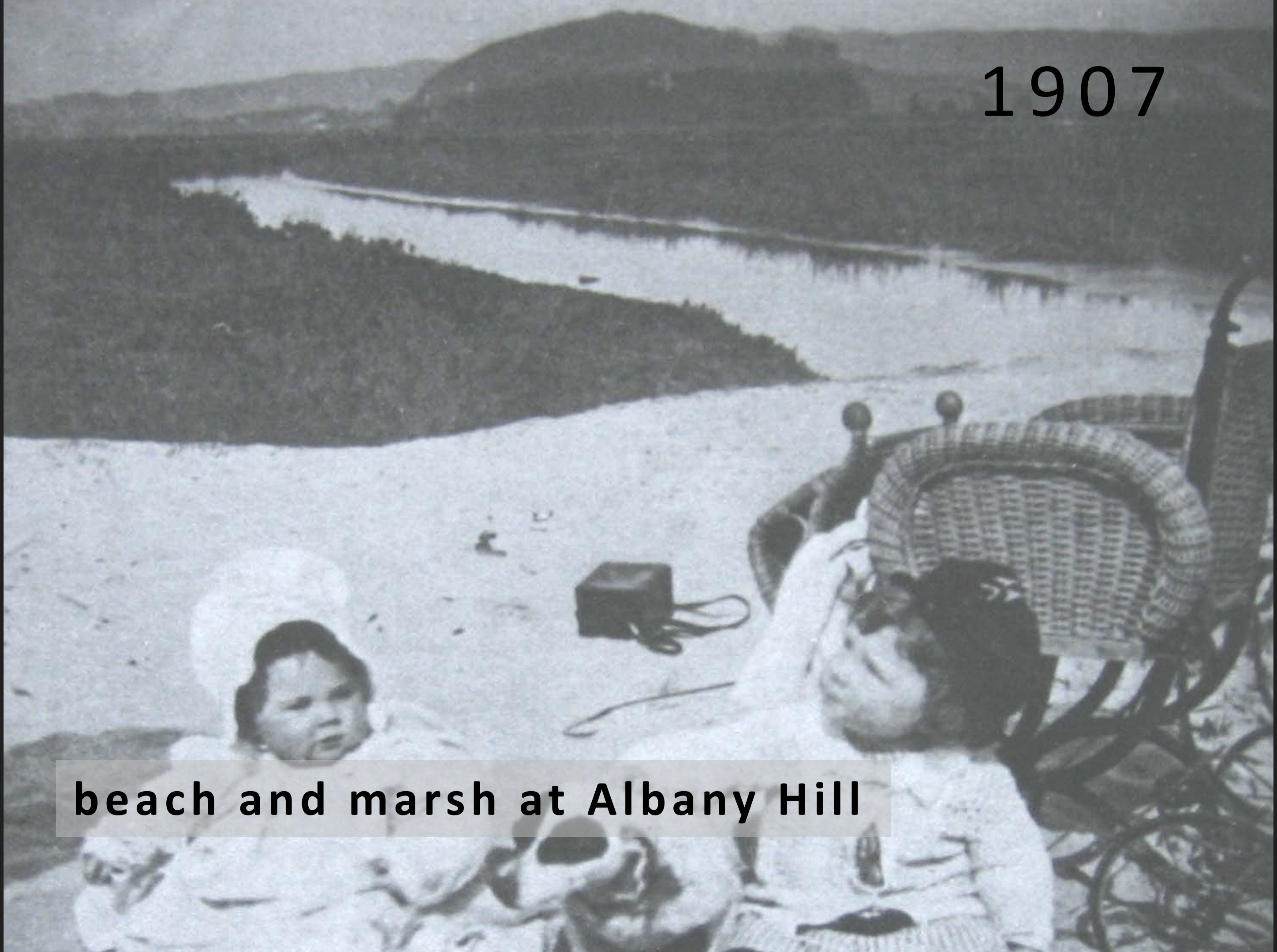
URBAN ECOLOGY

Designing the Climate-Resilient Cities of the Future


1939
orchards: San Jose



beach and marsh at Albany Hill

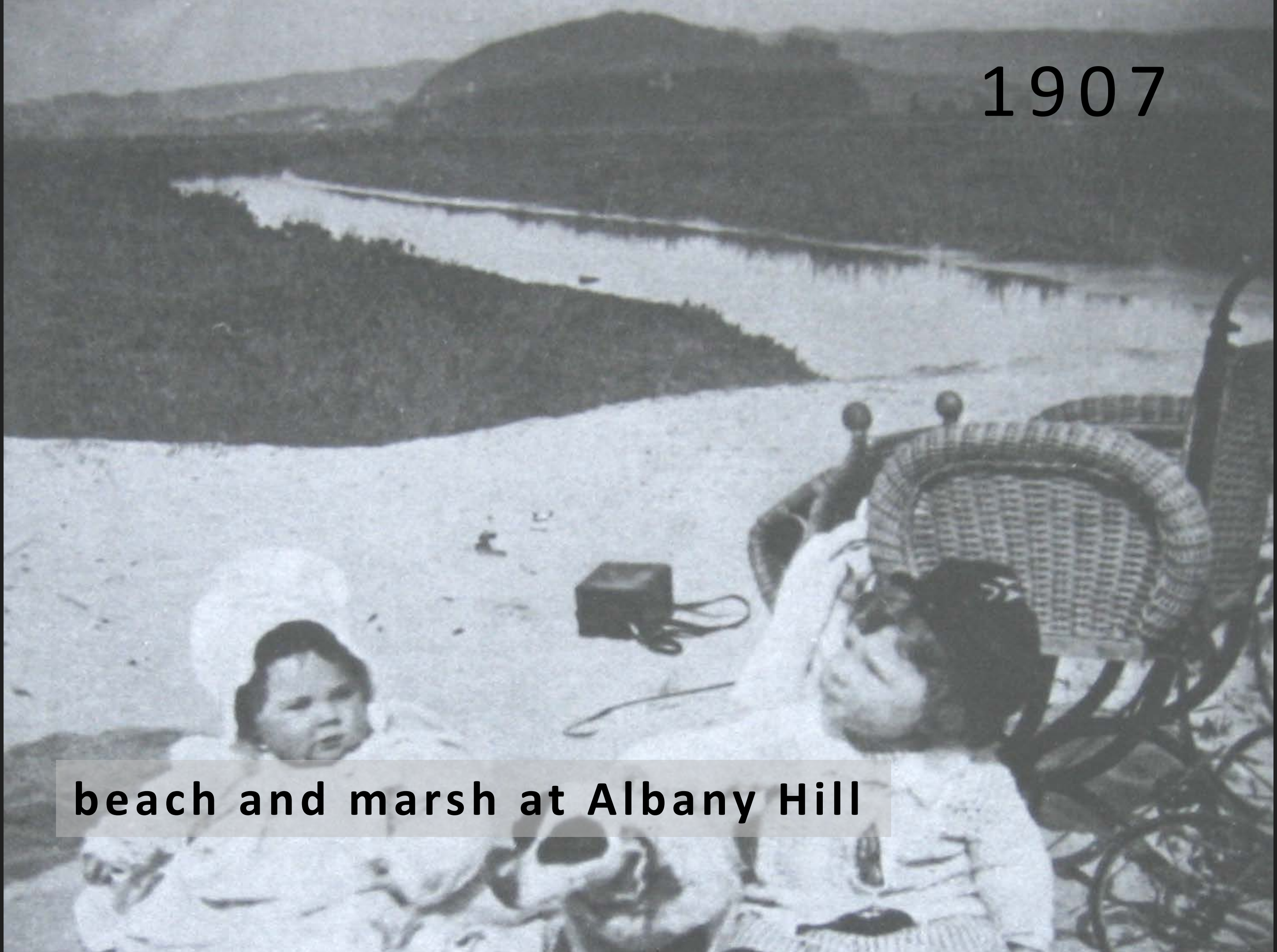

1895
adobe and grasslands: Napa

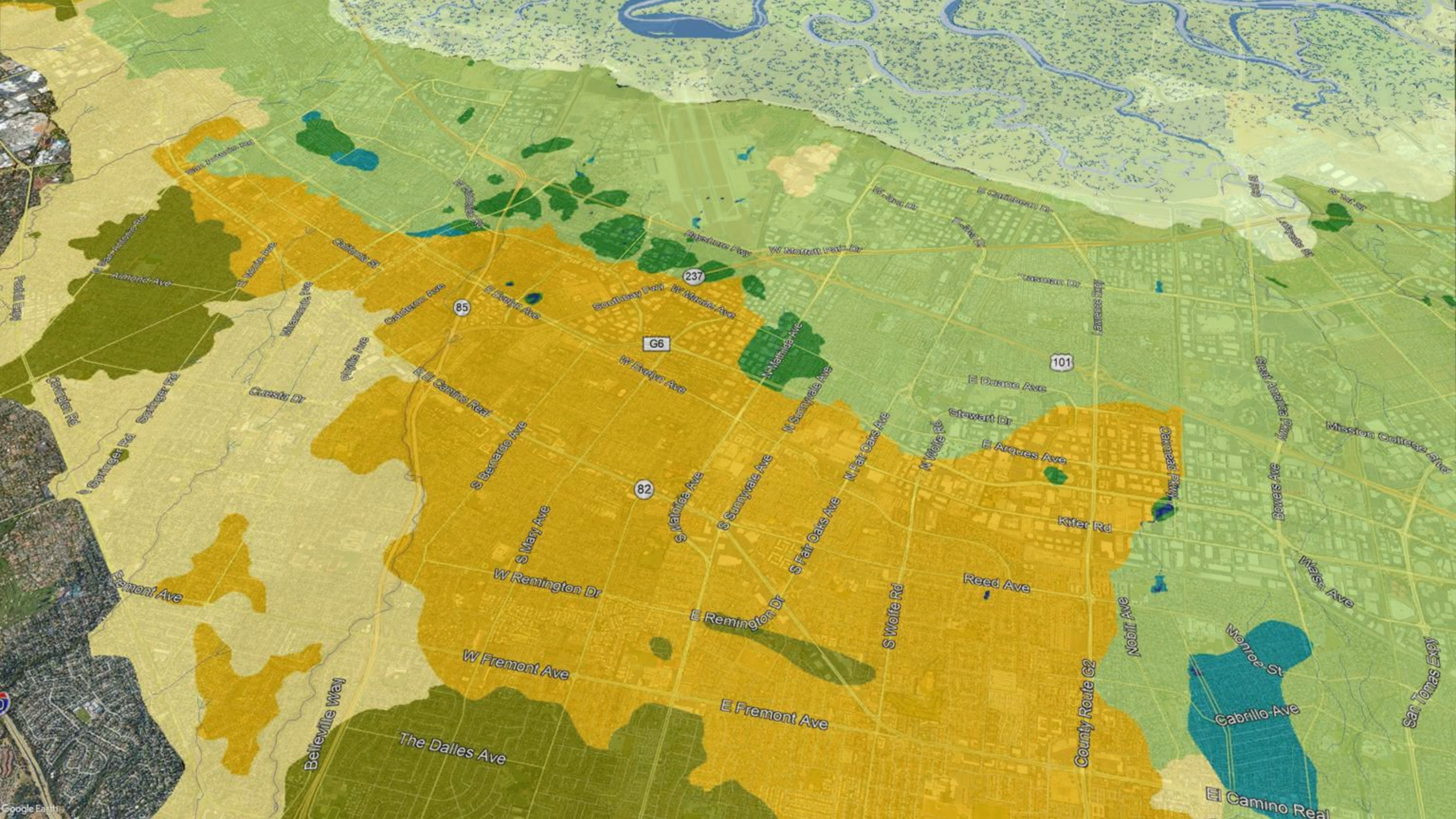

NAPA


1850
live oaks: Oakland


143 8th St
Exit St
ONE WAY

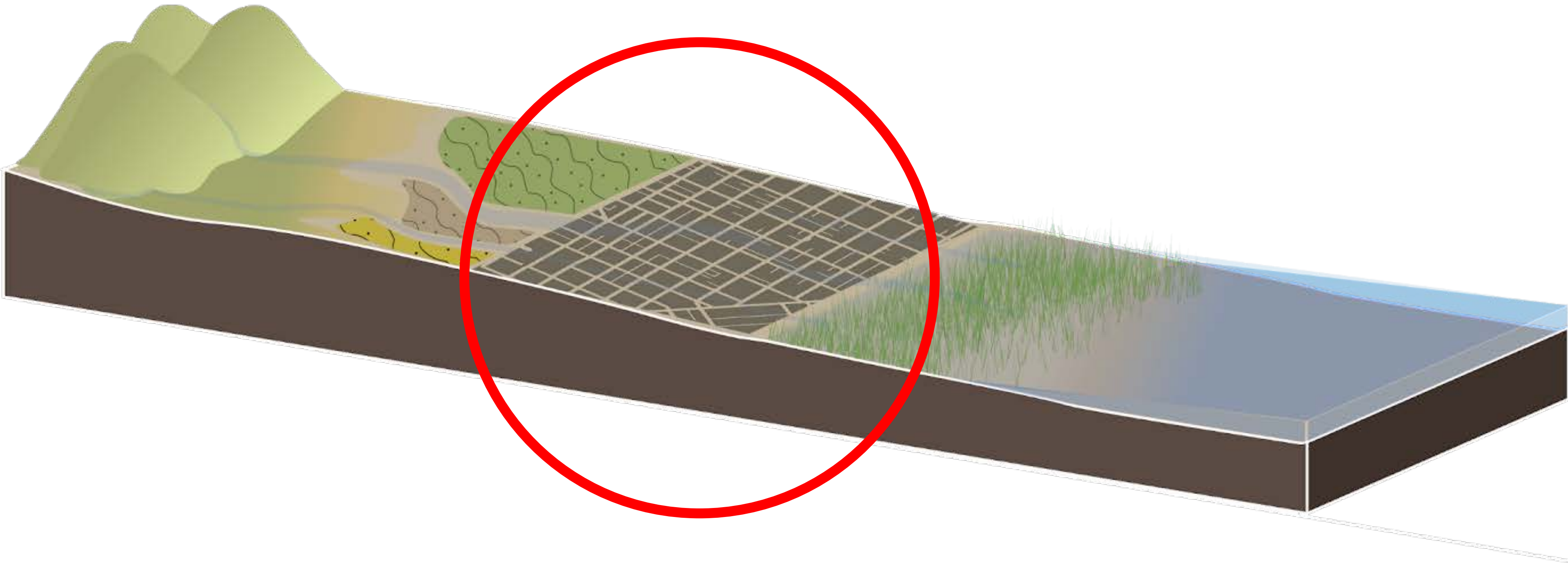

1850
live oaks: Oakland


1907
beach and marsh at Albany Hill



237
85
G6
101
82
W Moffett Park Dr
Tasman Dr
Lawrence Expy
E Duane Ave
Stewart Dr
