SHERWOOD
DESIGN ENGINEERS

FEASIBILITY STUDY

AUGUST 2021

REWILDING THE GUADALUPE RIVER IN SAN JOSÉ

Integrated Watershed Management at the Guadalupe River Park and Beyond

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INTRODUCTION

The Guadalupe River is A 14-mile-long waterway in San José, California, the Guadalupe River originates at the confluence of Guadalupe Creek and Alamitos Creek, with three urban creeks (Ross, Canoas, and Los Gatos) joining at different locations upstream of Guadalupe River Park. The river flows through heavily urbanized portions of San José before it discharges into South San Francisco Bay. This passage through the populated and industrialized landscape poses challenges to water quality, stormwater management and ecological habitat — and, in turn, to the quality of life for San José's residents.

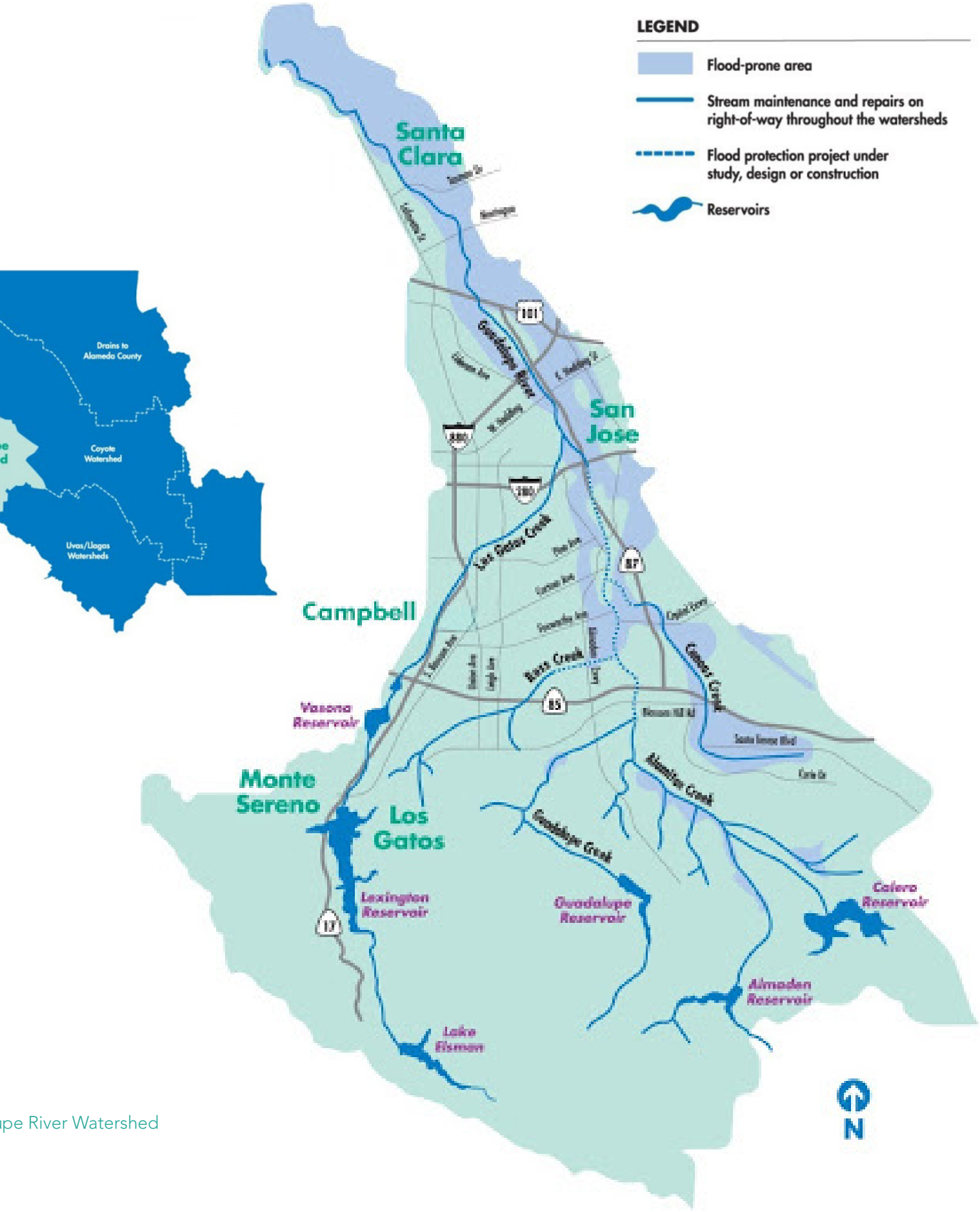
Situated at the hub of Silicon Valley, San José is seeing renewed redevelopment investment that's intended to reshape the downtown area. This presents an invaluable opportunity to capitalize on this growth by revitalizing the city's largest urban park, Guadalupe River Park, and rewilding the river that sits at its heart and has the potential to become the city's open space and ecological spine.

Throughout the years, the Guadalupe River has been impacted by agriculture, mining, dams and urban sprawl. San José paved over and forgot the river until 2005, when it created Guadalupe River Park. That effort resulted in a groundbreaking flood protection infrastructure and public space that brought community benefits to the city. Over a decade later, after limited maintenance and a legacy of illegal dumping, both the neglected park and river have become places where the booming city hides its social problems. The park and the riverbanks are now home to a displaced population's encampments, which have exacerbated the poor conditions, making the public increasingly hesitant to access the park and river.

This study was conducted to identify strategies to help protect and transform the Guadalupe River into a place that supports natural ecology, improves the human experience and public health of residents and increases the sustainability and resilience of the city. This report also provides background on current conditions and available opportunities, on the linkage between the river and its watershed, and ultimately on the importance of implementing integrated stormwater management and green infrastructure into the urban fabric. See the Glossary in the Appendix for more details on the hydrology terms used throughout the report.

Figure 1: The Guadalu

See the Glossary in the Appendix for more details on the hydrology terms used throughout



upe River Watershed

INTRODUCTION

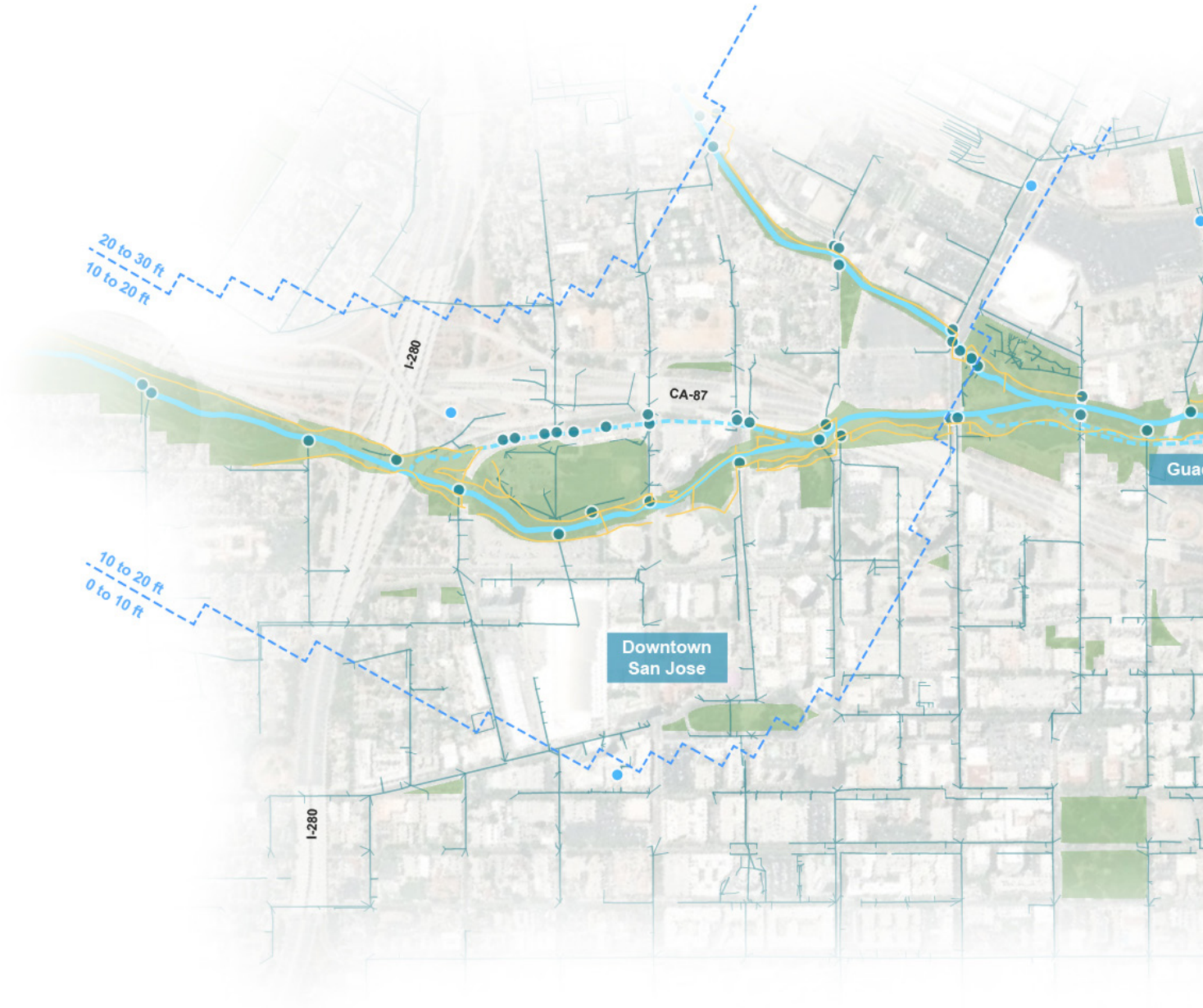
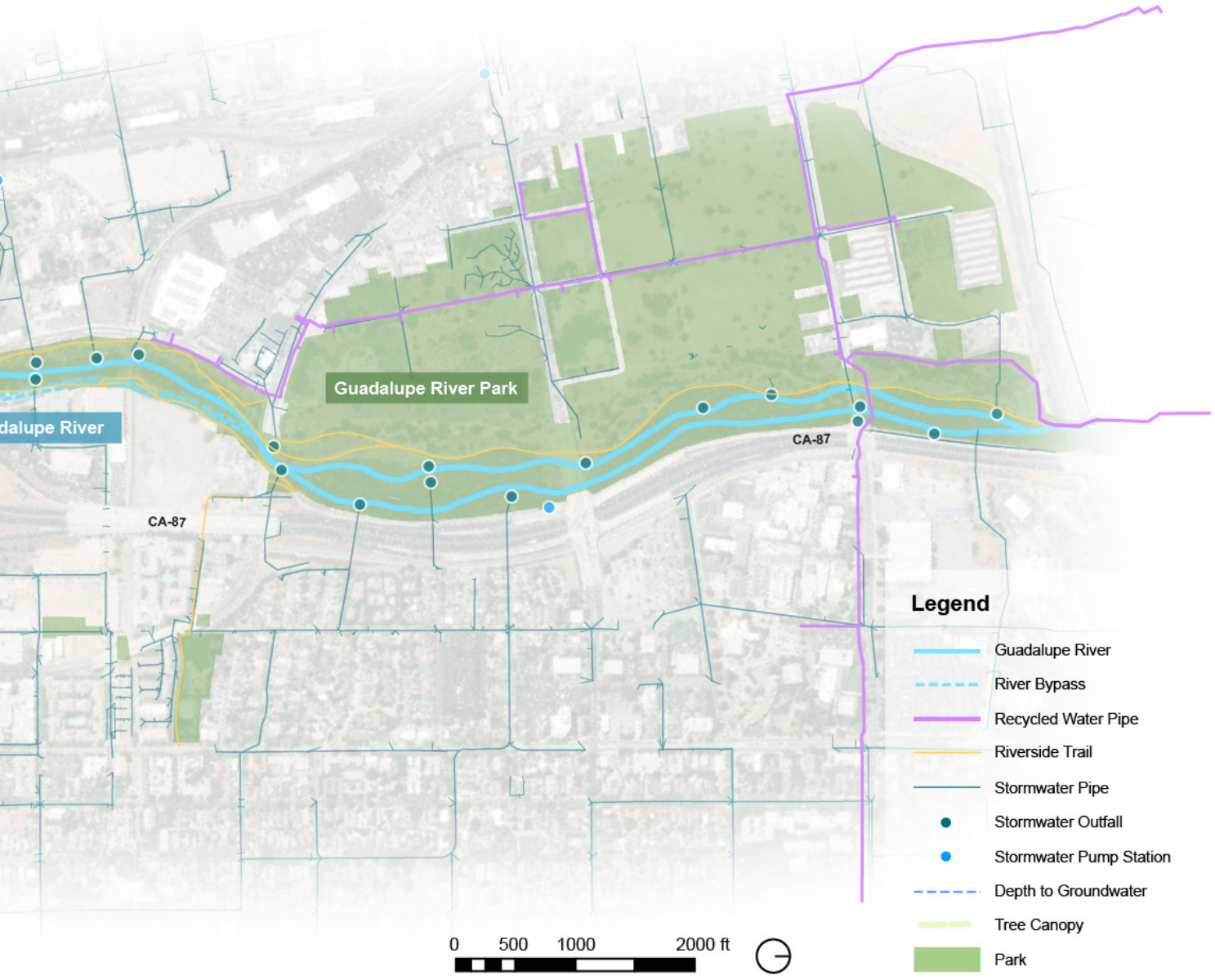


Figure 2: A comprehensive base map of the Guadalupe River, Guadalupe River Park, and Downtown San José


Guadalupe River Park
dalupe River
CA-87
CA-87
Legend
Guadalupe River
River Bypass
Recycled Water Pipe
Riverside Trail
Stormwater Pipe
Stormwater Outfall
Stormwater Pump Station
Depth to Groundwater
Tree Canopy
Park
0
500
1000
2000 ft

THE GUADALUPE RIVER AND SAN JOSÉ

The Guadalupe River is an urban, northward-flowing river that drains a 171-square-mile watershed. Dramatic changes over the past century have included dams on the three primary headwater tributaries, the isolation of historic tributaries in the lower river, channelization (an engineered alteration of the river's natural course), the disconnection of the river from its floodplain and rapid urban sprawl. The Environmental Protection Agency (EPA) has classified the Guadalupe River as "impaired for commercial and sport fishing due to high levels of mercury," "impaired for freshwater habitat due to mercury and diazinon" and "impaired for wildlife habitat and non-contact water recreation due to trash."

As the Guadalupe River flows through downtown San José, concrete, heavy infrastructure and intensive activity encroach on the river. Despite these challenges, and its current "impaired" status, the river ecosystem still has the potential to support productive native populations of species that can inspire and benefit the people and economy of San José.

CURRENT CONDITIONS OF THE RIVER AND ADJACENT AREAS

WATER QUALITY in the Guadalupe River has deteriorated over time due to untreated stormwater runoff, illegal dumping, excess nutrients (typically due to fertilizers and animal waste), trash and debris, toxins from historic mining, erosion, increased water temperature, reduced flow in dry seasons and loss of shade canopy.

ECOLOGY remains relatively intact in many areas, and recent species documented in the watershed include steelhead trout, salmon, beaver, river otter and a long list of significant bird life. While these native fauna are present along the river, their habitats have suffered a decline in conditions lately. Developing a more cohesive riparian corridor and resolving water-quality issues would help to improve these habitats. The reduced volume of water in the dry season also challenges the life cycles of fish and aquatic species that are essential to the ecosystem.

FLOW REGIMES have changed over time in the Guadalupe River due to upstream damming, reduced flow in the dry season, increasing amounts of impervious area (e.g., asphalt and cement) and channelization. These modifications have directly affected the water quality and biodiversity of the river.

PUBLIC RECREATIONAL AREAS other than the park are limited, and effective public access to the park and the river has decreased due to the large number of homeless encampments. In addition, portions of the trails are inaccessible because they have not been well maintained. Those using the park downtown will likely experience it in a fragmented way, given the lack of a consistent open space (other than Guadalupe River Park) and the noise and disconnection produced by freeways and large boulevards.

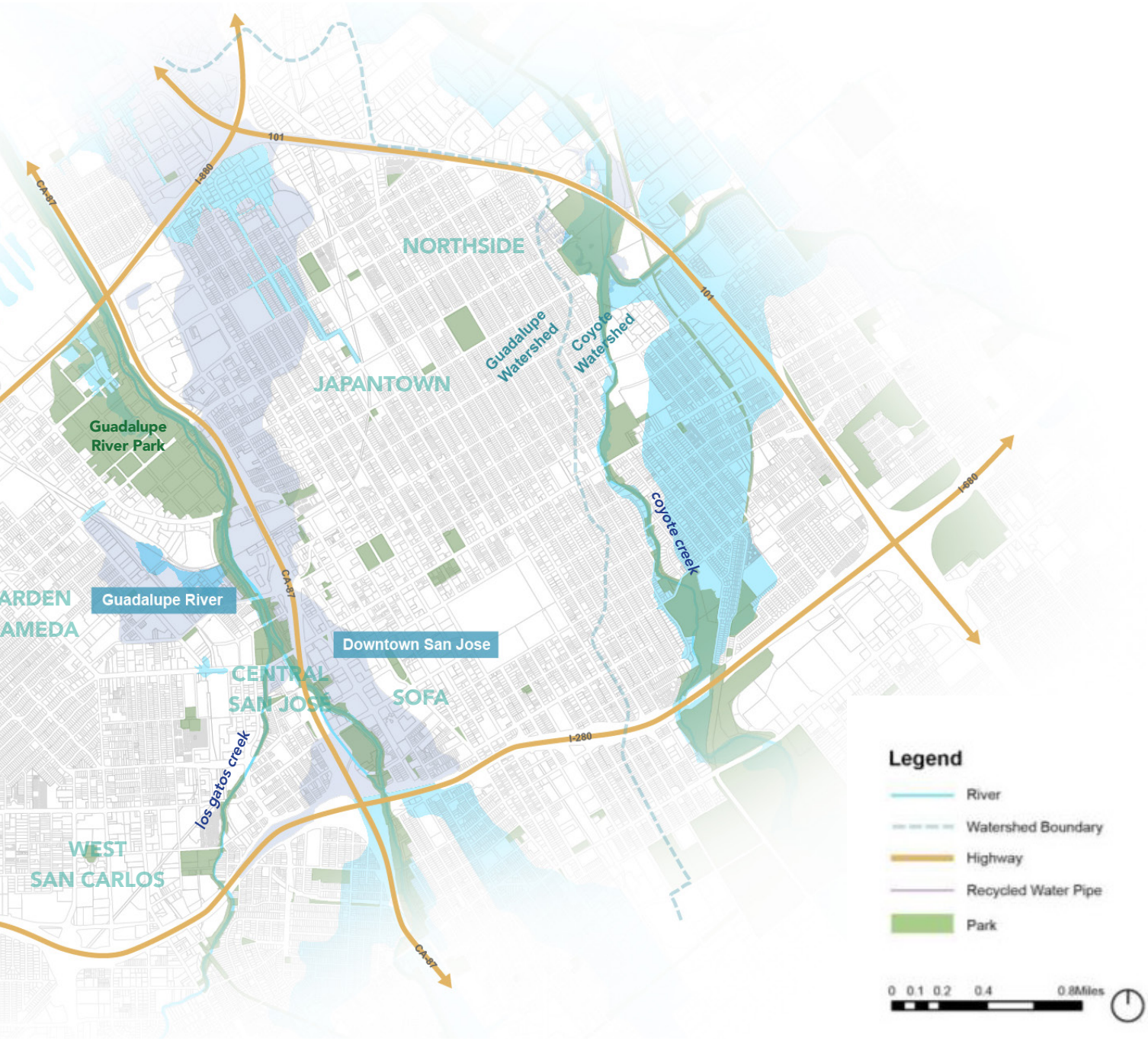
THE GUADALUPE RIVER AND SAN JOSÉ

STRESSORS

DISPLACED POPULATIONS , a result of the region's housing crisis, have set up encampments in the park. Numerous factors make the park and riverbanks appealing for campsites: the Guadalupe River's seasonal low flow, its proximity to downtown San José, the privacy offered by heavily overgrown areas and the general lack of pedestrian activity. These encampments have made trails inaccessible and uninviting to other park visitors and have created additional maintenance and water-quality challenges.

