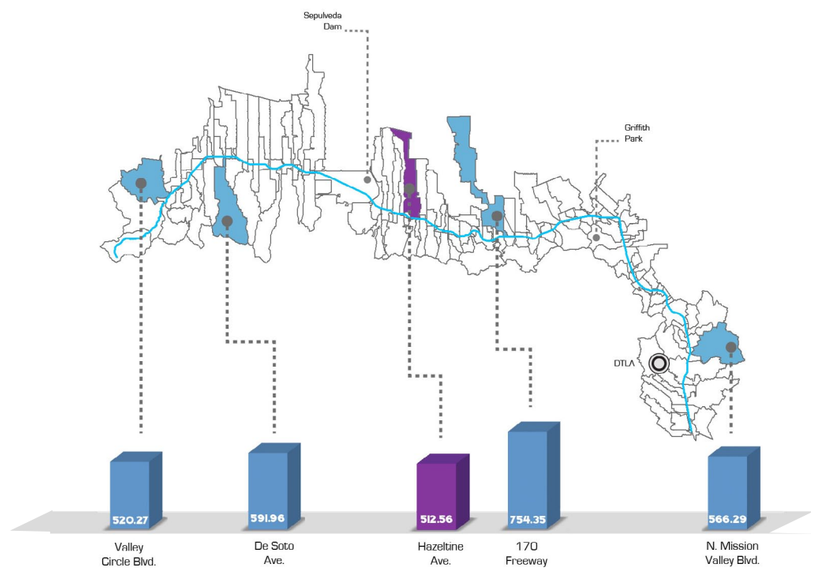
A priority subwatershed was identified by further dividing the Upper LA River Watershed into smaller units for comparison and analysis at a local scale.

REGIONAL PRIORITIES DEFINED BY LOCALIZATION



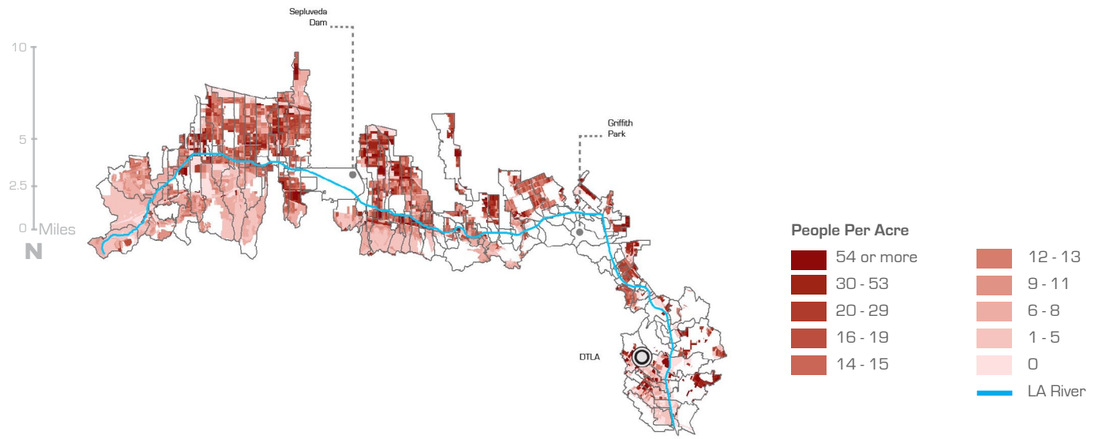
HIGH STORMWATER VOLUMES

TOP 5
subwatersheds



Stormwater run-off volume is fundamental for improving water quality. Managing it entails capturing and cleansing prior to stormwater entering the LA River. This data reflects peak rainfall volumes over a 24-hour period during a 50-year storm event and is represented in acre-feet. Areas in this region are capable of receiving over 750 acre-feet during the 24-hour period, represented in blue on the map above.