E Arques Ave
Mission College Blvd
Kifer Rd
Reed Ave
Bowers Ave
Walsh Ave
Monroe St
Cabrillo Ave
San Tomas Expy
Nobili Ave
El Camino Real
County Route G2
S Wolfe Rd
N Wolfe Rd
N Fair Oaks Ave
S Fair Oaks Ave
N Sunnyvale Ave
S Sunnyvale Ave
N Mathilda Ave
S Mathilda Ave
E Remington Dr
W Remington Dr
E Fremont Ave
W Fremont Ave
The Dalles Ave
Belleville Way
S Mary Ave
S Bernardo Ave
E El Camino Real
W Evelyn Ave
E Evelyn Ave
Central Expy
Cuesta Dr
Almond Ave
California St
Fremont Ave
Southbay Fwy
W Maude Ave
Great America Pkwy
Google Earth


Google Earth



Our cities were designed with little attention to natural processes

resulting in a landscape that provides little access to nature…

...and will not easily weather coming changes.

But cities can build landscape resilience

Marshes buffer shoreline from **rising sea levels**

Urban forests reduce **heat**, provide **shade,** and store **carbon**

Creeks with floodplains **reduce flood risk and store water**

Native trees and landscaping is **drought tolerant**, **connects people to nature**, and makes city **unique**

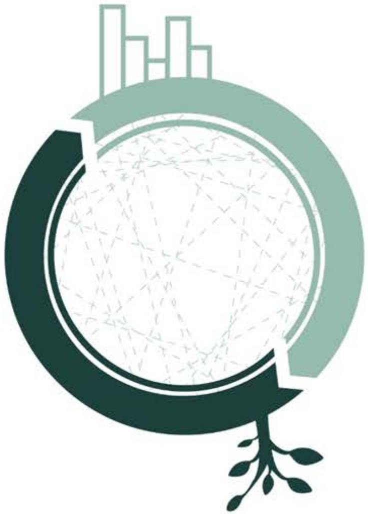
Multi-benefit urban ecology strategy

- Investing in Urban Greening: much $$ and activity by developers, cities, NGOs
- Diverse range of benefits often presumed from greening efforts but often not scientifically guided
- No systematic approach to assure benefits, maximize value of coordinated investments, minimize negative effects
- Little guidance about how to integrate available to agencies, landowners, designers, and planners




Henk Sijgers (left), EPA

Cities Need Better Nature...