THE URBAN SYSTEM in San José works against the river. The proximity of downtown San José means that there are many impervious surfaces, ranging from buildings to vast concrete spaces, and the runoff from these surfaces is insufficiently treated before it enters the waterway. The auto-centric roadways and industrial elements of the area (including rail infrastructure to the west) make it challenging for pedestrians and bicyclists to have a connected travel experience, and the trails along the river are poorly maintained. In summer, hot temperatures diminish interest in the outdoors and increase cooling demand in buildings, causing HVAC systems to release more heat outside. Finally, a generic and relatively hard-surfaced public realm offers few clues that the Guadalupe River lies nearby. Taken together, the existing urban experience is disconnected and somewhat disorienting.

Figure 3: Area watersheds and their boundaries


NORTHSIDE
JAPANTOWN
Guadalupe River Park
Guadalupe River
Downtown San Jose
CENTRAL SAN JOSE
SOFA
WEST SAN CARLOS
ARDEN
AMEDA
Guadalupe Watershed
Coyote Watershed
coyote creek
los gatos creek
101
I-880
CA-87
I-280
I-680
Legend
River
Watershed Boundary
Highway
Recycled Water Pipe
Park
0 0.1 0.2 0.4 0.8Miles

THE GUADALUPE RIVER AND SAN JOSÉ

FLOODING events have historically occurred in areas of downtown San José and the downstream Alviso community. Currently, these events are mostly contained within the river channel, thanks largely to infrastructure projects that have been completed to mitigate flooding from the river. In 2004, the U.S. Army Corps of Engineers and the Santa Clara Valley Water District completed a $100 million Downtown Guadalupe River Flood Protection project, which consisted of installing three diversion channels and culverts in the river adjacent to downtown that are designed to overflow during large disasters, including a 100-year flood. However, recent studies have raised concerns that flooding associated with more frequent storms remains a threat due to climate change, and ongoing modifications to the watershed.

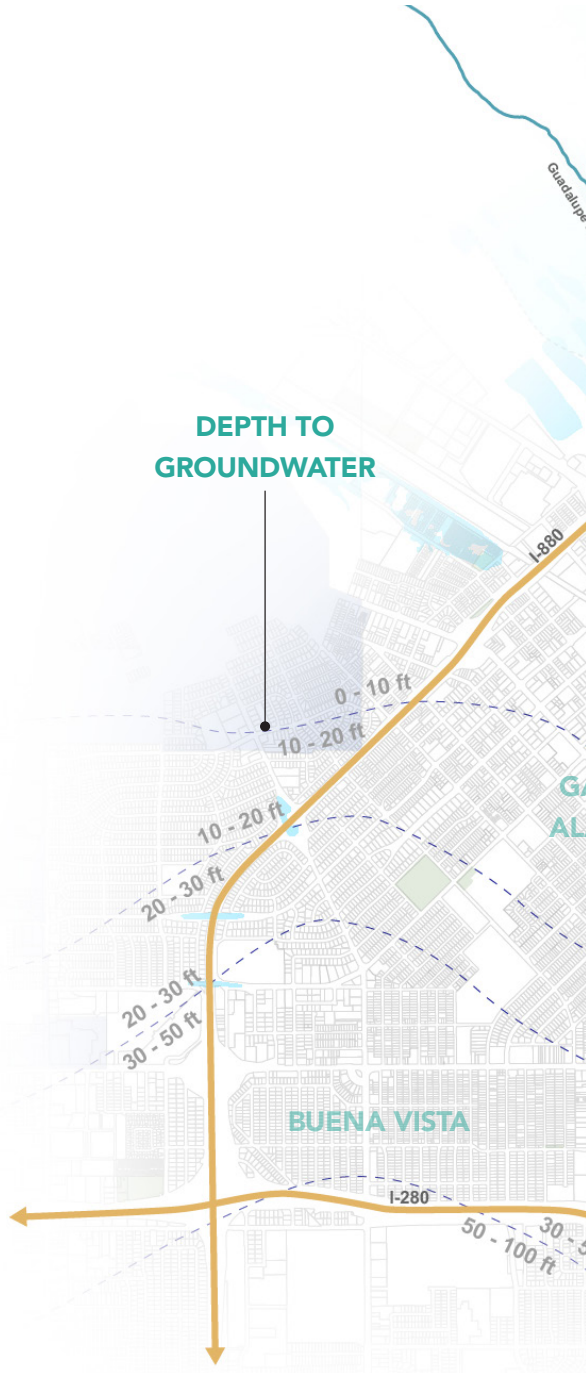


Figure 4: Floodplains and groundwater levels arc

ound the Guadalupe River

THE GUADALUPE RIVER AND SAN JOSÉ

LAND USE AND ZONING in the downtown area are currently dominated by commercial development and transit. Parks and green spaces are not well connected, which separates ecological habitats, disrupts continuous paths for pedestrians and precludes opportunities to create stormwater networks that capture and filter runoff. Areas zoned for commercial, industrial, transit and downtown-oriented development frame the Guadalupe River Park and connecting trails.

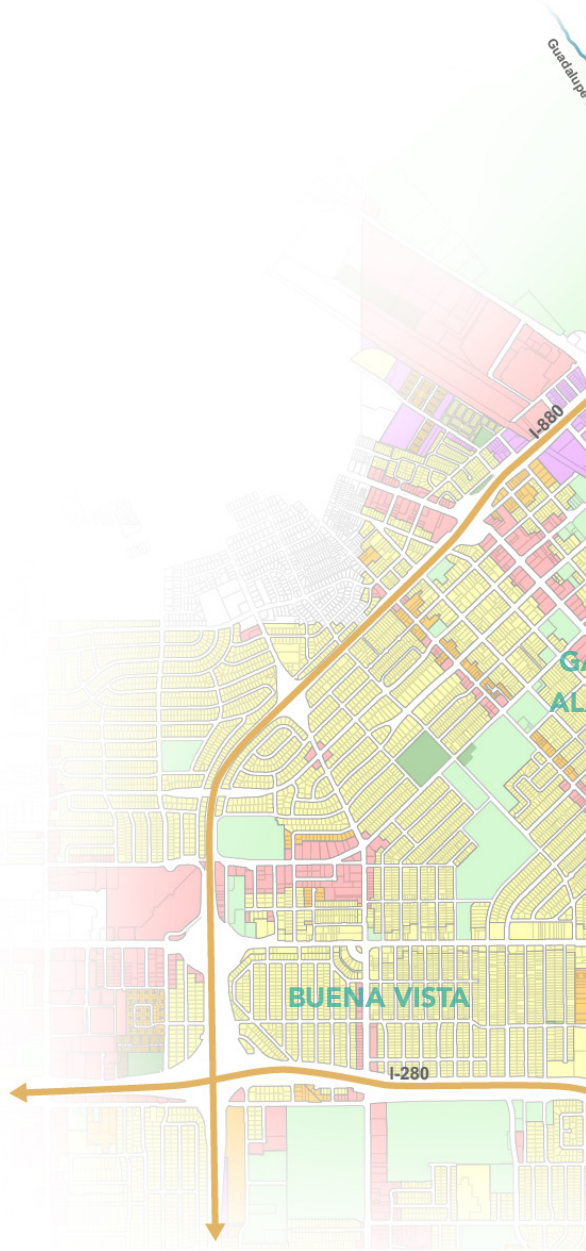
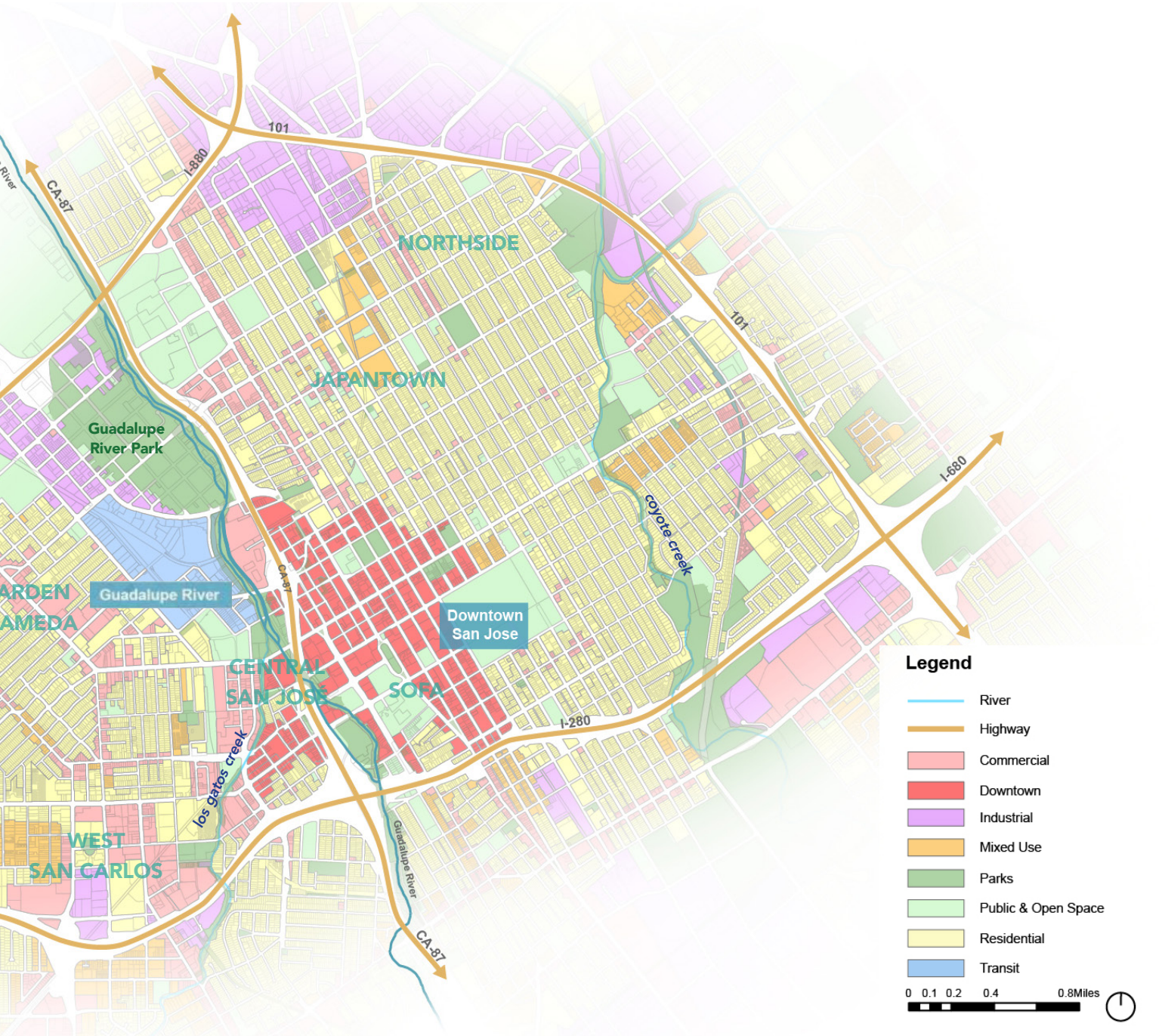


Figure 5: Zoning conditions, urban sprawl and fragm



mented green spaces

THE GUADALUPE RIVER AND SAN JOSÉ

URBAN HEAT ISLAND studies indicate that downtown San José experiences temperatures that are 5°F to 7°F higher than those of surrounding rural areas. During the summer months alone, the average monthly temperature for San José has increased 1°F to 3°F over the past 50 years. The term "urban heat island" describes the way that urban development tends to raise temperatures over pre-development levels. The increase happens for a number of reasons — for example, changes in albedo (the color and light reflectivity of surfaces, such as asphalt and roofing materials), the loss of water due to paving and drainage systems and the removal of plants that can help create shade and modulate temperature.

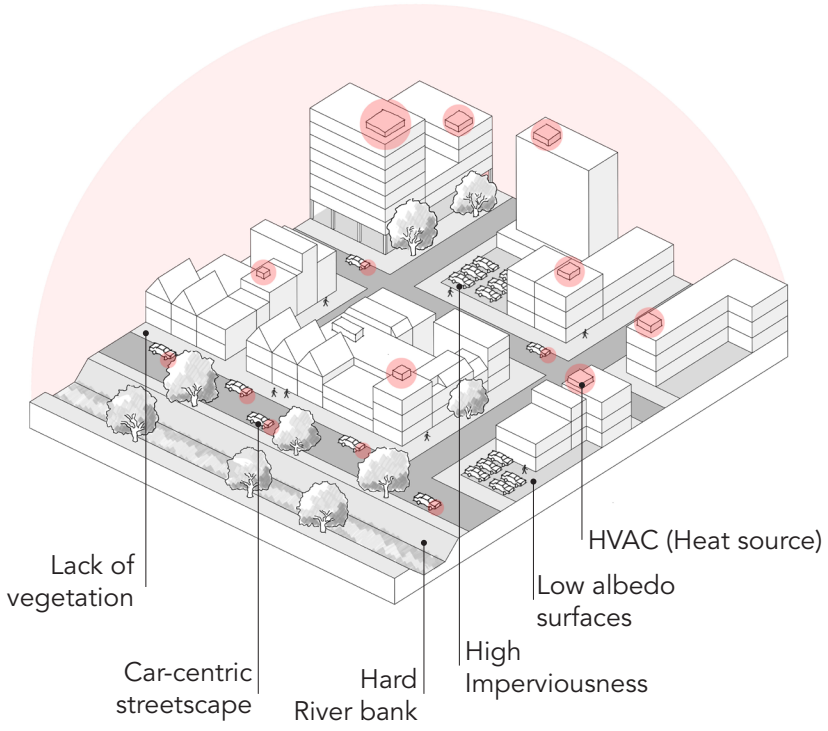
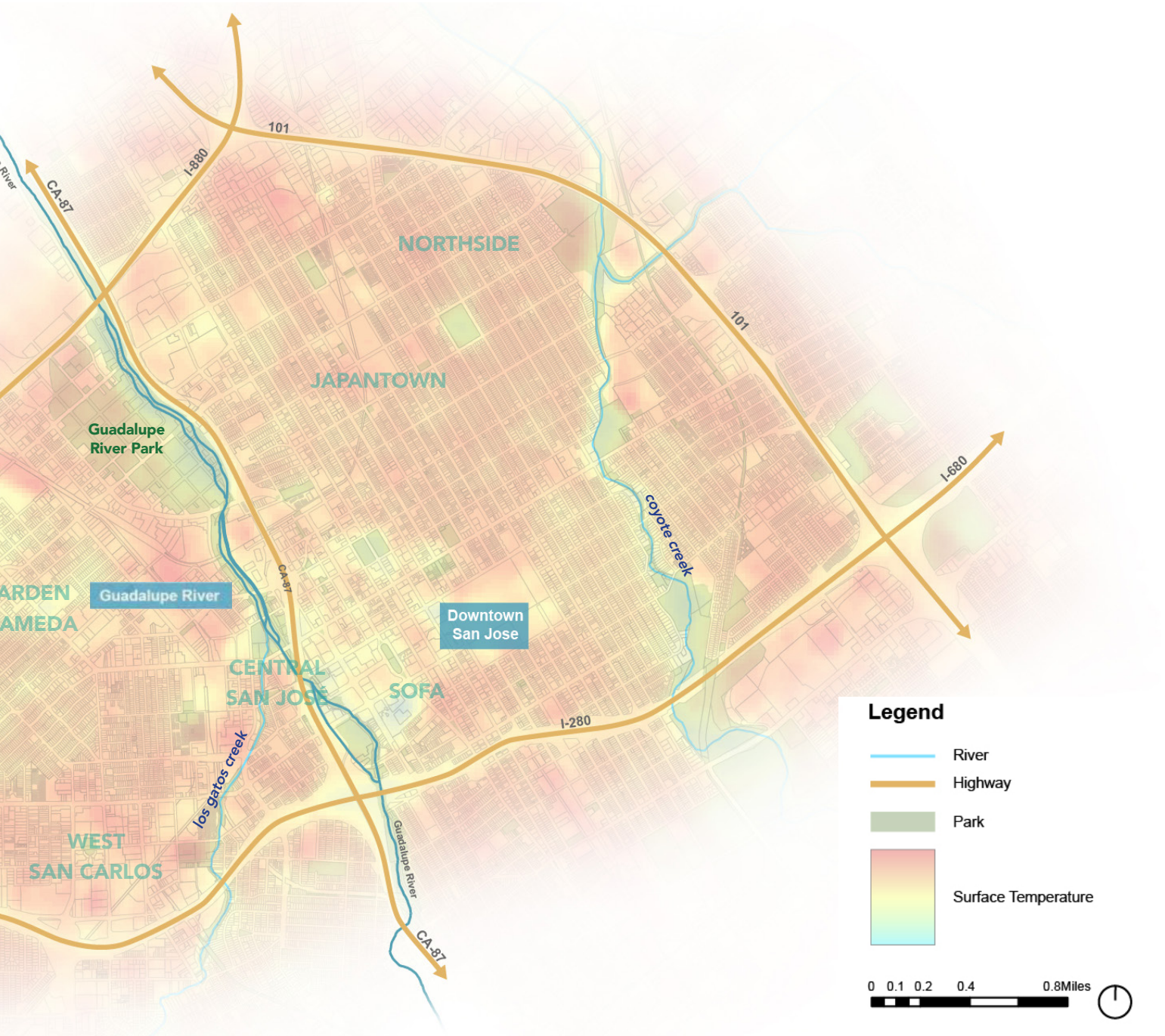


Figure 6: Anatomy of an urban heat island

Figure 7: Surface temperatures throughout San José


101
I-880
CA-87
NORTHSIDE
JAPANTOWN
Guadalupe
River Park
Guadalupe River
coyote creek
I-680
Downtown
San Jose
CENTRAL
SAN JOSE
SOFA
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los gatos creek
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SAN CARLOS
Guadalupe River
Legend
River
Highway
Park
Surface Temperature
0 0.1 0.2 0.4 0.8Miles

THE GUADALUPE RIVER AT THE CENTER OF A BLUE-GREEN SAN

A "blue-green San José" would work toward mimicking a more naturally oriented water cycle, with the Guadalupe River at the center, benefiting the city via integrated water management. This approach would provide resilient and adaptive measures to manage flood events and integrate a healthy river and green infrastructure elsewhere in the city.