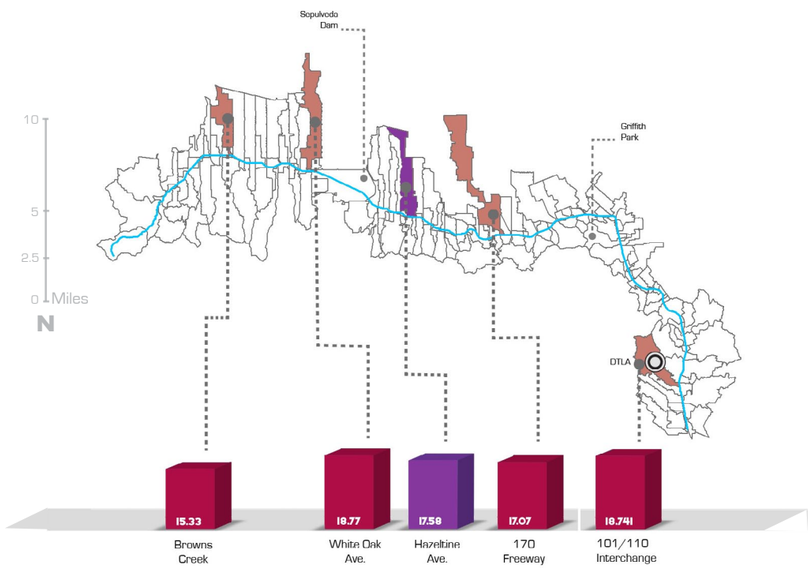
LOCATING COMMUNITIES IN MOST NEED



HIGH PARK POVERTY

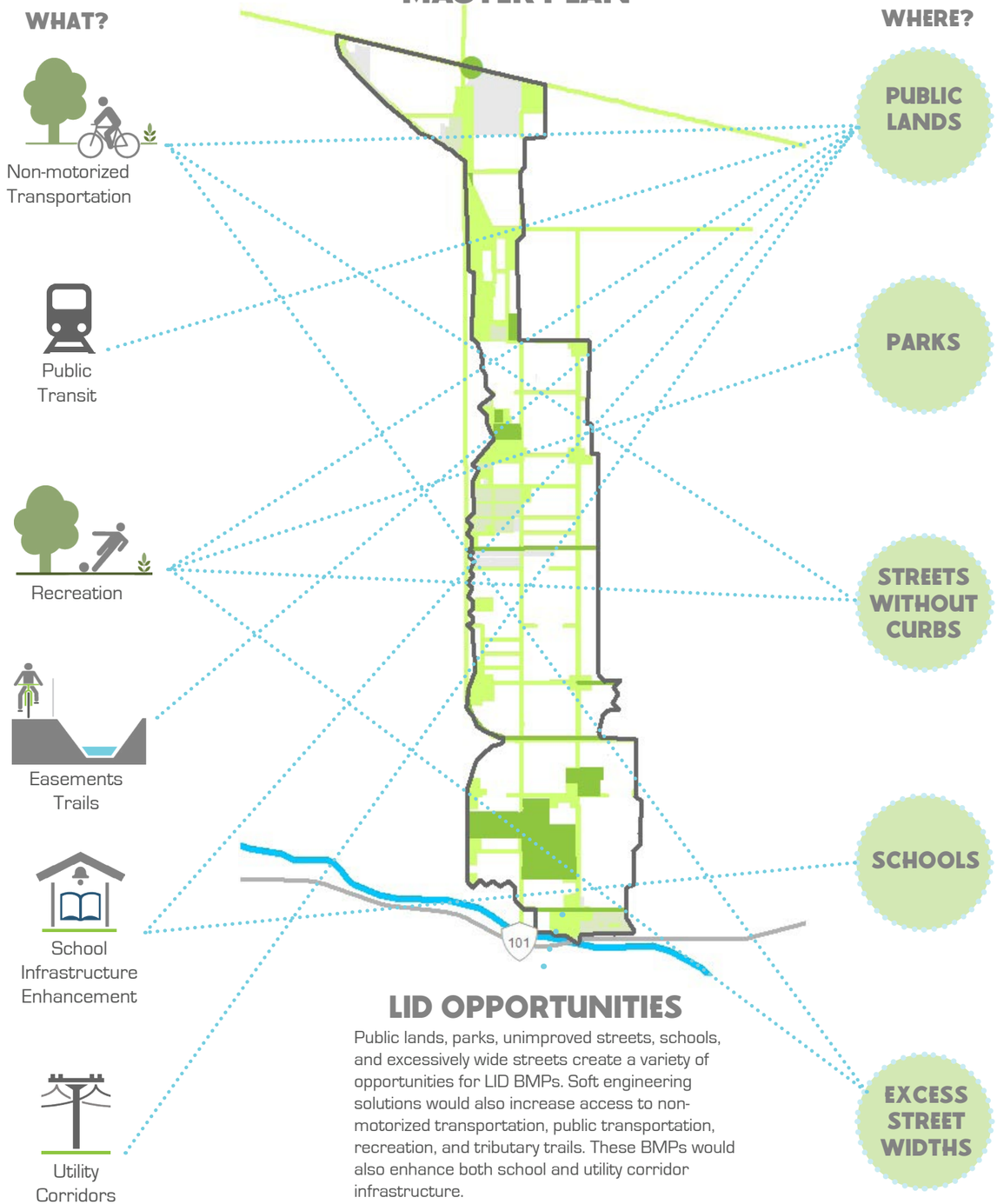
TOP 5

subwatersheds



Park poverty levels are indicators of poor public health. 2010 US Census data shows population density per census block combined with a 1/4 mile park buffer - which indicates a 10-minute walk to a park (Trust for Public Lands 2010). Areas ranging from pink to red on this map (left) are defined as park poor. The darkest of reds show high densities of people