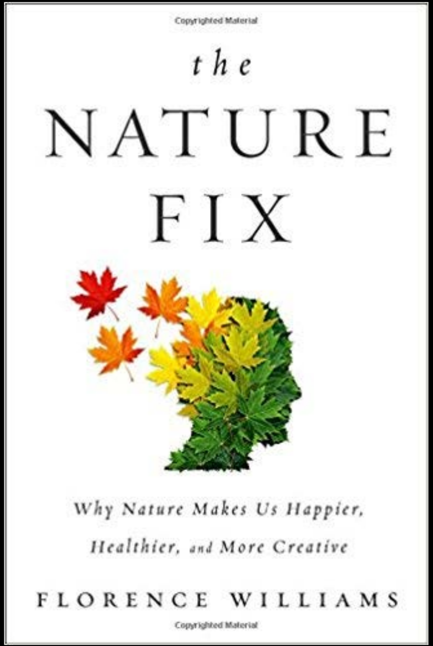
Nature Needs Better Cities...

NATURE and HUMAN HEALTH

- Well-being and psychological health
- Cognitive function, creativity

Access to biodiversity…

- Greater restorative benefit in urban park with high biodiversity
  - Fuller et al. 2007, Carrus et al. 2015
- Micro-biome rewilding may be greater with higher biodiversity
  - Immune system diseases - allergies, asthma, obesity, IBS
  - Flies et al. 2017



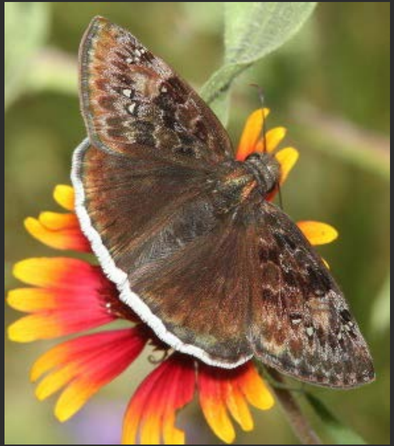
RE-OAKING SILICON VALLEY

Building Vibrant Cities with Nature


POLLINATOR GARDENS
POLLINATOR GARDEN
SEPARATED BIKE LANES WITH STREET TREES
LARGE OAK IN BACKYARD
green roof
Corporate Campus
[Research, Office Parks & Light Industrial]
Single Family Homes
[Medium Density Residential]
GREEN ROOF WITH OAKS
PARKING UNDER OAKS