Because rivers and streams are dynamic systems in their natural setting, they continuously change their form and function. In highly urbanized environments such as San Jose, the stream course is confined, defined and controlled, giving the river limited access to its floodplain and little or no room to respond to changes in the watershed.

OPPORTUNITIES IN OPEN SPACE

Developed areas throughout San José offer limited potential for adding new green space. Several proposed building projects downtown are exploring green infrastructure solutions as part of redevelopment efforts. The Mayor's Green Vision Objective focuses on expanding San José's urban canopy by planting 100,000 new trees by 2022, with the intent to develop a citywide street tree management plan.

Underutilized land, from unbuildable lots to rights-of-way and roadway medians, can play an important role in addressing stormwater and hydrology. When aggregated, these parcels amount to a substantial opportunity for managing stormwater runoff that would otherwise be discharged directly into the Guadalupe River. These areas can expand the functional riparian corridor, increasing habitat and public access while tackling climate challenges.

Capturing stormwater and putting it in the ground (a process called "infiltration") can absorb flooding in the winter and increase the availability of cold, clean subsurface water in the summer, when it's needed the most by wildlife. To enhance this effect even when there is little rainfall (i.e., in the dry season), the city could augment water to this infiltration system if a reliable and inexpensive source of water were identified. In addition to collecting stormwater, underused land can support vegetation that cools the city, improves air quality, provides open-space continuity and enhances ecological vitality.

There are many such parcels near the Guadalupe River Park and river corridor in downtown San José that the city could utilize to create a mosaic of green infrastructure. An array of coordinated solutions would allow soil and vegetation to capture and clean stormwater runoff before being discharged into the river.

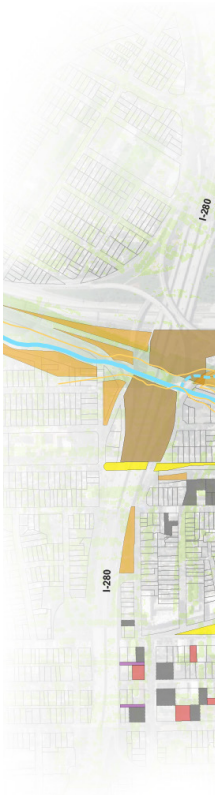


Figure 8: Open sp

JOSÉ

Strategies such as bioswales, tree wells, and rain gardens would slow surface runoff. These spaces would also provide shade and evapotranspiration, decreasing peak surface temperatures. And the improvements in water quality would likely spur recreational and educational opportunities along the river, including creek clean-ups, outdoor educational walks and even kayaking in the river during appropriate seasons.

Creating a robust blue-green district centered around the Guadalupe River Park would highlight the significance and value of San José's natural river system.

paces for opportunity along the Guadalupe River and in downtown San José

THE GUADALUPE RIVER AT THE CENTER TOWARDS A BLUE-GREE

BENEFITS

Riparian corridors improve the natural function of a river, stabilizing adjacent soils from erosion, filtering surface discharge, and generating a microclimate that can enhance both habitat and human experience in an urban downtown. In the western United States, riparian areas comprise less than 1% of the land area, but they are among the most productive and valuable of natural resources by providing diverse habitat, mitigating floods and stabilizing stream channels and banks. In the Santa Clara Valley, riparian forest once lined the majority of permanently flowing streams, dissipating into the wetlands and willow sausals (groves) of tidal deltas at the bay's edge. The largely shade- and water-dependent plants found in riparian forest provide abundant food and physical cover for a dense array of wildlife.

While riparian corridors comprise a rather small portion of the Guadalupe River project area, they can be considered a priority for a healthy, thriving Guadalupe River. In addition to providing critical habitat, they naturally help to filter water pollutants such as nutrients and sediment, support stable riverbanks and, when planted with trees, provide shade. The protection from the sun lowers water temperatures, supporting higher dissolved oxygen levels which are important to native fisheries.

EN SAN JOSÉ

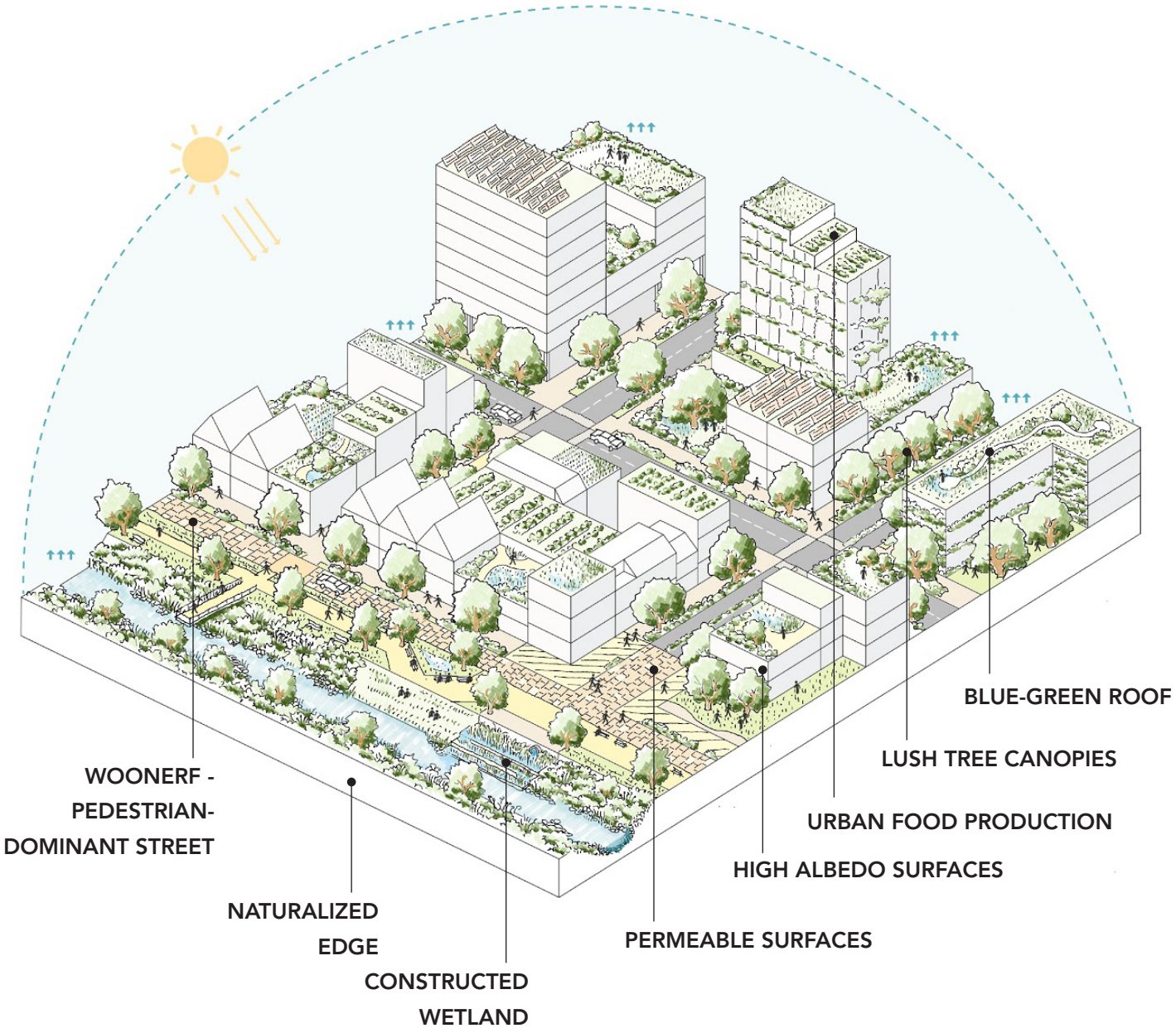


Figure 9: Integrated watershed management strategies

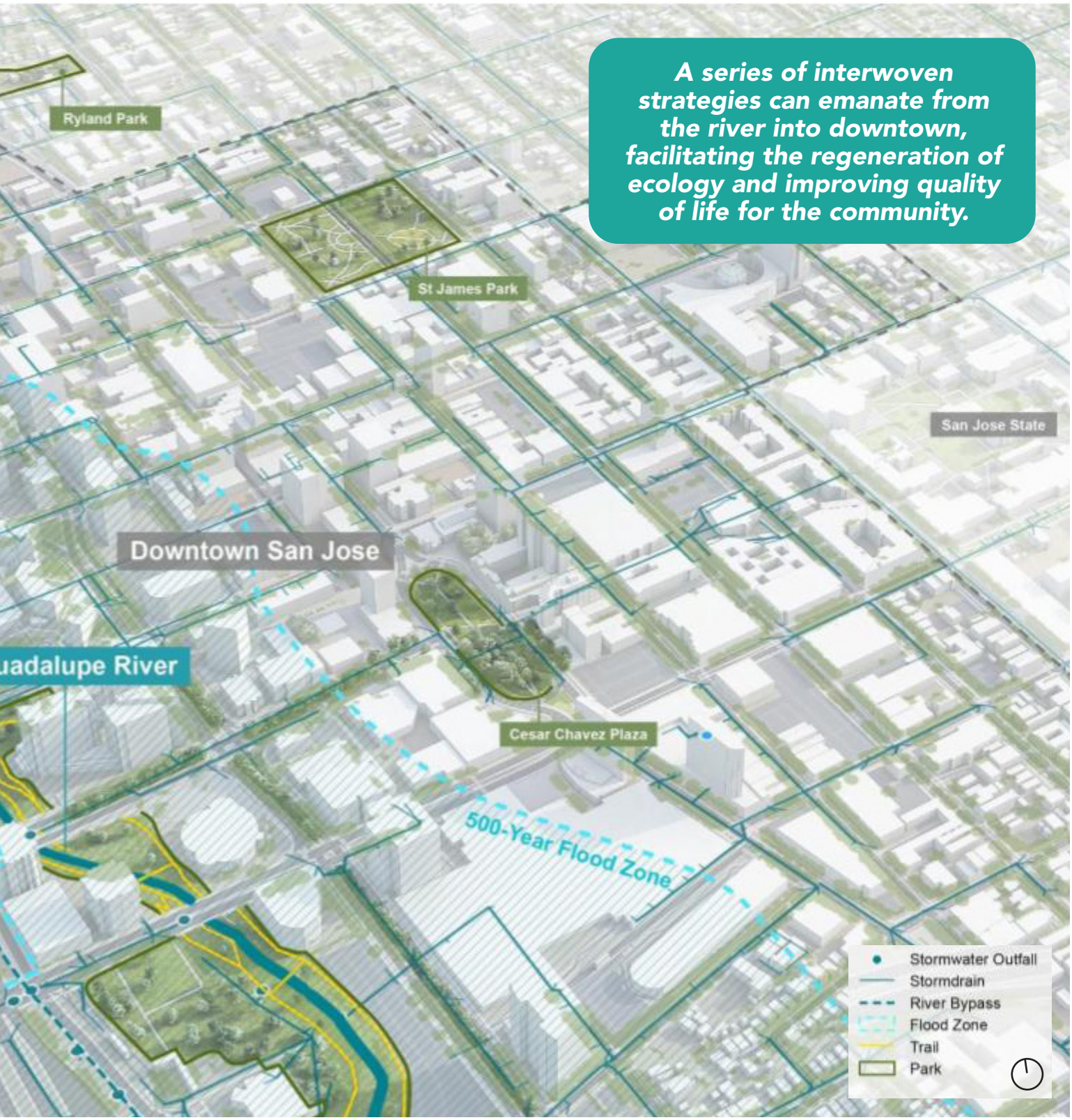
THE GUADALUPE RIVER AT THE CENTER TOWARDS A BLUE-GREE

This report is not intended as a design proposal, but offers a series of ideas for stakeholders to consider when developing site-specific designs in the future. An integrated tool kit of urban bluegreen strategies can leverage the river asset for infrastructure and social resilience.

While some of the strategies explored herein are both technical and aspirational (such as base flow augmentation and sewer mining), IWM strategies offer pragmatic solutions to improve water quality and water levels and support ecosystem vitality along the Guadalupe River. For example, sewer mining involves using locally treated wastewater to accommodate a range of localized needs for non-potable water demand, including the irrigation of urban vegetation. Base flow augmentation — which artificially manages flow volumes, especially during dry seasons — has been used in other locales to maintain stream flows that benefit key species such as steelhead trout, red-legged frogs and other sensitive aquatic species.

Figure 10: An aerial vision of a blue-green San José, starting w

EN SAN JOSÉ



ith the rewilding of the Guadalupe River

STRATEGIES

Innovative contemporary, ecological integration of pedestrian, ecological, and hydrological strategies can propel San José forward as a leader in urban environmental stewardship, but also reorient the city culturally around a thriving Guadalupe River.

This report focuses on some of the more tangible and visible strategies evaluated in the study.

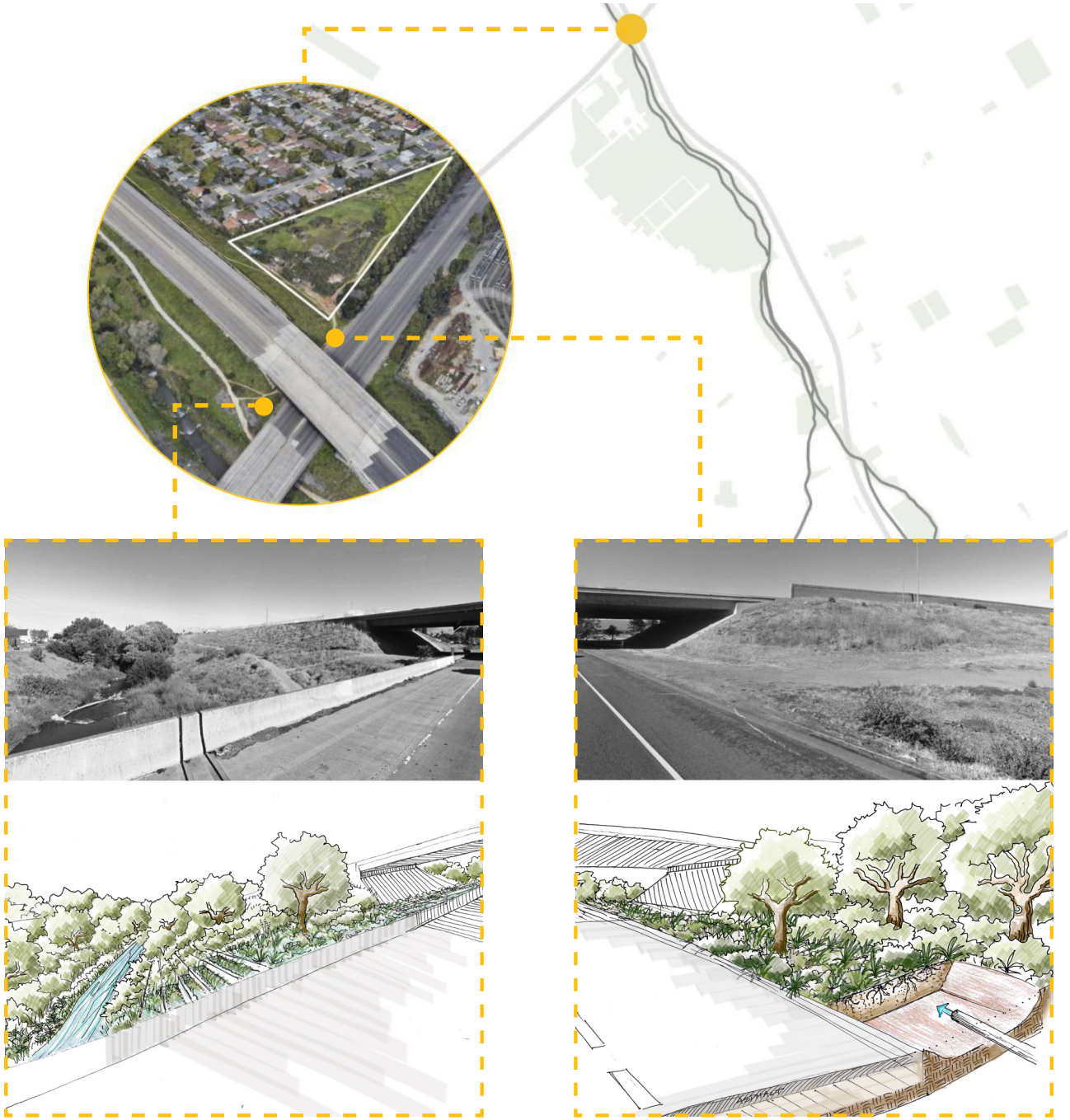
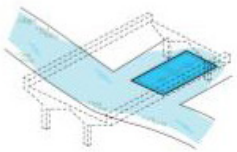
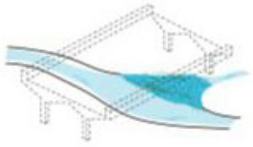