per acre, living in an area that lacks quick and easy access to recreational space.

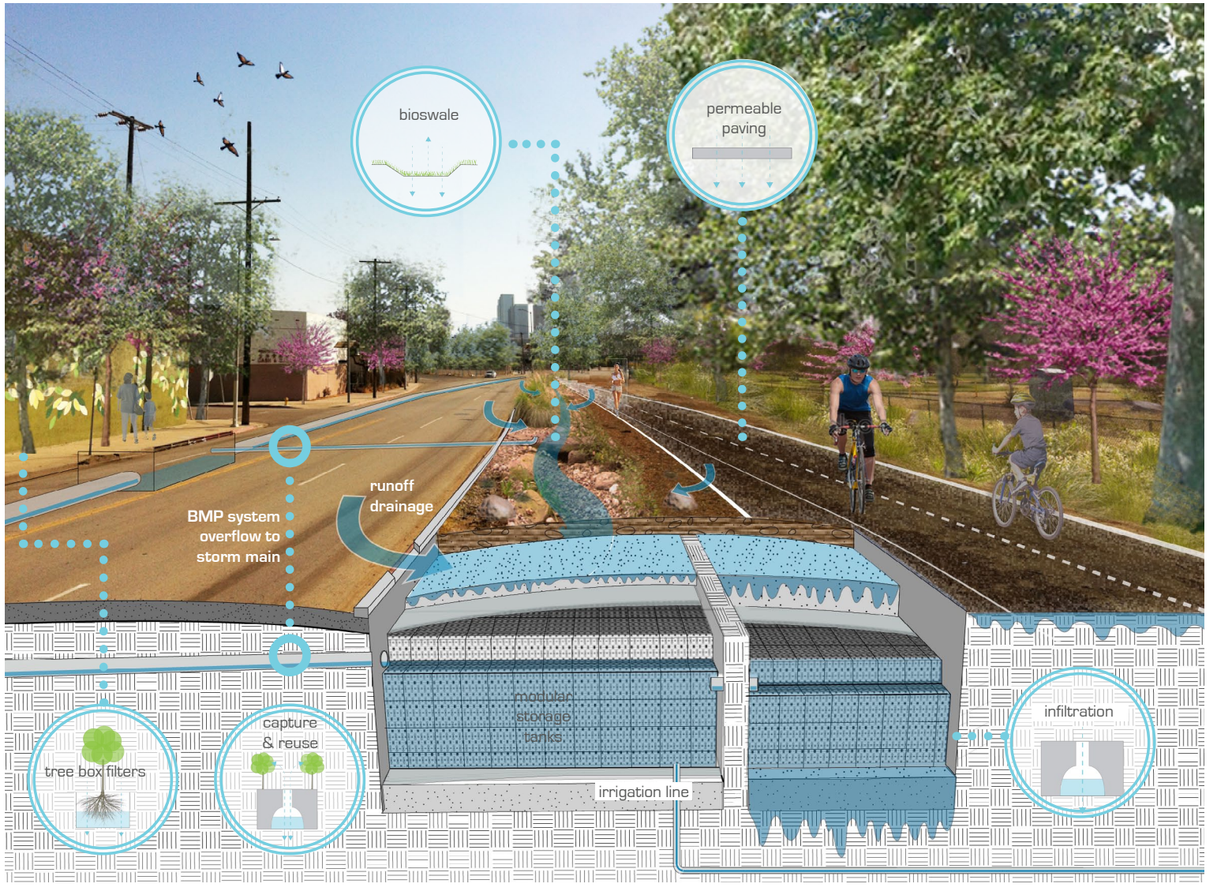
HAZELTINE MASTER PLAN



LID OPPORTUNITIES

Public lands, parks, unimproved streets, schools, and excessively wide streets create a variety of opportunities for LID BMPs. Soft engineering solutions would also increase access to non-motorized transportation, public transportation, recreation, and tributary trails. These BMPs would also enhance both school and utility corridor infrastructure.