Benefits for biodiversity




Acorn Woodpecker

Oak titmouse

Mournful duskywing

California sister

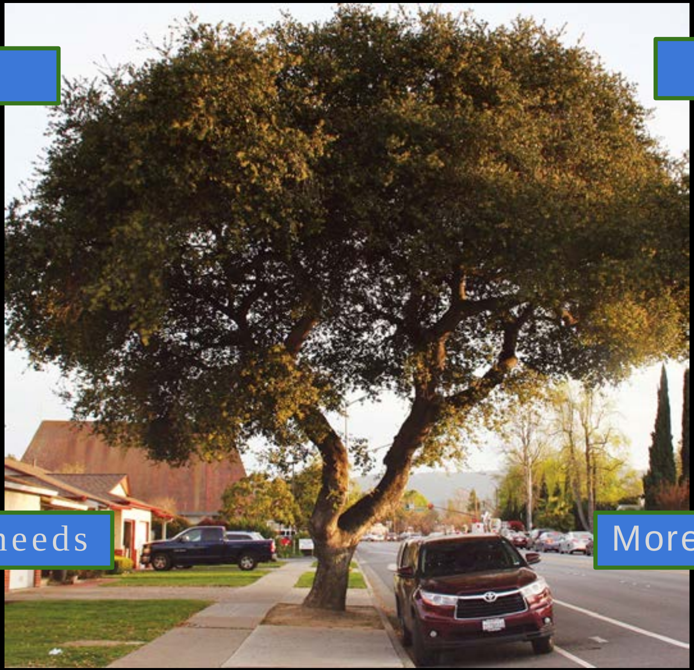
Crab spider

More services for people

Large shade canopy

Natural heritage

Store more C/year

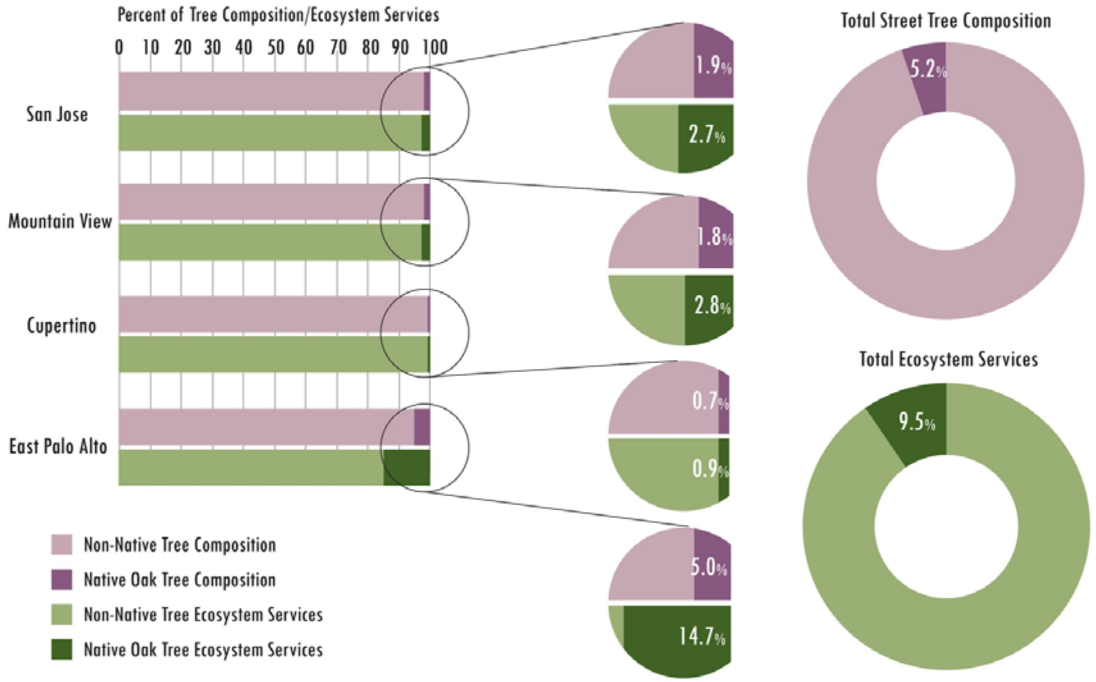


Reduced water needs

More drought-tolerant

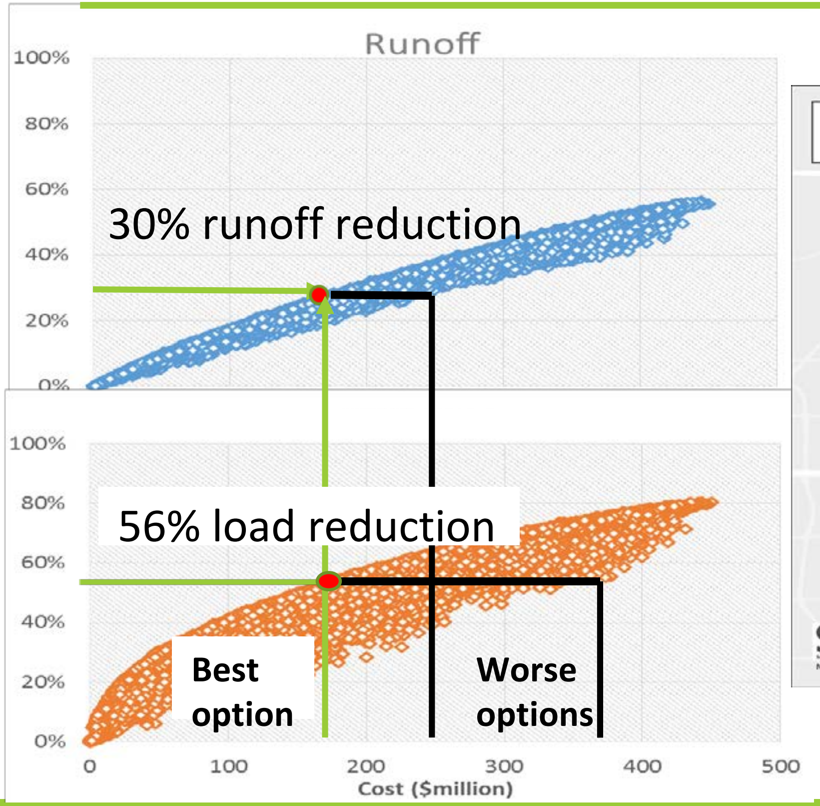
Evergreen → runoff reduction

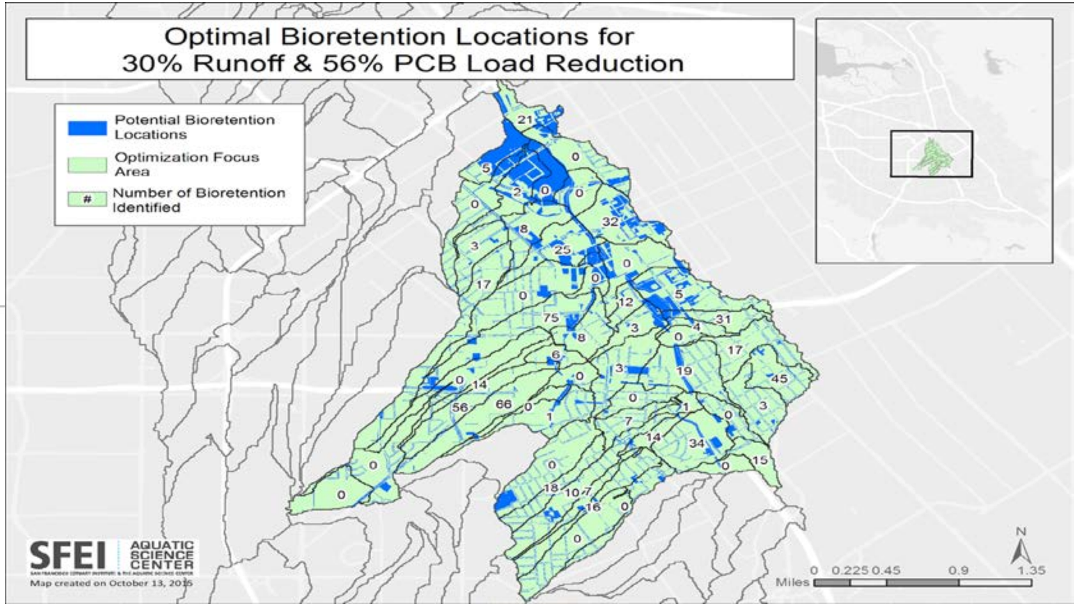
Ecosystem Services Provided by Native Oaks



UC Berkeley and SFEI

Linking urban ecology and hydro: GreenPlan-IT





GreenPlan-IT

- Identified GI locations for City of San Mateo's Sustainable Street Plan

- Identified cost-effective GI locations for Downtown San Jose for PCB control

Healthy Watersheds Resilient Baylands (EPA WQIF)