Figure 11: An underpass as a potential site for constructed wetlands and stream flow augmentation

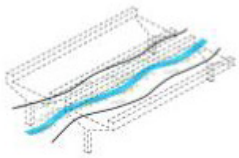
FLOOD MANAGEMENT



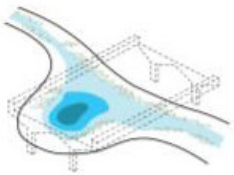
Floodable
Open Space



Constructed
Wetlands

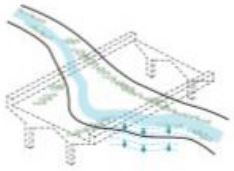


Stormwater
Conveyance

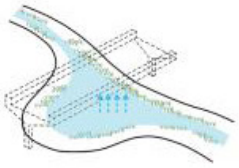


Stormwater
Detention

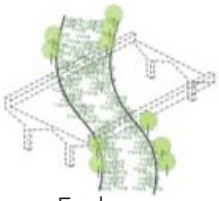
ECOLOGY



Groundwater
Replenishment



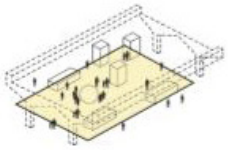
Evapotranspiration &
Cooling



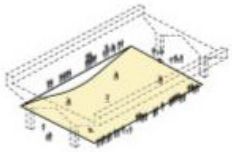
Ecology
Corridor

Canopy
Connectivity

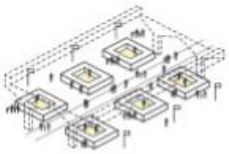
COMMUNITY & RECREATION



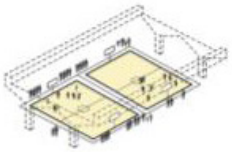
Gallery
Space



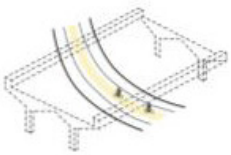
Skate
Park



Open-Air
Market



Playground



Bike Path

STRATEGIES

ENHANCING ECOLOGY

Enhancing riparian systems off-channel along the Guadalupe River might include modulating stream flow volumes to revitalize native flora and fauna along the river, providing a unique urban character and enhancing the city's natural resilience against climate change.

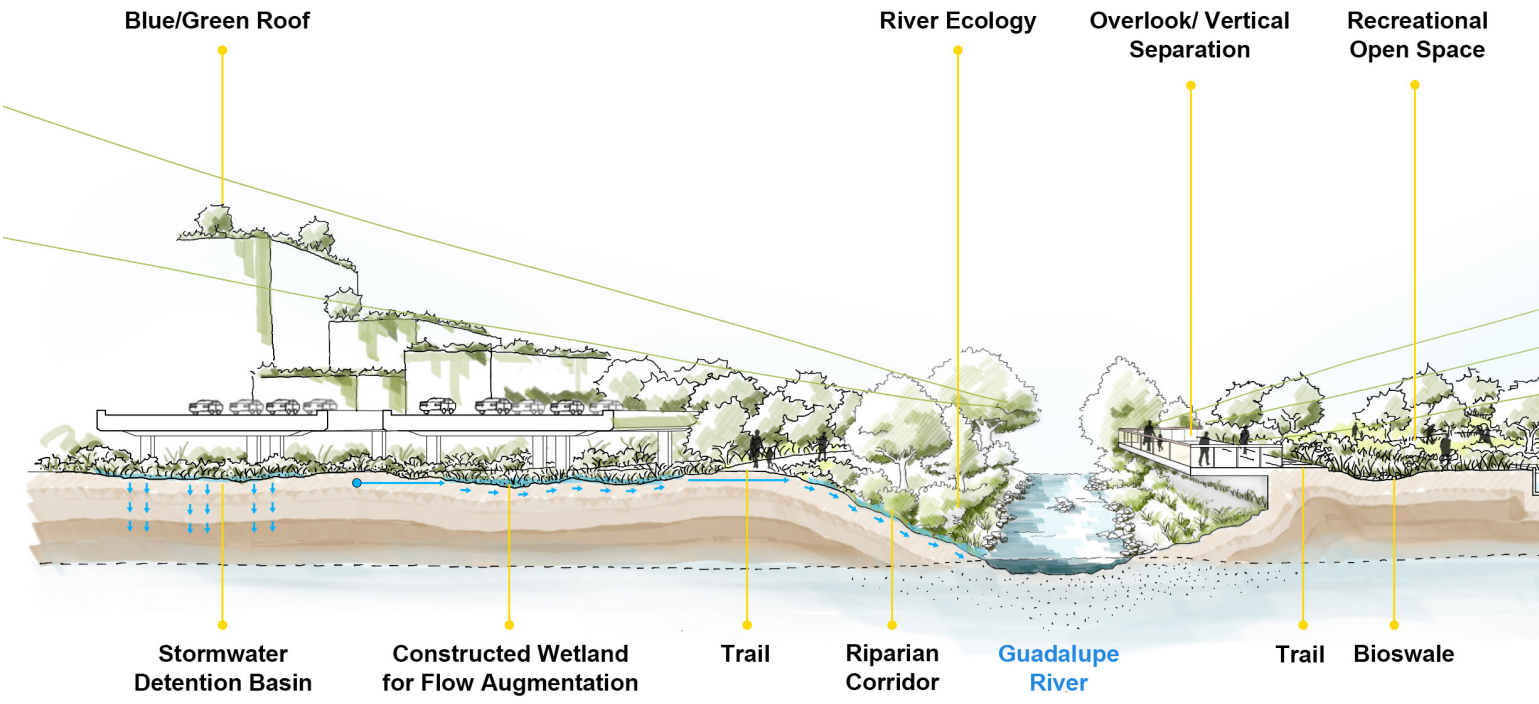
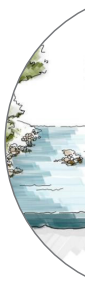


Figure 12: Envisioning a vegetated gradient from the Guadalupe River into downtown San José

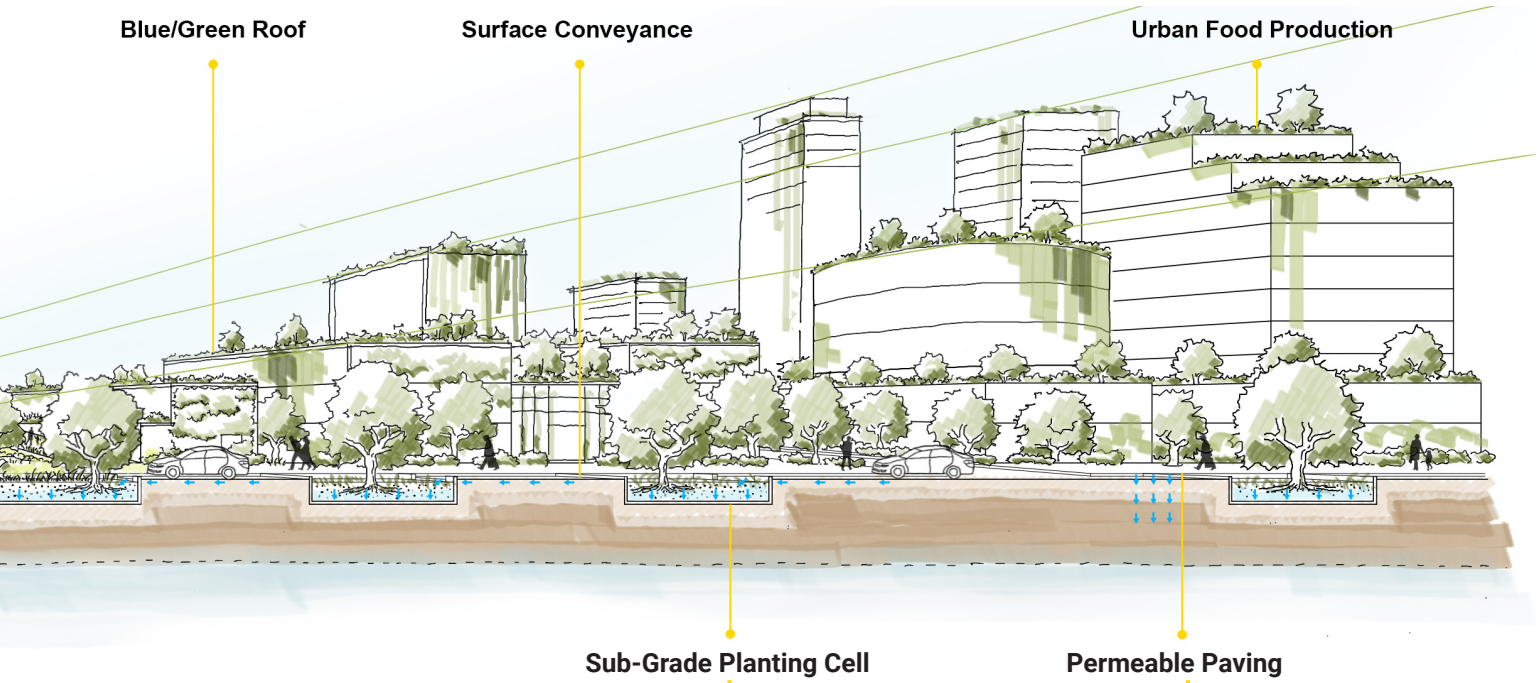
EXPANDING ON THE RIPARIAN CORRIDOR

Expanding vegetation outside the river's channel can allow San José to meet its tree planting goals while creating a connected natural network for use by pedestrians and stormwater systems. High water tables historically supported a complex variety of riparian vegetation; the natural function and process of native vegetation can be a valuable aspect of San Jose's infrastructure and urban experience.



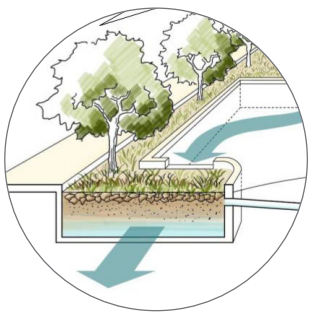
SHAPING A SPATIAL DYNAMIC BETWEEN COMMUNITY AND ECOLOGY

Creating recreational environments that are inviting to people of all backgrounds will improve the community's resources. To maintain the quality of the environment, it is important to identify areas where the needs of people and wildlife might conflict. Some natural areas might be designated for limited public access, and activity within the channel should be curated.



IMPROVING STORMWATER AND FLOOD MANAGEMENT

Introducing green stormwater infrastructure that reflects the Guadalupe River corridor in select streets of downtown San José can create opportunities to robustly address water-quality and seasonal flow issues.



STRATEGIES

STORMWATER AND FLOOD MANAGEMENT

As cities grow, impermeability increases as buildings and hardscape replace natural systems. Larger flood volumes result, alternating seasonally with decreased summer flows. As these conditions emerge, many cities — San José included — have attempted to restore urban hydrology using green-infrastructure initiatives. These strategies aim to retain stormwater, recharging local groundwater and reducing the rate at which runoff is discharged to rivers.

Green street and parking lots, rain gardens, vegetated roofs, disconnected downspouts, permeable pavements and soil amendment are tools to improve water capture and soil infiltration for individual properties.

Bioretention and subgrade soil systems have become common green-infrastructure practices nationwide. Runoff collected from streets can be directed into subgrade soils, to slow and treat runoff.

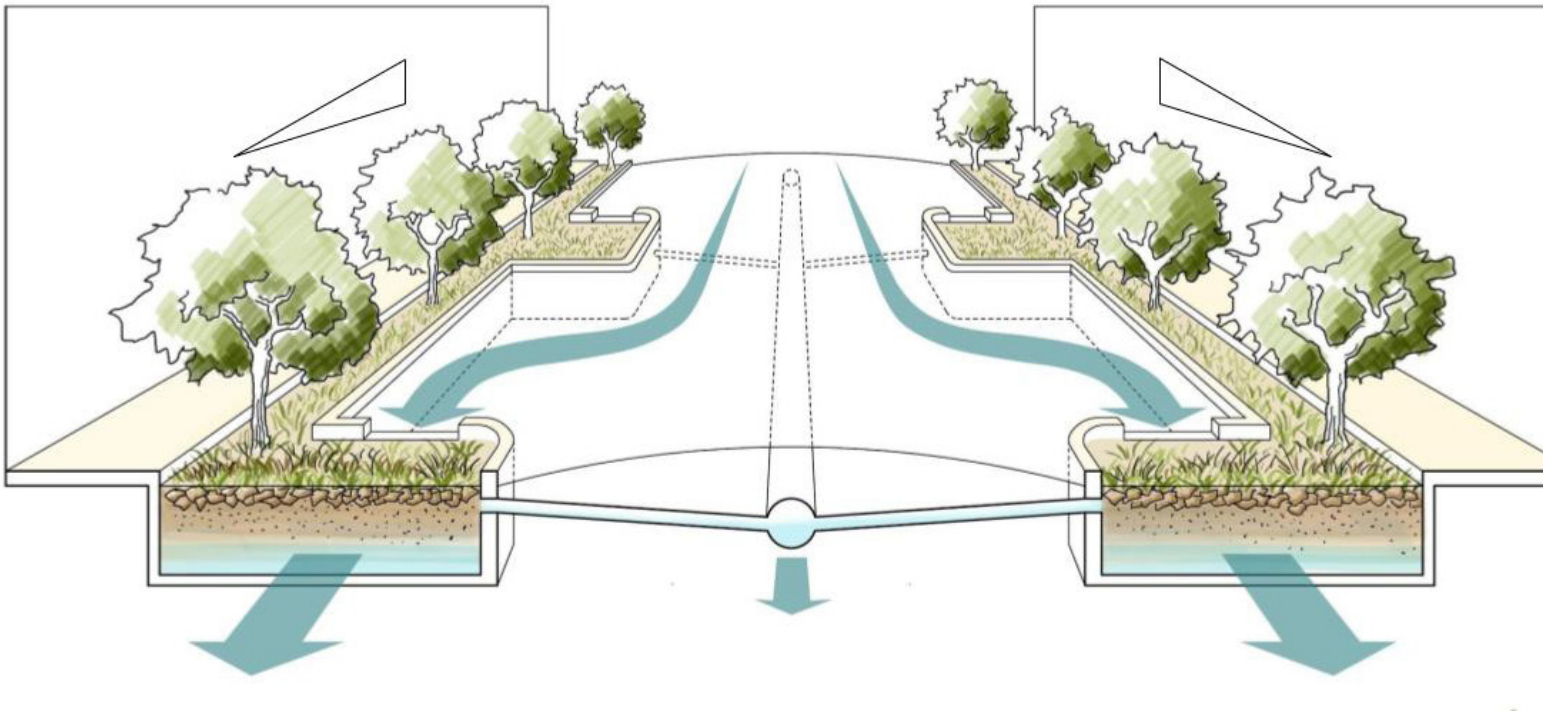


Figure 13: Sub-grade soil system for stormwater conveyance. Street tree planter soil volumes are interconnected, allowing for the continuous conveyance of captured stormwater for detention and cleaning.

Linking appropriate streets within the downtown to the river can extend the character and performance of the riparian corridor through bioretention (a process of removing contaminants from runoff) and low impact development (LID) practices (see Glossary for more details).

PRECEDENT: Greater New Orleans Urban Water Plan, New Orleans, LA

The Greater New Orleans Urban Water Plan is a resiliency study to develop sustainable strategies for managing the water resources of three parishes within Greater New Orleans. The plan provides a road map to manage flood and subsidence threats, create economic value and enhance quality of life for residents. It's designed to work in tandem with other water management, hurricane and flood protection systems, creating an additional line of defense. Intelligent retrofits and a new approach to stormwater and groundwater management will provide measurably higher levels of safety, reduce the rates at which the region is sinking and restore the identity of Greater New Orleans as a preeminent place rich in public assets, industry and innovation.

The hydrological strategy of the Greater New Orleans Urban Water Plan has two phrases:

1. **WHEN IT RAINS, SLOW AND STORE:** Stormwater moving fast is hard to manage. Holding it where it falls, slowing the flow of water across the landscape and storing large volumes of rainfall for infiltration in the ground and other uses are fundamental to managing stormwater. The plan calls for pump stations to be activated when necessary, rather than as a default every time it rains.

2. **WHEN IT'S DRY, CIRCULATE AND RECHARGE:** Surface waters and groundwater move naturally across every delta. Incorporating surface water and higher water levels into everyday water management improves groundwater balance, water quality and the region's ecological health.

STRATEGIES

The Guadalupe River suffers from reduced summer flow rates. Impervious surfaces and piped stormwater alter surface hydrology, increasing winter high flows and decreasing groundwater infiltration and associated dry season flows. This can impact aquatic species, particularly steelhead and other salmonids sensitive to water temperature and oxygen levels. Augmenting flow volume in the dry season ("base flow augmentation") can also help to maintain habitat and improve summer survival. Few resources are available during summer months; restoring summer base flows would most likely require recycled water, nuisance ground water, and/or successfully stabilizing groundwater levels seasonally.

SEWER MINING & POINT-OF-USE RECYCLING

Perhaps the most consistently available source of water to augment dry-season river flows is recycled water. One alternative is sewer mining and point-of-use water recycling, in which municipal wastewater is extracted from a sewer line and treated on-site to meet a range of local needs for non-potable demands. Consistent with some regional long term water infrastructure plans, such "satellite" plants can provide an effective strategy for combating water scarcity and help optimize the watershed. This has been successfully done as pilot projects in other watersheds, notably in the Pacific Northwest, and requires advanced treatment.