GREENWAY DESIGN



SAMPLE PLANTS


Achillea millefolium / Yarrow


Ceanothus griseus "Santa Ana'/ Santa Ana Ceanothus


Platanus racemosa / Western Sycamore


Populus fremontii / Western Cottonwood

BIORETENTION


Eleocharis macrostachya / Pale Spikerush


Juncus patens / California Gray Rush


Juncus phaeocephalus / Brown Headed Rush


Schoenoplectus maritimus / Cosmopolitan Bulrush

PHYTOREMEDIATION

Plants from California Stormwater Quality Association, Los Angeles Council for Watershed Health & UCSB Cheadle Center for Ecological Restoration.

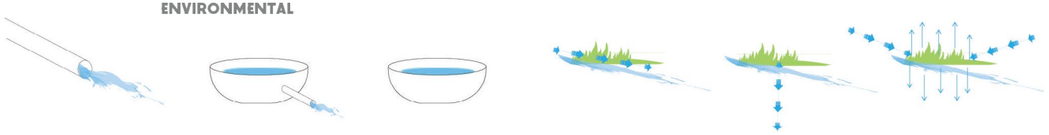
STORMWATER HARVESTING

Following the protocols of the rain garden, street-side bioswales can filter street catchment and its adjacencies. Runoff then percolates through various levels of bio-filtration before reaching an underground storage system. Modular tanks create versatile storage volume capacities, accomodating the strictest excavation restrictions. Stored water irrigates local trees, with excess runoff draining to an infiltration chamber. This system reduces pressure on potable water supply by recharging groundwater supplies, decreases demand on existing stormwater infrastructure, and introduces an economically viable alternative water source that is up to 75% less expensive than traditional stormwater management techniques (Sydney Metropolitan Catchment Management Authority WSUD, 2012).

GRASS GOALS

RELEVANT PLANS & POLICIES

- Olmsted-Bartholomew Plan, 1930 ("Parks, Playgrounds, and Beaches")
- "Living Streets" Model for Design, Los Angeles County 2011
- City of Los Angeles Low Impact Development (LID) Ordinance
- LAUSD-Campus Master Planning
- BOS Prop O
- WPD Water Quality Compliance Master Plan for Urban Runoff
- WPD TMDL Implementation Plans for LAR
- Los Angeles River Revitalization Master Plan (LARRMP)
- Los Angeles River Master Plan
- City of Los Angeles General Plan
- Greater Los Angeles County Integrated Regional Water Management Plan (IRWMP)
- City of Los Angeles Proposition 84
- AB 1881
- Los Angeles County Clean Water, Clean Beaches Measure



CONVENTIONAL INFRASTRUCTURE → **GREEN INFRASTRUCTURE**

> "THE CITY HAS THE ABILITY TO INCORPORATE MULTIPLE SYSTEMS. NATURE IS A WHOLE THAT NOT ONLY EMBRACES THE CITY, BUT HAS POWERFUL IMPLICATIONS FOR HOW IT IS BUILT AND MAINTAINED"
>
> - SPIRN 1984

Drought, water supply reliability and pollution have sparked political action within the City of Los Angeles (LA). The Low Impact Development **(LID)** Ordinance seeks to capture the **first ¾"** of any rain event for infiltration to LA's aquifers. Since **88%** of LA's water is currently imported from hundreds of miles away, this represents a shift to local water use. This project followed a scientific method to develop a system of **multifunctional greenways** that address **park poverty** while capturing **stormwater** through a series of engineered and open space design strategies. The client for this project is the City of LA **Dept. of Public Works Bureau of Sanitation (BOS).** This agency and the rest of City is committed to the "One Water Approach," which provides a holistic, integrative approach to water that looks at ground water, drinking water, stormwater, recycled water, and wastewater as a single universal resource that should be captured, conserved and reused.

GREENWAYS TO **R**IVERS **A**RTERIAL **S**TORMWATER **S**YSTEMS

PHASE 1

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