- Integrate water quality benefits and ecological functions
- Identify where GI and urban forestry can synergistically achieve multiple benefits

Questions for Optimization and Maximum Benefit: Urban Biodiversity and Water Quality

- How to link LID, urban forestry, and landscaping to benefit biodiversity and water quality?

- Maximize placement and species ofurban trees to benefit hydrology and water quality improvements

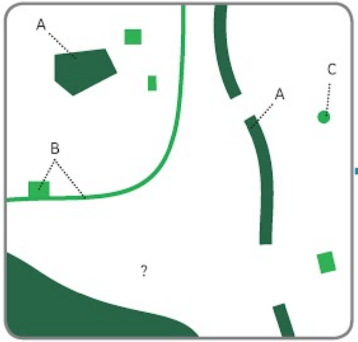
  → deciduous trees where winter light is more important than runoff reduction? (e.g. valley oak)

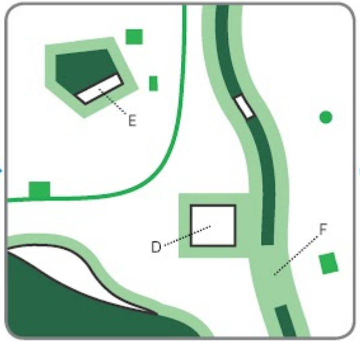
  → evergreen over impervious substrate? (e.g. live oak)

- Can we prioritize canopy cover to LID feature drainage area to maximize feature effectiveness in storms?