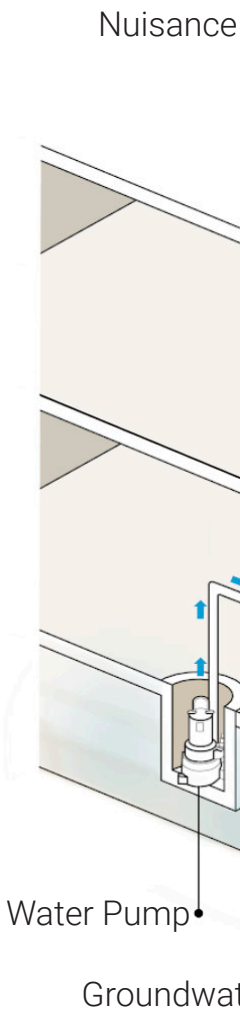
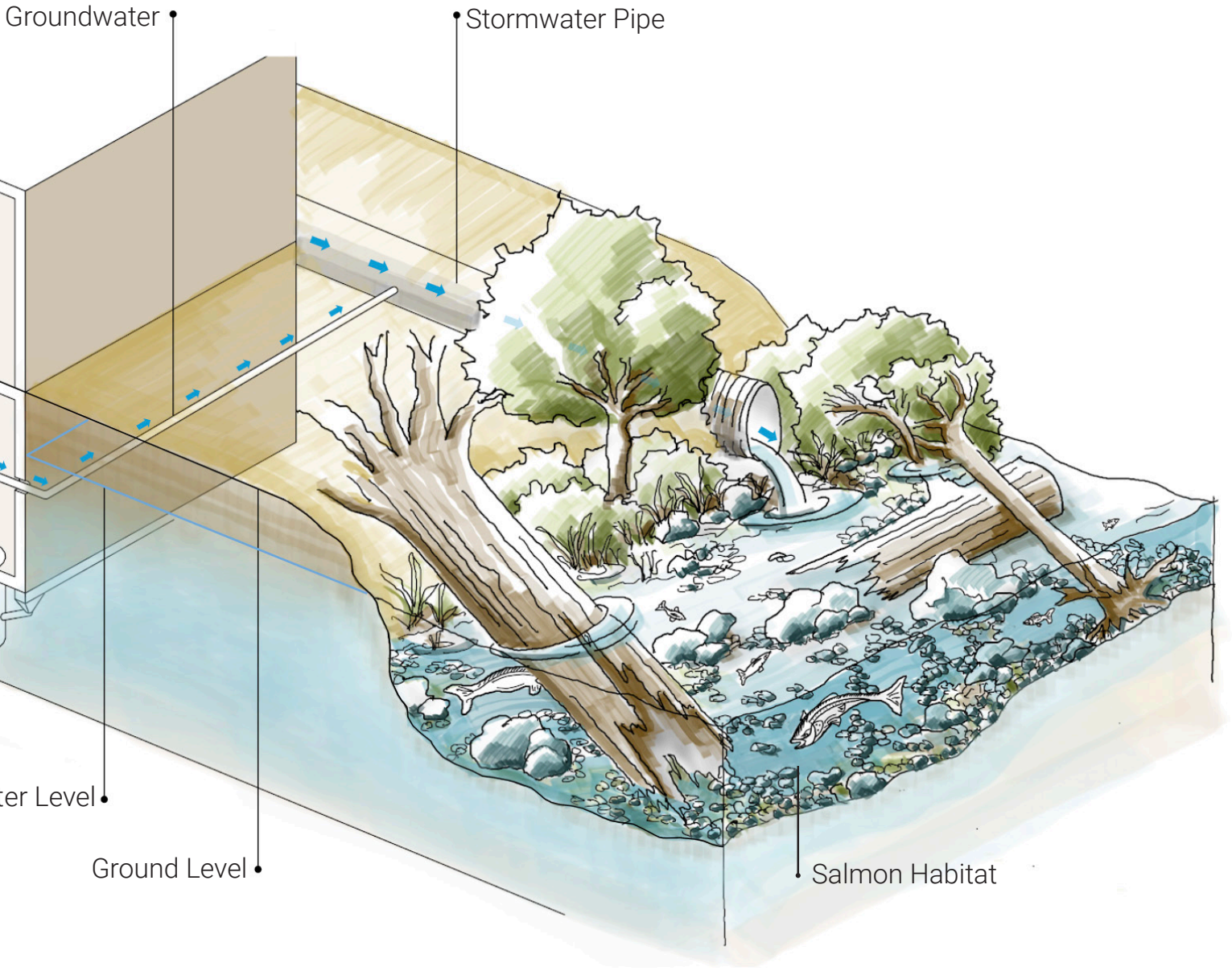


Figure 14: Nuisance gr



oundwater being treated and discharged into the Guadalupe River to help create habitats for marine life.

STRATEGIES

HIGH PERFORMANCE LANSCAPES

Constructed wetland treatment systems along the periphery of the river can provide "polishing" functions for stormwater and recycled water, introduced to improve water quality and rehydrate off-channel landscapes within the city. As the recycled water passes through different engineered filtration beds, trace pollutants are removed by chemical, physical and microbial processes. In addition, as the water travels horizontally through subsoil, target temperatures can be achieved to benefit the receiving stream via infiltration. This approach should only be considered where shallow groundwater recharges stream flows, and is not connected to water supply aquifers.

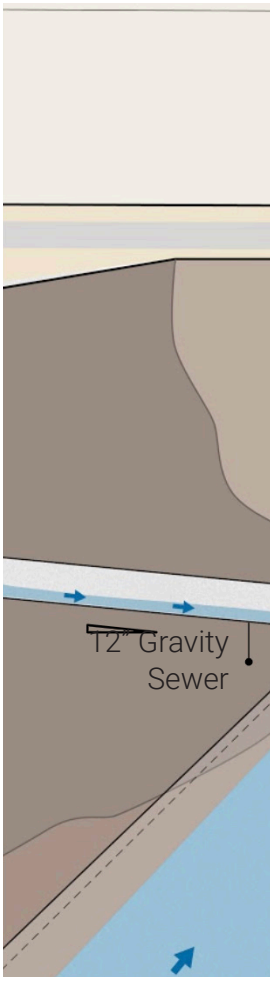
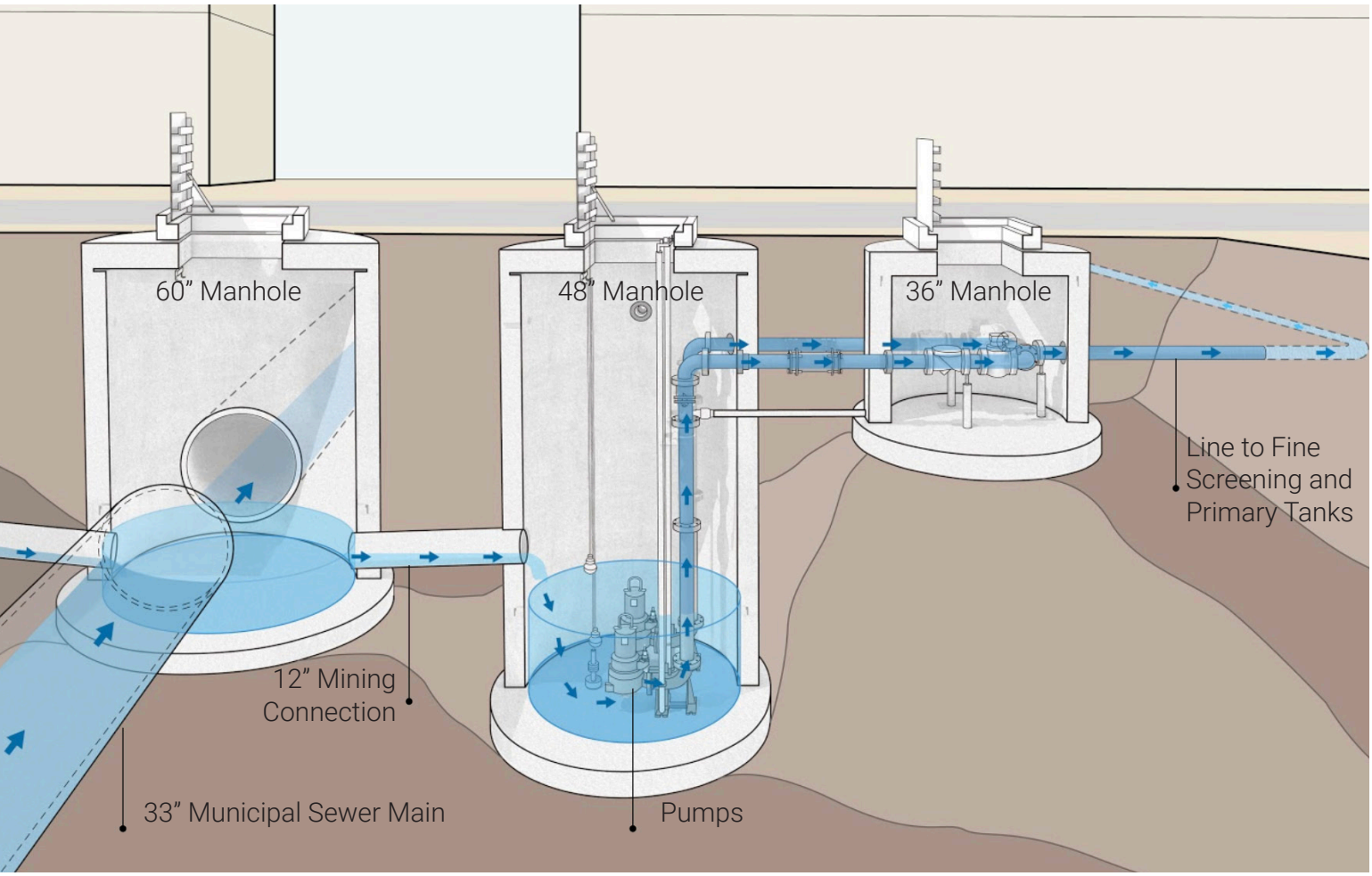


Figure 15: Tapping into



o sewer mining to maintain stream volumes and flow rates

STRATEGIES

ENHANCING THE RIVER ECOLOGY

Riparian areas have drawn human beings for millennia due to their abundant resources and comfortable microclimate. As dumping sites, ad hoc sewers, armored flood channels and sources of water for manufacturing, many rivers have become compromised by industrial and illicit use. The Guadalupe has weathered these impacts relatively well, with a battered but persistent aesthetic and a biodiverse remnant ecosystem. As a public amenity, the river as an asset has been estimated by some to be worth over $1 billion in value, primarily in infrastructure and real estate appreciation.

In recent decades, many cities have gone to great lengths to bring back natural river processes and to draw people back to riverfronts for recreation and other amenities. These projects take place in a variety of settings, ranging from flood management in highly urbanized environments to natural areas and parks that focus on habitat for wildlife.

A riparian approach to management prioritizes protection of existing intact natural areas to maintain patches of functionality and provide a foundational framework. The restoration of altered or degraded areas can follow, building on the existing fabric, with priority given to projects with the highest potential to provide cost-effective benefits for low effort. Over time, larger and more challenging projects can be identified and prioritized by the community.

The upper watershed is an important factor that cannot be overlooked. Upstream management can significantly alter the magnitude and timing of the river's flow, the production of sediment and the quality of water arriving at a downslope riparian area.

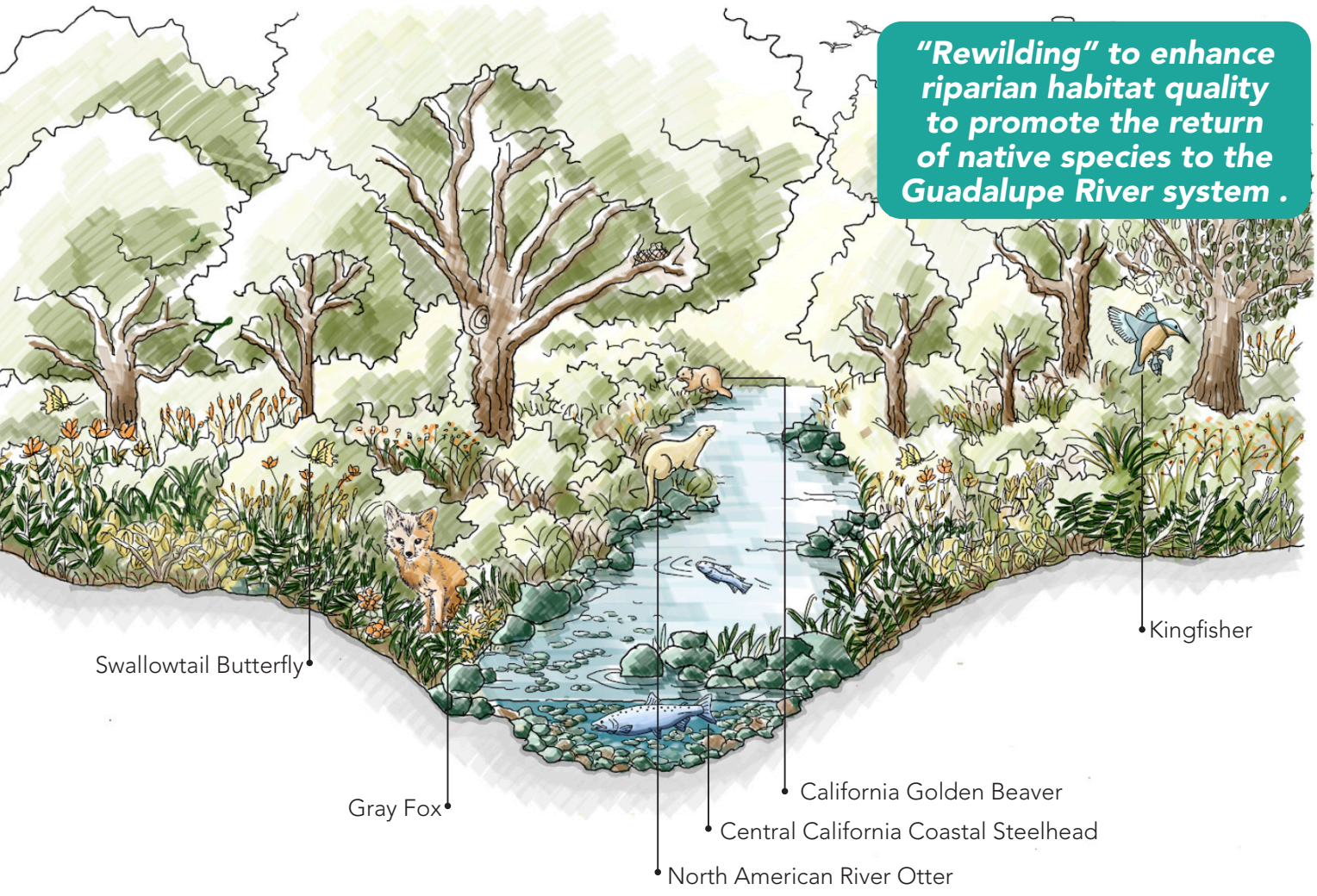
Good riparian ecosystem management is a valuable component of good watershed management, and by definition much of this system is outside the channel. A holistic approach to watershed management should result in development that takes river dynamics into account during both design and construction phases, within and outside of the channel. For further discussion of policies that may impact rewilding, upslope management and watershed approach, see the Appendix.

PRECEDENT: Four Riverbanks, Chicago, IL

In Chicago, the nonprofit Urban Rivers manages The Wild Mile project, which is transforming the man-made, steel-walled North Branch Canal of the Chicago River into a

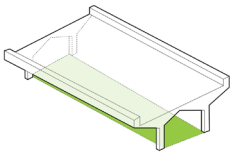
Figure 1

haven for wildlife. A few small sections are already complete, and by 2020, the canal will have wetlands, forest, walkways and kayak access points. The crux of the initiative is the creation of faux riverbanks made of coconut-fiber beds anchored to the channel. The root systems reach into the water to filter and break down pollutants in this neglected section of the canal and provide a habitat for mussels, birds and other species.

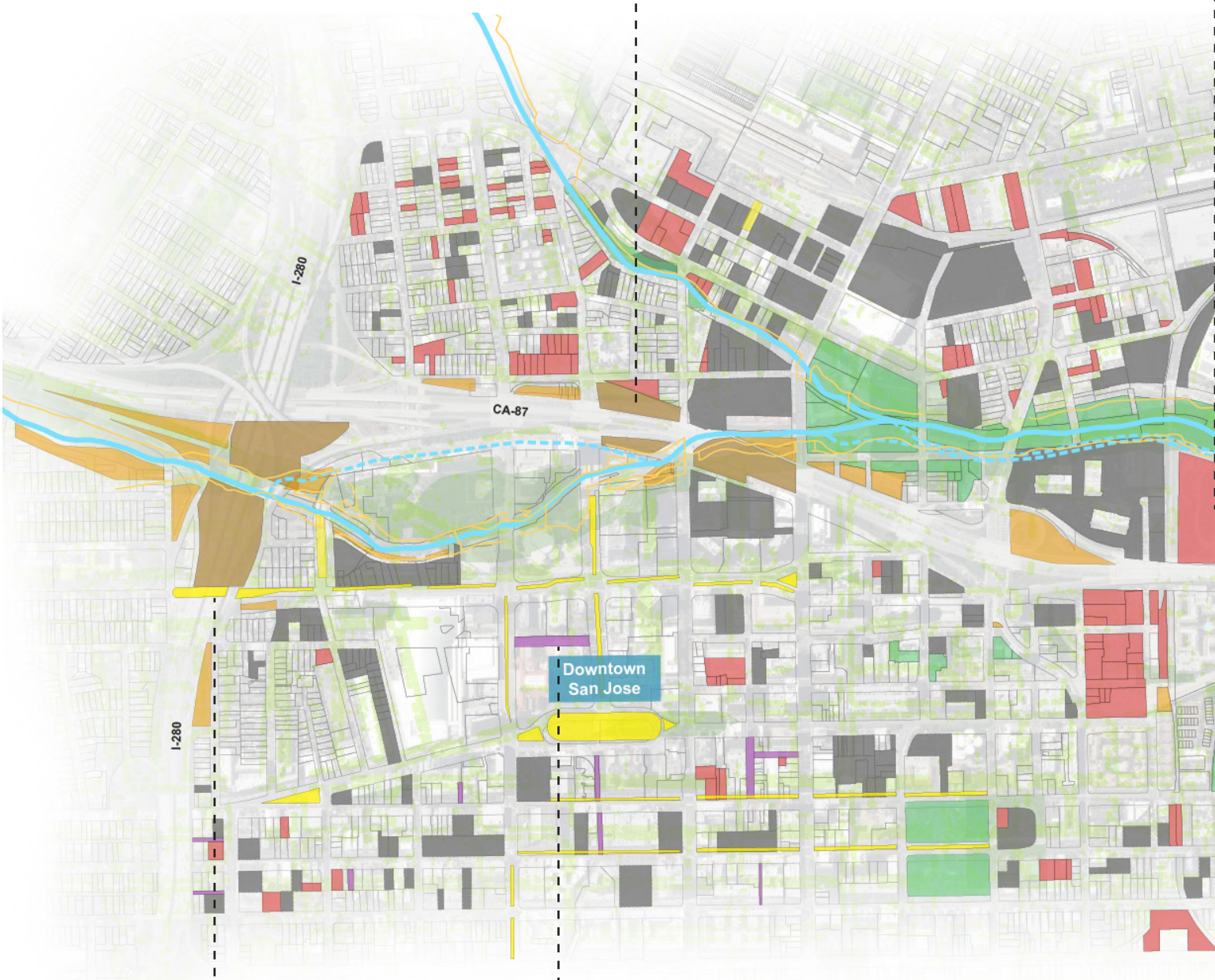


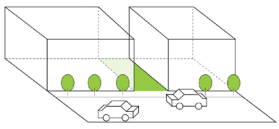
6: Imagining a "rewilded" Guadalupe River

STRATEGIES

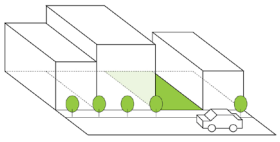


UNDERPASSES
6 lots
23.9 acres

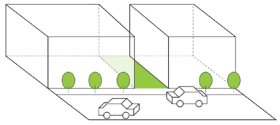




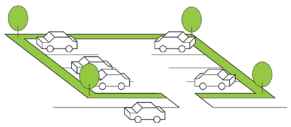
ROADWAY MEDIANS
29 lots
15.57 acres



ALLEYS
11 lots
3.58 acres

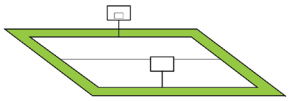


UNDERDEVELOPED LOTS
140 lots
59.28 acres



PARKING LOTS
244 lots
173.07 acres

INTERSTITIAL GREEN SPACES
32 lots
26.59 acres



RECREATIONAL GREEN SPACES
36 lots
54.55 acres

STRATEGIES

STRATEGY MATRIX

This matrix qualitatively lays out the capital, operations, and maintenance costs for a variety of strategies. In addition, it evaluates the difficulty of factors such as permitting, engineering, ease of construction, funding and environmental mitigation.

	STRATEGIES	COST UNIT	CA C
	FLOOD MITIGATION		
PRIORITY 1	**Adaptive Channel Management**	River Mile Treated	
PRIORITY 2	**Earthen Berm / Levee**	River Mile Treated	
	Floodway Enhancement / Widening	River Mile Treated	
PRIORITY 3	**Buildings on Podium**	River Mile Treated	ME
	Floodwalls (Static)	River Mile Treated	
	Floodwalls (Deployable)	River Mile Treated	
	Elevated Roadway / Berm	River Mile Treated	
	ECOLOGICAL ENHANCEMENT		
PRIORITY 1	**G.I. Conveyance: Bioswale / Tree Well**	Acres Treated	
	G.I. Capture & Detention: Bioswale / Tree Well	Acres Treated	
	Green Streets / Green Parking Lots	Acres Treated	ME
	Base Flow Augmentation: Collected Stormwater	Cubic CFS Increase	MI
PRIORITY 2	**Expanding Riparian Corridor**	Acres Treated	MI
	Base Flow Augmentation: Nuisance Groundwater	Cubic CFS Increase	MI
PRIORITY 3	**Base Flow Augmentation: Recycled Water**	Cubic CFS Increase	

APITAL COST	OPERATIONS & MAINTENANCE COST	COMPLEXITY *Planning /engineering /environmental analysis / permitting / ease of construction / community support*	FUNDING MECHANISM *Public / Public Private / Private*	ENVIRONMENTAL MITIGATION
LOW	MEDIUM	MEDIUM	Public	LOW
HIGH	LOW	MEDIUM-HIGH	Public - Built in Public ROW	HIGH
HIGH	LOW	HIGH	Public - Built in Public ROW	HIGH
EDIUM-HIGH	LOW	MEDIUM-HIGH	Public-Private / Private	LOW
HIGH	MEDIUM	HIGH	Public - Built in Public ROW	MEDIUM
HIGH	MEDIUM	MEDIUM-HIGH	Public - Built in Public ROW	LOW-MEDIUM
HIGH	LOW	MEDIUM-HIGH	Public - Built in Public ROW	MEDIUM
LOW	LOW	LOW-MEDIUM	All Three Sectors	LOW
LOW	LOW	LOW-MEDIUM	All Three Sectors	LOW
EDIUM-HIGH	LOW	MEDIUM	All Three Sectors	LOW
EDIUM	MEDIUM	LOW	All Three Sectors	LOW
EDIUM	LOW	MEDIUM	All Three Sectors	LOW
EDIUM	LOW	MEDIUM	All Three Sectors	LOW* **Dependent on groundwater quality*
HIGH	MEDIUM	HIGH	All Three Sectors	MEDIUM

MOVING FORWARD

SHAPING A SPATIAL DYNAMIC BETWEEN COMMUNITY AND ECOLOGY

The complete removal of people from the river is not only impractical but undesirable, and not likely to encourage residents to view the river as an asset and a resource. To enable habitat in an urban downtown, protected nodes along the river might be dedicated to ecosystem regeneration, accompanied by public access and social benefit programs that are based on local opportunities and constraints. This strategy should aim to maintain the economic and social value of the river and provide the public with access to the river corridor in a variety of ways, curated by policy and various stakeholders.

San José is experiencing a housing crisis that has left many people across the region homeless. Many have found refuge, including shelter and access to water, among local rivers and streams; this has introduced significant amounts of trash, biological waste and other impacts into natural systems. Encampments along the Guadalupe significantly impact the river's water quality and further challenge species that depend upon the already impaired stream. In addition to access and human interaction, it is crucial that the Guadalupe River be sufficiently buffered from human activity if species are to thrive and biodiversity is to be encouraged.

Figure 17: Visualizing an overlook along the Guadalupe River that creates a protective distance between people and wildlife habitat

Among successful precedent mitigations for human impact on rivers are programs curated by local agencies and nonprofits that focus on actively taking care of the river. Several cities across the United States have launched work pilot programs for unhoused people, and the Santa Clara County Creeks Coalition has hired people experiencing homelessness to help collect trash along the Guadalupe (see "Homeless Stewardship Programs" in the Appendix). Another effective program might be to recruit volunteer river stewards to participate in creek clean-ups and provide outdoor educational walks along portions of the river. In the long term, some river stewards might organize events and activities that invite people to the river, such as the Los Angeles River's permitted summer boating program.

Through programs led by local residents and organizations, the river can gradually be transformed into an equitably accessible resource for all residents of San Jose.

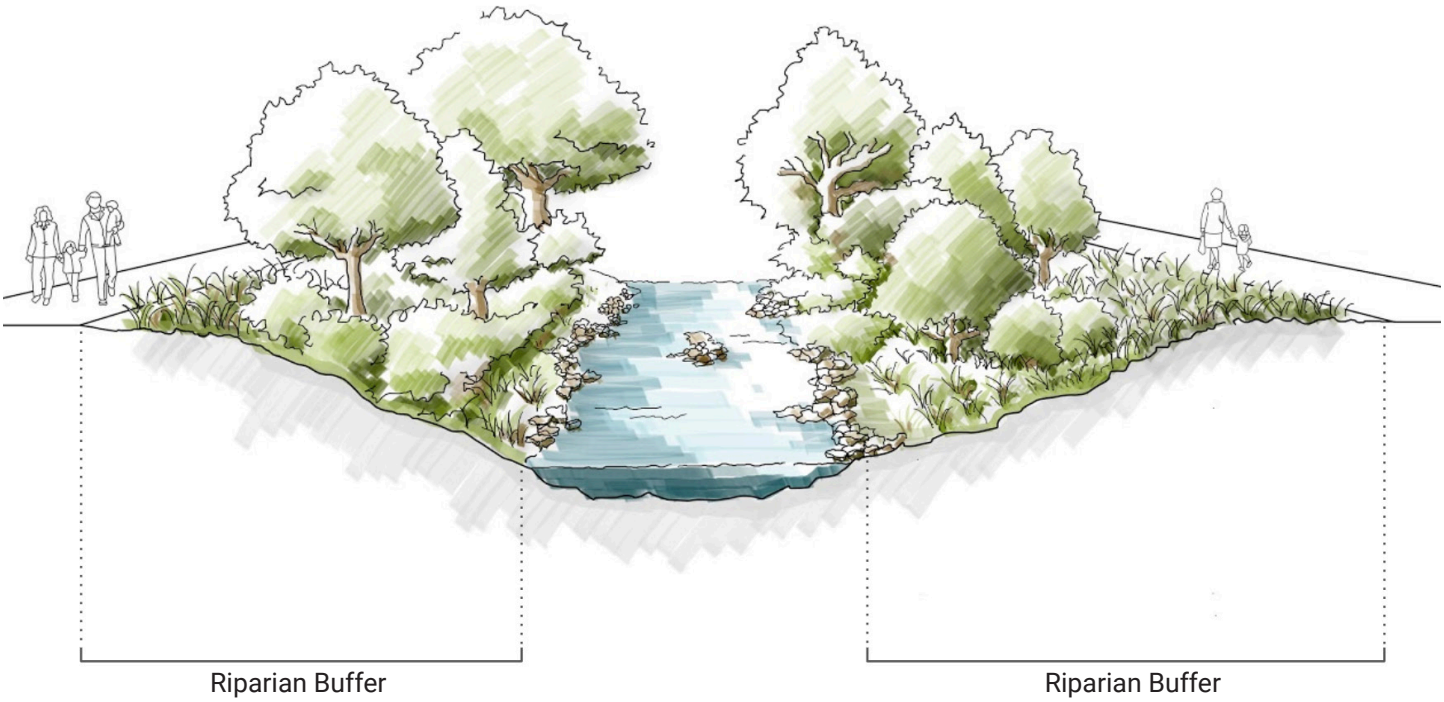


Figure 18: Visualizing riparian buffers along the Guadalupe River trail system that provide both access to nature and a barrier for the river ecosystem

MOVING FORWARD

PROPOSING A PHASED APPROACH

The strategy analysis matrix on page 38 helps lay out the relative costs for the strategies discussed thus far. In addition, it rates the difficulty in implementing the strategies due to factors such as permitting, engineering, ease of construction, funding, and environmental mitigation.

This analysis has identified three categories of strategies that represent the highest benefit, lowest cost approaches to make a significant impact if implemented in the next five to 10 years. All of these would help to mitigate water quality issues and diminishing ecological benefits of the Guadalupe River :

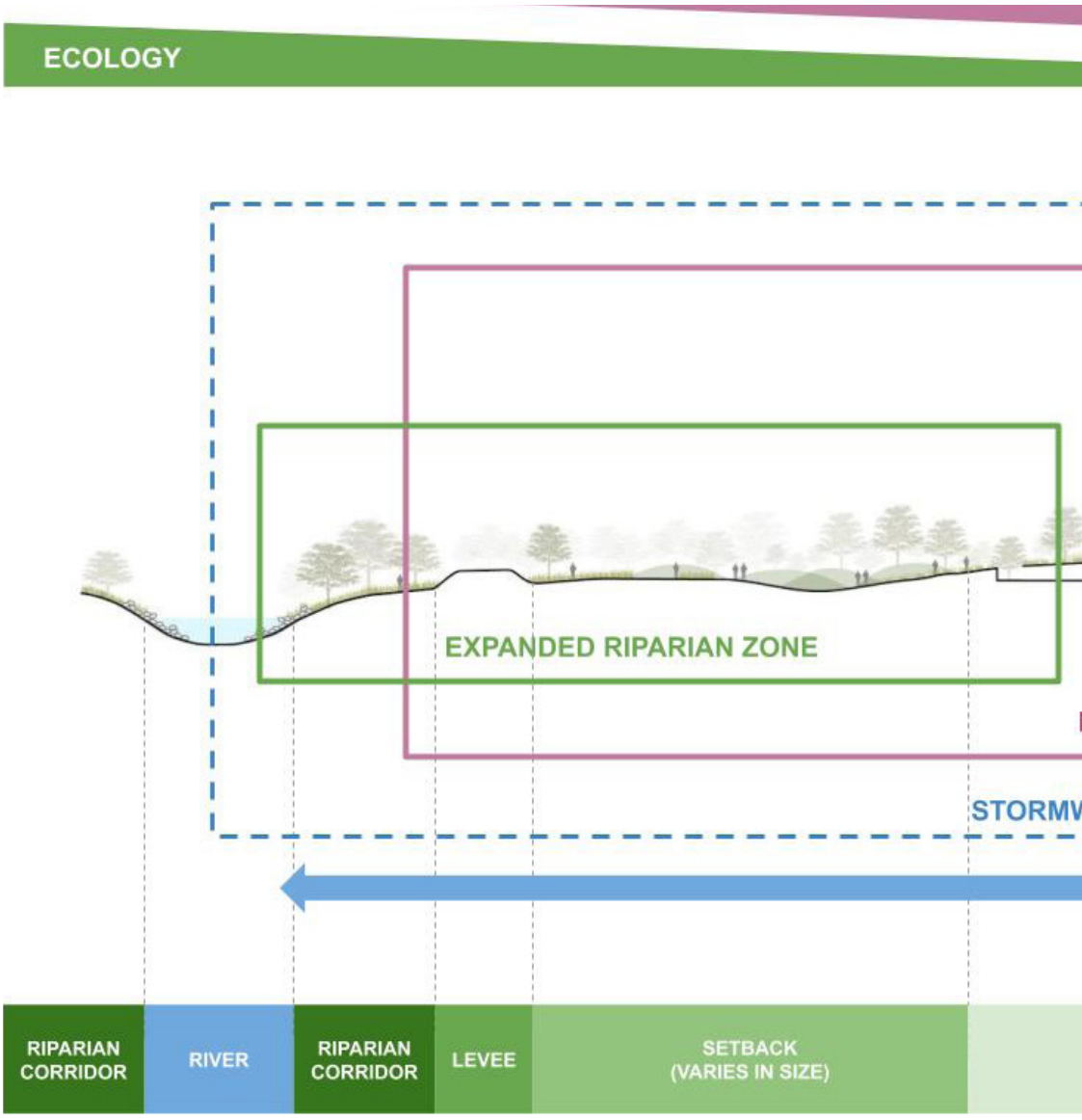
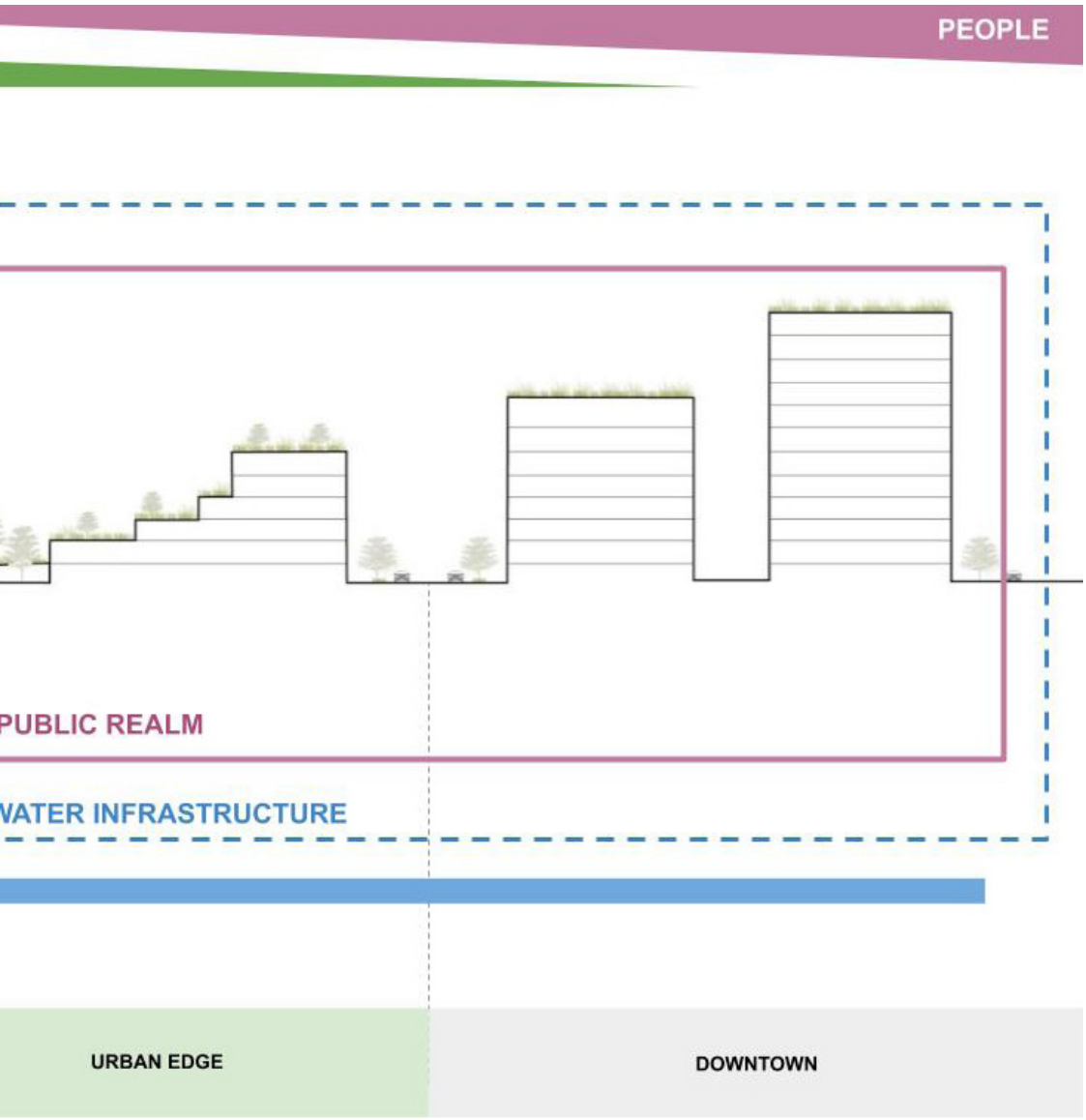


Figure 19: Striking a spatial balance between nature and the built environment can promote the Stormwater infrastructure is an essential feature that threads itself through this landscape, conv vegetation and architecture intermix.