- How do we evaluate ecological functions provided in relation to contaminant accumulation and management requirements?

Multibenefit Urban Biodiversity Framework





1. Identify key landscape features

A Identify regional patches & corridors. Identify large patches and long corridors - these features act as biodiversity hubs at the regional scale. Patches of 130 acres or larger are often small in number in cities, but provide large biodiversity benefits, and can support edge-sensitive and forest-interior species that may not occur in smaller patches. Similarly, corridors that cross cities (along streams, or greenways) can enhance connectivity at the regional scale, enabling movement through the city.

B Identify local patches & corridors. Smaller patches and corridors can act as local biodiversity hubs. For example, patches of at least 11 acres are likely to support more biodiversity than smaller patches, and can act as stepping stones if they are strategically located between larger patches or near regional corridors. Similarly, local corridors can help connect larger patches, enhancing local connectivity.

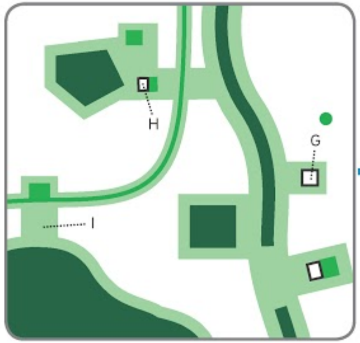
C Locate high-quality matrix habitat. Existing areas of high quality matrix habitat may already support biodiversity, and can be built upon to increase the size of the patch, or improved with management or addition of special resources.

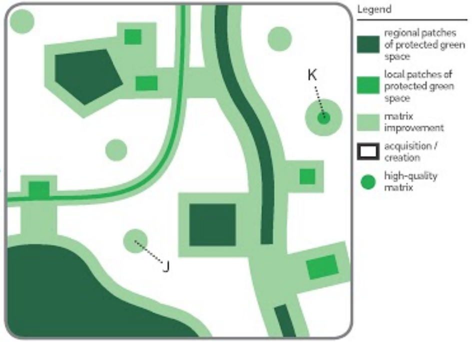
2. Build regional biodiversity hubs and corridors

D Create. When possible, seize opportunities to acquire or assemble parcels to create large patches and long corridors that can serve to enhance biodiversity and connectivity at the regional scale.

E Expand. When possible, acquire land adjacent to existing large patches and along regional corridors. Biodiversity can benefit from expansion of existing hubs, and connectivity can be improved by filling gaps along regional corridors.

F Coordinate in the matrix. Where acquisition is not feasible, improve matrix quality around hubs and along corridors. Higher habitat quality in the urban matrix can increase the effective patch size of hubs and can improve connectivity by helping to fill gaps in corridors. Matrix improvements along corridors can also increase their width, increasing their effective patch size and reducing the negative effects of abrupt edges.





3. Build local biodiversity hubs and corridors

G Create. When possible, acquire land to create new patches that can function as local hubs of biodiversity. These patches can enhance biodiversity and connectivity by creating stepping stones that facilitate movement across the urban landscape.

H Expand. When possible, acquire land adjacent to existing local biodiversity hubs and corridors to increase their effective patch size, increase connectivity, and fill gaps. Prioritize acquisition that builds connections between local and regional hubs and corridors.

I Coordinate in the matrix. Improve matrix quality around local hubs and corridors to their effective patch size and to improve connectivity by filling gaps and expanding stepping stones. Prioritize matrix improvements that can help build connections between local and regional hubs and corridors.

4. Build habitat complexes in the matrix

J Create. Identify areas with low matrix quality (for example, low canopy cover of urban forest), and coordinate efforts to create new habitat complexes that can act as patches of habitat (increasing patch size) and stepping stones (increasing connectivity).

K Expand. Identify areas with high matrix quality and build on them, coordinating matrix improvements to create habitat complexes that can increase the size of existing habitat patches in the urban matrix.

Building resilience across the landscape. . . the time is now.

stream restoration

urban parks

tidal marsh restoration

street trees

urban forestry plans

stormwater system redesign

backyard landscaping

pollinator pathways

flood control channel redesign

open space conservation

THANK YOU