• Green infrastructure (such as bioswales, tree wells and permeable parking lots) and stormwater conveyance along critical streets that run perpendicular to the Guadalupe River

• Naturalizing the river along downtown San José

• Base flow augmentation



e resilience of the river ecosystem while encouraging the community to enjoy park amenities.
eying water from downtown to the river. The "urban edge" is a blurred threshold where

CLOSING NOTES

The process of embracing natural ecosystems in San José's urban environment begins with the Guadalupe river corridor, but does not need to end there. The positive effects of rewilding along the Guadalupe River have the potential to radiate into downtown San José, shifting public perceptions of the river and the way people interact with it. These opportunities include an enhanced civic identity, deeper sense of place, improved infrastructure resilience to flooding and a more user friendly urban core.

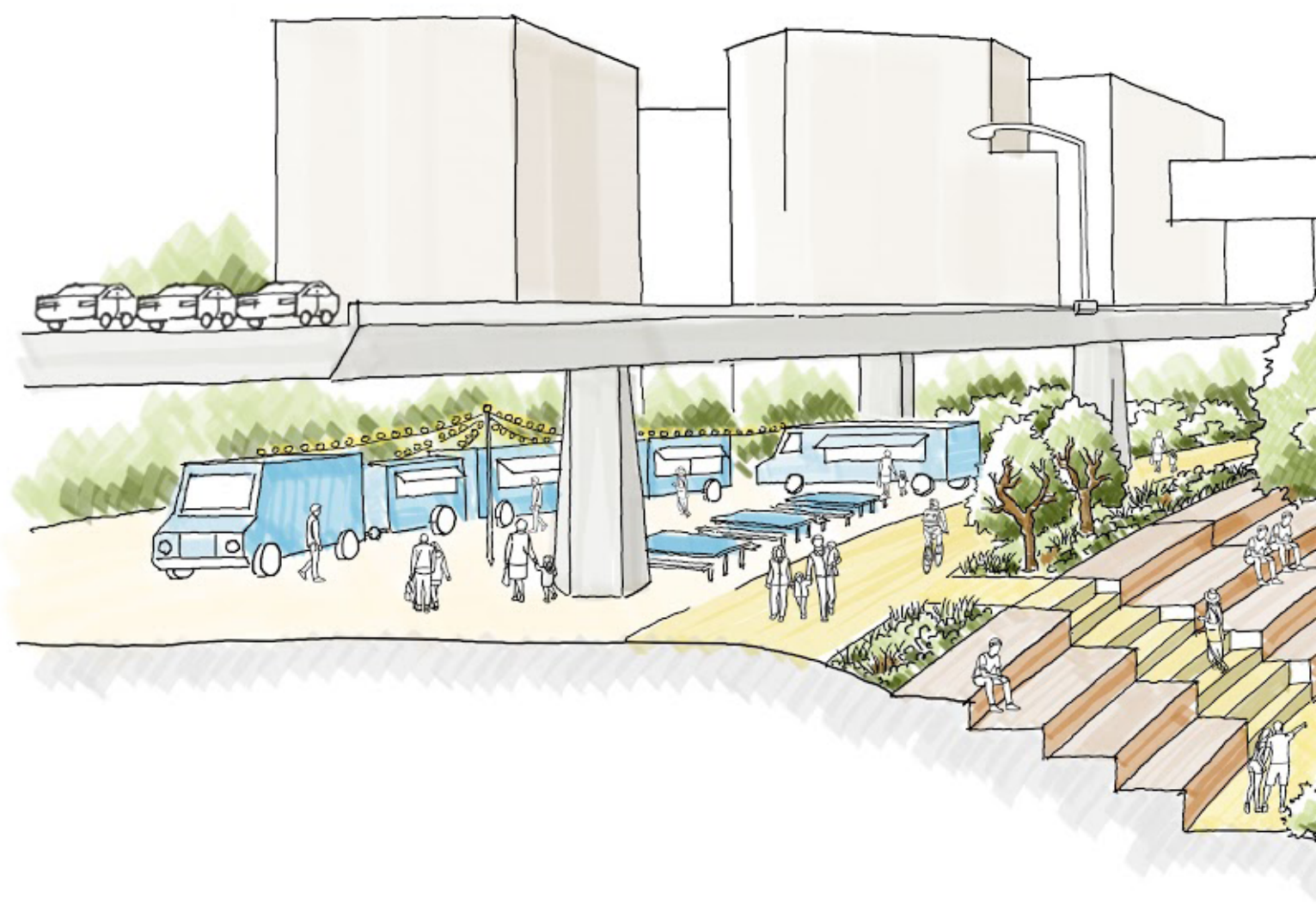
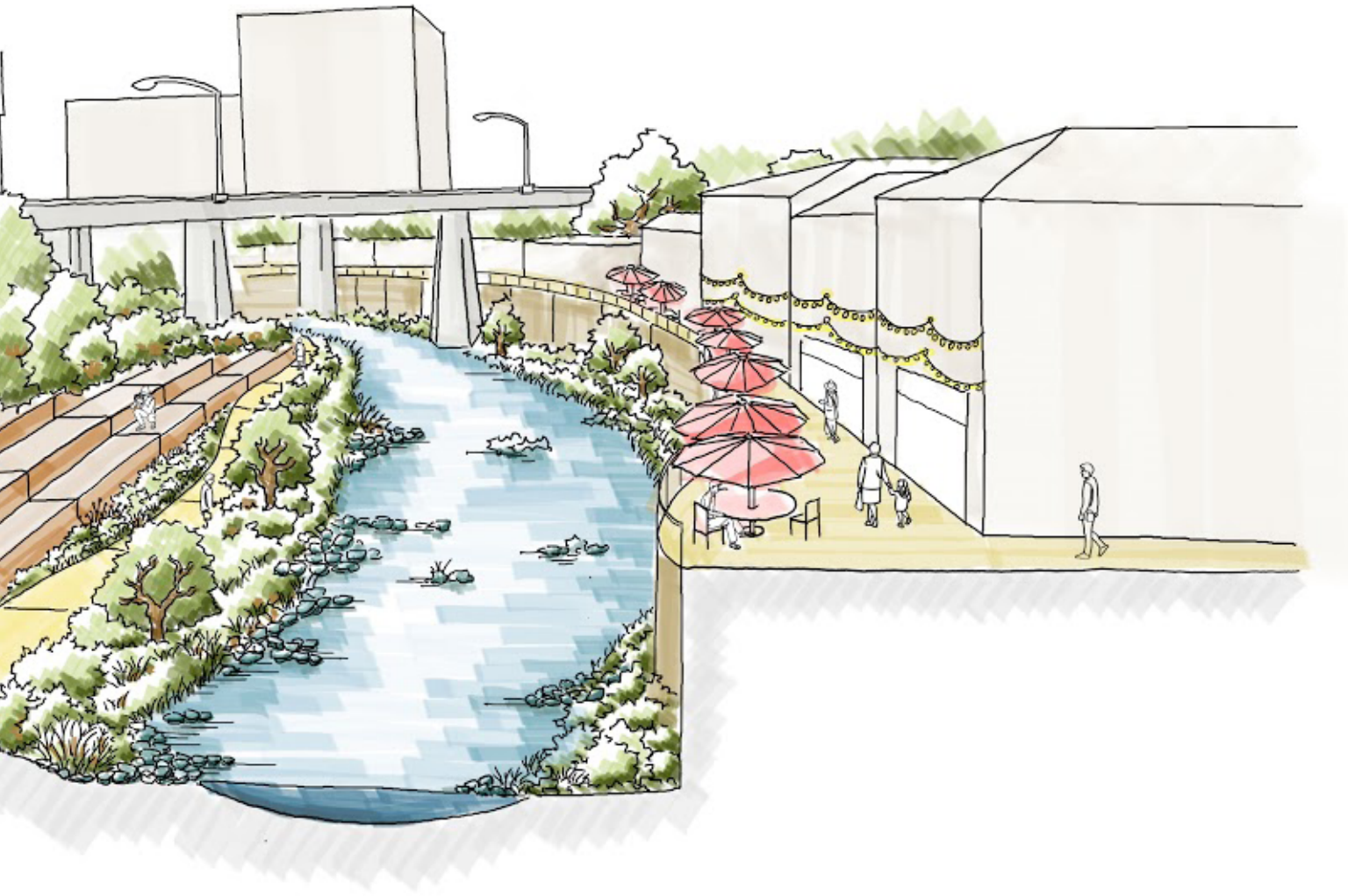


Figure 20: A vision of blue-green San José and its thriving Guadalupe River

Embracing the Guadalupe River and making the necessary investments to ensure it exists in its highest potential will require the participation of multiple stakeholders. Local agencies and stakeholders must develop and curate programs that proactively safeguard the river, while the community works to implement progressive and well-structured policy frameworks and programs that provide equitable access and ecological resilience. If this can be realized, the benefits are tremendous, both quantitatively and qualitatively.




EXIT
35

APPENDIX

APPENDIX

GLOSSARY

• **ADAPTIVE CHANNEL MANAGEMENT:** Adaptive channel management is a channel management approach that acknowledges how natural systems respond to human alterations by treating policies and management interventions in natural systems as experiments from which to learn.

• **ALBEDO:** The proportion of light or radiation that is reflected by a surface.

• **BASE FLOW AUGMENTATION:** Temporary storage of subsurface water during the wet season; during the dry season, the stored water is released to increase the magnitude of low flows.

• **BIODIVERSITY:** The variety of life in the world or in a particular habitat or ecosystem.

• **BIORETENTION:** The process that removes contaminants and sedimentation from stormwater runoff.

• **BIOSWALE:** A channel, or trench, built to receive stormwater runoff and planted with vegetation to slow and filter water.

• **BLUE-GREEN INFRASTRUCTURE:** a means to incorporate landscape, water design and management.

• **BUILDING ON PODIUM:** Podium buildings consist of single- or multi-story construction above grade, sitting on top of concrete podiums that may have parking levels below grade.

• **CHANNELIZATION:** An engineered alternation of a body of water to straighten, deepen or widen it.

• **CONSTRUCTED WETLAND:** An artificial wetland to treat municipal or industrial wastewater, greywater (wastewater from residences and office buildings) or stormwater runoff.

• **DISCONNECTED DOWNSPOUT:** A downspout that has been disconnected from a sewer pipe or turned away from a paved area and reconnected to a rain-collection barrel or redirected to drain onto a lawn or garden.

• **EARTHEN BERM:** A physical barrier made out of earth (soil)

• **ECOLOGY:** The totality of the relationships organisms have with one another and with their physical surroundings.

• **ECOSYSTEM:** A biological community of interacting organisms and their physical environment.

• **ENCAMPMENTS:** Temporary accommodations consisting of huts or tents, typically for residents of a city who do not have homes.

• **FLOODPLAIN:** Low-lying ground adjacent to a river that is subject to flooding.

• **FLOODWALL:** A wall built to prevent flooding in high-water conditions. A floodwall can be static (stationary) or deployable (removable).

• **FLOODWAY:** A channel designed to receive floodwaters of a river or stream to convey from upstream to downstream.

• **GREEN INFRASTRUCTURE:** Infrastructure that incorporates natural elements, with the aim of addressing urban and climate challenges; sometimes abbreviated as "GI."

• **GREEN STREET:** A stormwater management system that incorporates vegetation, soil, and other mitigation measures such as permeable pavement to reduce runoff.

• **GREY INFRASTRUCTURE:** Constructed structures that are often made of concrete, such as treatment facilities, sewer systems, stormwater systems or storage basins.

• **GROUNDWATER RECHARGE:** The process by which water enters the aquifer, as surface water from storms and other sources seeps underground.

APPENDIX

• **HARDSCAPE:** Hard landscape materials in the built environment, such as paths or walls.

• **HVAC:** Heating, ventilation and air conditioning.

• **HYDROLOGY:** The branch of science concerned with the properties of the earth's water.

• **IMPERVIOUS SURFACE:** A surface that allows little or no stormwater infiltration into the ground.

• **INFILTRATION:** The process by which water on the ground enters the soil.

• **LOW IMPACT DEVELOPMENT (LID):** Land planning and engineering design that manages stormwater runoff as part of green infrastructure. LID emphasizes conservation and use of on-site natural features to protect water quality.

• **NATIVE VEGETATION:** Flora (sometimes fauna) indigenous to a given area.

• **NUISANCE GROUNDWATER:** Groundwater in a shallow water table that contributes to nuisance leaking in basements; nuisance groundwater can be pumped out and distributed into local stormwater pipes to mitigate damage to buildings.

• **PERMEABLE PAVEMENT:** Any kind of paving surface that absorbs water or allows stormwater to infiltrate the ground through it.

• **RAIN GARDEN:** A sunken garden that can collect stormwater runoff, allowing it to soak into the ground.

• **RESILIENCE:** The capacity to recover quickly from difficulties.

• **RIGHT OF WAY:** Portion of land, usually publicly owned, that is used for transportation or infrastructure purposes.

• **SAUSAL:** A small orchard or group of trees, often along a wetland region; from the Spanish word *sausal*, meaning "willow grove."

• **SEWER MINING:** A process in which municipal wastewater is pumped from a trunk sewer and treated on-site to accommodate a range of local, non-potable water needs.

• **SOFT INFRASTRUCTURE:** Services required to maintain the economic, health, cultural, and social standards of a population, as opposed to the hard infrastructure such as roads, bridges etc.

• **SOIL AMENDMENT:** Material added to a soil to improve its ability to absorb and retain water.

• **STEWARDSHIP:** The job of supervising or taking care of something, such as an organization or property.

• **STORMWATER DETENTION:** An area where stormwater is temporarily stored, or detained, and is eventually allowed to drain slowly when water levels recede in the receiving channel.

• **STORMWATER MANAGEMENT:** The effort to reduce runoff of rainwater or melted snow into streets, lawns and other sites and to improve water quality.

• **STORMWATER RETENTION:** An area that holds or retains stormwater on a more permanent basis.

• **SUBGRADE SOIL SYSTEM:** Large engineered soil systems that exist below grade and incorporate structural supports to prevent compaction, designed to facilitate healthy tree root growth and to capture stormwater runoff.

• **SURFACE RUNOFF:** The flow of water occurring on the ground surface when excess rainwater, stormwater, meltwater or other sources can no longer rapidly infiltrate the soil.

• **THERMAL COMFORT:** Satisfaction with the temperature of the human body's immediate environment.

• **TREE WELL:** A circular area around the base of a tree that can help absorb and filter stormwater.

APPENDIX

• **TRIBUTARY:** A river or stream flowing into a larger river or lake.

• **URBAN CANOPY:** The layer of leaves, branches and stems of trees that cover the ground when viewed from above.

• **URBAN HEAT ISLAND:** An urbanized area that experiences higher temperatures than outlying areas due to human activity.

• **URBAN REWILDING:** Initiatives or programs that seek to encourage biodiversity, ecosystem function and the persistence of native species in a range of urban settings, including on private and public land. It is meant to be a progressive approach to natural restoration that contributes to habitat expansion, brings back wildlife and reconnects human activities to nature.

• **VEGETATED ROOF:** Also called a "living roof" or "green roof," a building roof planted with vegetation that absorbs stormwater and diminishes runoff.

• **WATERSHED:** An area of land that drains all the streams and rainfall to a common outlet, such as the outflow of a reservoir, the mouth of a bay or any point along a stream channel.

• **WOONERF:** A living street shared between pedestrians and vehicles alike, originally implemented in the Netherlands. Techniques include shared space, traffic-calming measures and low speed limits.

APPENDIX

REGULATIONS AND PERMITTING

State Regulations and Initiatives

The 2014 California Water Action Plan called for stormwater management solutions with multiple benefits and more efficient permitting programs. This directive created the State Water Board's Strategy to Optimize Resource Management of Stormwater (STORMS). STORMS' stated mission is to "lead the evolution of stormwater management in California by advancing the perspective that stormwater is a valuable resource, supporting policies for collaborative watershed-level stormwater management and pollution prevention, removing obstacles to funding, developing resources, and integrating regulatory and non-regulatory interests."

Municipal Regional Stormwater Permit (MRP)

The City of San José is subject to the requirements of the Municipal Regional Stormwater NPDES Permit (MRP) for Phase I municipalities and agencies in the San Francisco Bay Area (Order R2-2015-0049), which became effective on January 1, 2016.

The MRP applies to 76 municipalities and flood control agencies that discharge stormwater into the San Francisco Bay. Over the last 16 years, new development and redevelopment projects on private and public property that exceed certain size thresholds have been required to mitigate impacts on water quality by incorporating post-construction stormwater control measures, such as more environmentally conscious site design, pollutant source control, stormwater treatment and alternative runoff flow control measures. Low impact development (LID) treatment measures that use natural treatment processes, such as rainwater harvesting, stormwater infiltration strategies and biotreatment, have been required on most regulated projects since 2011.

MRP Provision C.3.j requires the development and implementation of long-term green stormwater infrastructure (GSI) plans for the inclusion of LID drainage design into storm drain infrastructure on public and private lands, including streets, roads, storm drains, parking lots, building roofs and other elements. Much of the incorporation of green infrastructure is intended to be accomplished by retrofitting existing impervious areas in public rights-of-way and on public property, as well as continuing to implement LID strategies on regulated projects.

Legal Mechanisms

As described in Section 1.3 of San Jose's GSI Plan, the City of San José and other municipalities must require post-construction stormwater control measures on regulated development projects. The goals of these stormwater controls are to reduce pollutants from entering local and regional water bodies and to lower the risk of flooding by managing peak runoff.

Chapter 20.95 of the city's Municipal Code includes stormwater management requirements that are consistent with the MRP. It references two city council policies that govern the requirements for post-construction stormwater controls:

- Council Policy 6-29, Post-Construction Urban Runoff Management
- Council Policy 8-14, Post-Construction Hydro-modification Management

The city's Municipal Code establishes legal authority for the city to require regulated private development projects to comply with MRP requirements. GSI capital projects must conform to the sizing and design requirements contained in Provision C.3 except under certain limited circumstances within city-owned land they are primarily public projects under control of the City. The city's General Plan, along with its Urban Village Plans, Complete Streets Plan and other plans described in Chapter 3 of the GSI, govern and direct the city's actions in developing and implementing the goals of the GSI Plan. The city also uses the SCVURPPP GSI Handbook and associated guidelines, details and specifications to assist with the design of GSI projects, as stated in Chapter 4 of the GSI Plan. The City will evaluate the implementation of projects as part of this GSI Plan and, as needed, may consider whether additional policies or ordinances could help facilitate GSI Plan implementation into the future.

Funding Mechanisms

The City of San José currently uses a combination of federal and state grants and storm sewer fees to fund construction and operations and management of CIP projects. The work plan for prioritized projects presented in Chapter 7 of the GSI Plan outlines more than $100 million in spending on high-priority regional projects. In addition, the work plan stated in Chapter 7 of the GSI Plan defines the process to significantly increase annual implementation of green street and LID retrofits to reach capture goals.

Recognizing that current revenue sources would not be sufficient to fund these expenditures, the city conducted a study to evaluate funding alternatives to meet the revenue shortfall. The city reviewed potential funding mechanisms in the following ways:

- Benchmarked funding mechanisms being used by a sampling of other California agencies
- Reviewed legal requirements and limitations on the city's ability to implement various mechanisms,
- Completed preliminary ratepayer focus groups and phone surveys to assess attitudes about stormwater, including the potential for a finance measure to fund improvements to storm sewer infrastructure

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The California Constitution imposes a number of requirements and limitations on the city's ability to increase revenues that apply to funding options for stormwater management mentioned in Table 7.1 of the GSI Plan. In addition to those summarized in Table 7-1, other GSI funding options currently used and/or being considered by the city include:

• Grants: To date, the city has secured several grants totaling more than $4 million to design and construct early-implementation GSI projects.
• Integration with transportation projects: Installing and maintaining GSI facilities as part of integrated roadway programs can reduce total city costs and enable the city to pursue funding mechanisms that might not normally be available to a traditional stormwater project.

The GSI Plan achieves, assists, and aligns with the implementation of goals, policies, and actions from various City planning documents including the Envision San José 2040 General Plan - specifically, Action IN3.17 to develop and implement a green streets plan.

WATER INFRASTRUCTURE

Sewer And Stormwater Infrastructure
The sanitary sewer (SS) was constructed for industrial fruit-canning facilities in the early 1900s. The city is upgrading its "level of service" (LOS) criteria for the first time in 40 years. Sewer and stormwater issues are manifold and include age and corrosion, similar to aging infrastructure issues nationwide. The age of the storm drain (SD) system is not clear, and the city faces a consent decree that would require it to implement a wide range of retention strategies. The City of San José is not actively looking at ways to broaden recycled water infrastructure downtown. The entity most concerned about water supply is Valley Water. The city only retails water in north San José (small geography) and doesn't create a lot of its own water (instead purchasing it wholesale from Valley Water), but may operate some groundwater wells.

Stormwater Interception:
At any scale, stormwater must comply with state and local code. Compliance as well as additional benefits may be achieved via green infrastructure applications. Today, green infrastructure comprises approximately 4% of the collection area. Ground plain detention (surface storage basins or facilities that provide flow control through attenuation of stormwater runoff) and treatment areas can be reduced via green roofs and district-scale facilities. Off-site centralized treatment and storage compliance can present additional entitlement complexity.

In addition to space savings, the benefits of retaining stormwater can include reuse, a reduction

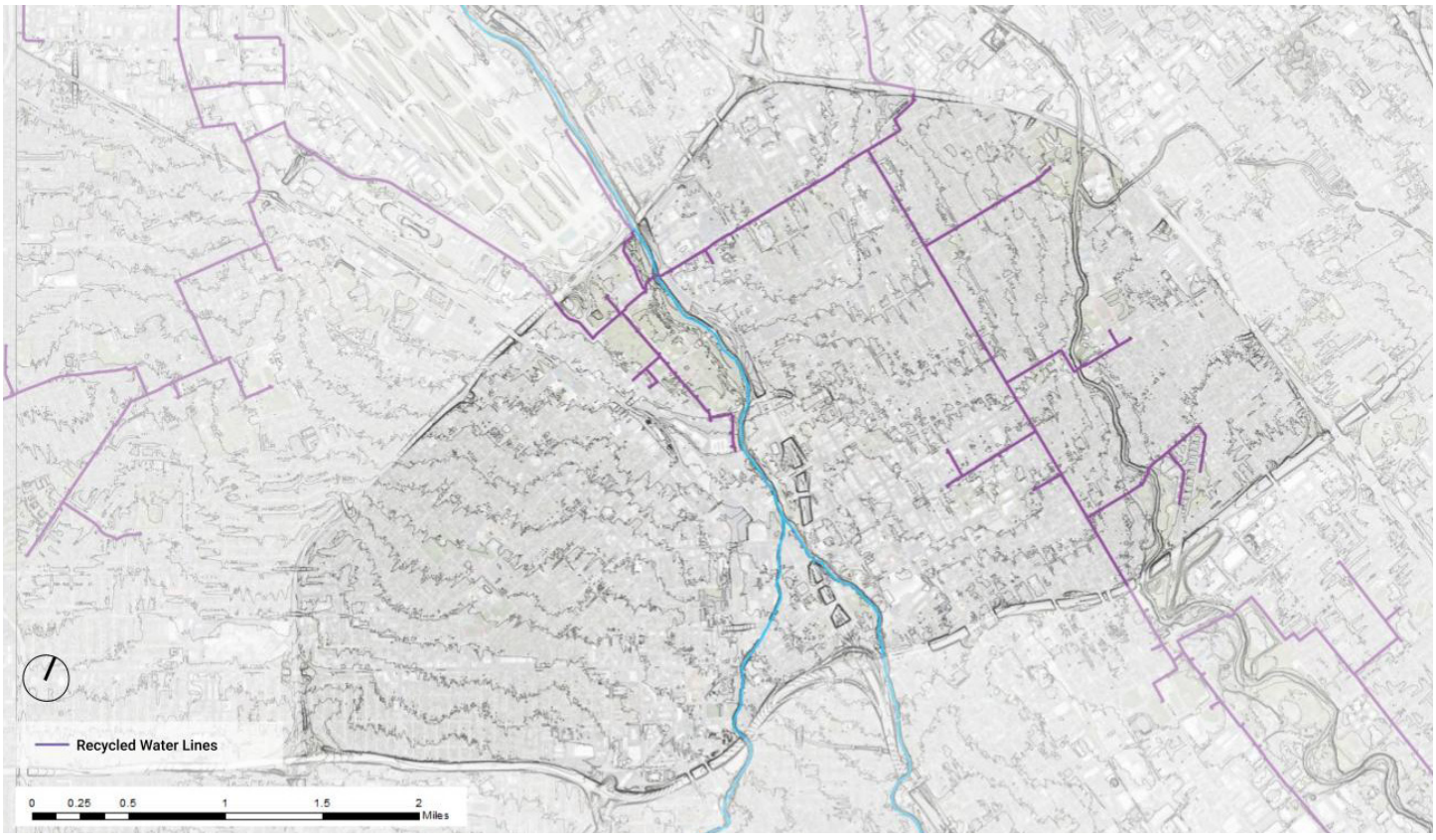
in irrigation demand, flood attenuation (releasing water slowly), habitat improvements and thermal comfort. If carefully engineered, infiltrating stormwater can boost summer flows in adjacent streams.

In addition to private lands - alleyways, parks, street trees, public landscapes, and streetscapes can all contribute to a district scale approach to green infrastructure. Local aquifer recharge is not likely due to aquifer management concerns. In some areas, high groundwater may present constraints for infiltration due to potential water quality Challenges.

Alleyways, parks, street trees, public landscapes and streetscapes (in addition to private lands) can all contribute to a district-scale approach to green infrastructure. Local aquifer recharge is not likely due to aquifer management concerns. In some areas, high groundwater may present constraints for infiltration strategies due to potential water-quality issues.

Recycled Water (Purple Pipe):
The South Bay Water Recycling Program produces approximately 15 millions of gallons per day, and the existing recycled water pipeline extends to City Hall and San José State University.

The city does not have the pressure and flow to hydraulically serve new connections. It would need to do an engineering study of the pipeline hydraulics and then determine where to build adequate



storage and pumping facilities to provide the recycled water to further extents. While it's not certain that storage and pumping would be needed, it's a good assumption given what is known about the system today. The city has stated that it has the capacity to produce as much recycled water as needed for new connections through 2030 and will provide it on a "first-come-first-served" basis (unofficially).

The city will advocate for an extension of its recycled water system if a project is substantial enough to warrant it. Developers will pay 100% for this infrastructure, however. Since the city is not required to use any more of its recycled water to meet wastewater discharge limits, it cannot make sewer rate payers fund recycled water extensions anymore.

For a wastewater treatment plant, the San Francisco Bay Regional Water Quality Control Board issues the operational permit, or order. The State Water Resource Control Board ("State Water Board") Division of Drinking Water reviews the engineering report and provides technical comments on tertiary filtration and disinfection unit processes. The Santa Clara County Department of Public Health may act in an advisory role. The City of San José acts as a permit stakeholder and issues an industrial pretreatment permit (if required) and the building permit.

The permit and approval requirements include:

- California Water Code, Section 7 (Porter-Cologne Act)
- California Health Laws Related to Recycled Water ("The Purple Book")
- California Code of Regulations (CCR), Title 22, Division 4. Environmental Health
- California Plumbing Code (CPC)
- City of San José Industrial Pretreatment Permit requirements for the discharge of wastewater treatment residuals
- Bay Area Air Quality Management District requirements

All on-site non-potable water systems in the state are required to comply with SB 966 by December 1, 2024. The earliest the State Water Board is required to have the new regulations ready is December 1, 2022, at which time a local program may issue permits, if San José or Santa Clara County elects to develop one. There has not been a lot of action at the local level (cities, counties) to develop these local programs. Most local regulators who are aware of SB 966 (not many) consider it an unfunded mandate.

CONSENT DECREE

In June 2016, Baykeeper — a local nonprofit that has worked to stop pollution and other threats to the Bay Area — came to an agreement with the City of San José that the city would make significant future environmental investments by implementing more stormwater capture projects. Potential long-term benefits include reduced pollutants in creeks, recharging of groundwater and beautification of the city landscape, all ultimately enhancing the quality of life for San José residents. According to Baykeeper, urban stormwater runoff is one of the largest sources of pollution in the San Francisco Bay, and through a collaborative effort with the City of San José's Environmental Services Department, the City will take further measures to target trash and potential sewage discharges by investing in the installation of capture systems that collect trash from stormwater before it reaches rivers and streams and will improve its sanitary sewer system to prevent sewage from potentially migrating into the storm sewer system.

PLANNING DOCUMENTS

Envision San José 2040 General Plan

The Envision San José 2040 General Plan sets forth a vision and a comprehensive road map to guide the city's continued growth through the year 2040. The plan includes land use policies to shape the transformation of strategically identified and historically underutilized Growth Areas into higher-density urban districts that would increase employment and housing growth, as well as promote transit use and walkability. These strategies, in combination with progressive economic and environmental policies, will guide the city toward fulfilling its future vision.

San José's Envision 2040 General Plan is the primary document used to identify and govern the city's goals, policies and actions. The Green Stormwater Infrastructure (GSI) Plan implements many goals and policies from the General Plan, such as Measurable Sustainability (MS), Environmental Resources (ER), Community Design (CD), Transportation (TR) and Infrastructure (IN). The Plan calls for the city to:

- Promote, require, and practice the use of GSI facilities, such as permeable pavement bioretention and rainwater harvesting, on public and private land (MS, ER, CD, TR)

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• Protect and enhance groundwater as a water supply, improve local watersheds, and reduce flood risk (MS, ER)
• Promote, partner with, and educate the public and key stakeholders on the importance of responsible stormwater management (ER)
• Provide and maintain adequate infrastructure to support the city's residents and businesses (IN).
• Develop and implement a Green Street Plan consistent with the MRP (IN)

To include further policies that facilitate GSI, the General Plan would need to be updated during annual or four-year major reviews.

Climate Smart San José
Climate Smart San José is the continuation and escalation of San José's 2012 Green Vision and will take San José into the next generation of urban sustainability. It articulates how every facet of the city — from buildings to mobility to the workforce — needs to transform in order to minimize the city's impact on the climate.

The GSI Plan is consistent with the city's goal to be a sustainable, climate-smart city. Strategy 1.2 of Climate Smart San José includes embracing the California climate by "creating an urban landscape, in our homes and public places that is not just low water use, but attractive and enjoyable." Potential actions to support this strategy include:

• Convening to advance a regional conversation around how stormwater capture and reuse might contribute to the region's water-supply portfolio
• Running a program to include green stormwater infrastructure (e.g., rain gardens) as part of "complete streets" requirements

City of San José Green Stormwater Infrastructure Plan
The City of San José Green Stormwater Infrastructure (GSI) Plan is intended to serve as an implementation guide for reducing the adverse water-quality impacts of urbanization and urban runoff on receiving waters over the long term, directly resulting in several improvements to the Guadalupe River and its surrounding ecologies. The GSI Plan is required by the city's Municipal Regional Stormwater National Pollutant Discharge Elimination System (NPDES) permit for the discharge of stormwater runoff from the city's storm drain system.

EXISTING EFFORTS

Recognizing that existing efforts are underway by the city and other groups, this report seeks to build upon their momentum in a collaborative fashion.

City of San José Stormwater Management Annual Report 2017–2018
San José's implementation of Permit Provision C.3 continued to focus on LID stormwater management requirements. The city worked with developers to implement tools such as data forms, web pages and worksheets to ensure that upcoming projects comply with LID requirements. Further endeavors and tools implemented by the city to ensure LID compliance are:

• Stormwater Treatment Measure Operations and Maintenance Inspection Programs, to ensure proper maintenance and function of on-site stormwater treatment systems.

• The city's Business Inspection Plan, to direct inspector resources toward facilities with a higher potential to contribute pollutants to stormwater. This prioritization considers the type of business and the compliance history of a facility in establishing inspection frequency.

• The Illicit Discharge Detection and Elimination Ad Hoc Task Group on multiple projects, to share information, discuss issues and coordinate communication.

• The Parks, Recreation, and Neighborhood Services Department's Parks Division's Chemical Advisory Board, to evaluate new methods for reducing pesticide use and provide IPM training to staff.

• The Clean Waterways, Healthy City: Long-Term Trash Load Reduction Plan and Assessment Strategy (originally submitted to the State Water Board in February 2014, and since updated), to serve as a road map to help San José achieve the trash-load reduction requirements and the vision of Clean Waterways, Healthy City.

• The Direct Discharge Trash Control Program (approved by the State Water Board executive officer in August 2016), to coordinate efforts with three other departments and external partner organizations to conduct outreach to unhoused individuals, dismantle encampment structures, remove residual trash and patrol creeks to prevent the establishment of new encampments.

Park Paseo Proposal
The Park Paseo proposal aims to revitalize the Paseo de San Antonio, which links San José State

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University to César Chávez Park through the heart of downtown, and to extend the pedestrian experience along Park Avenue to Guadalupe River Park.

The design process created a "culture collector," bringing together the arts, innovation and technology by linking significant cultural institutions along the route. In the proposal, dynamic canopies designed to enliven the paseo provide shade from the summer sun, drawing in during the winter months and transforming into sculptural lanterns after dark. A generous tree canopy reinforces the seasonal transformation and strengthens the character of San José as a garden city. Park Avenue is transformed from bare avenue to verdant park, connecting the natural qualities of Guadalupe River Park with the city's cultural center.

Guadalupe River Channel Improvement Efforts

Since the most recently harmful flood in 2000, Valley Water and the Army Corps of Engineers worked together on a series of flood mitigation efforts along the Guadalupe River, implementing strategies such as channel widening, construction of floodwalls and levees, replacement of road crossings and planting of streamside vegetation. Some of the major elements of the project, which broke the river into three segments — Upper Guadalupe River, Downtown Guadalupe River and Lower Guadalupe River — included bypass channels, floodplain bench creation, in-stream grade control structure to control bank instability, creation of freshwater wetlands, and significant vegetation and sediment management.

Around downtown San José in particular, flood protection efforts included 2.3 miles of protection, designed to handle roughly 17,000 cubic feet per second.

Homeless Stewardship Programs

Most initiatives aimed at involving San José's unhoused people in creek cleanups have died off, partly due to hesitation from city officials.

In 2014, the Santa Clara County Creeks Coalition provided the homeless residents of the city with trash cans to help clean up after themselves and pick up litter they come across during the day. However, the city confiscated these receptacles, arguing that this method would encourage homelessness along waterways rather than address root problems.

Two years later, the organization Coyote Creek Homeless Stream Stewards was established, and more than 48,000 pounds of garbage were removed. Trash bags were collected at checkpoints along a half-mile of the creek, and for every two bags of trash collected, participants received a ticket and a chance to win $10 gift cards.

In 2018, the Coalition hired 25 homeless residents to pick up litter they came across for $15 an hour, with the goal to provide a stable source of income to the residents, eventually resulting in full-time work. This was part of a beautification program overseen by Goodwill of Silicon Valley and the Downtown Streets Team. Moving forward, the project aims to involve cleaning up 40 hotspots (litter dumping grounds) around the city. The city council also approved a $200,000 litter abatement grant, some of which was used to fund the program.

In 2019, the Homeless Encampments Ad Hoc Committee was created to consider a range of programs that would combat litter and homelessness together. On Environmental Cleanup Day (December 7, 2019), the committee succeeded in obtaining $90,000 in approved funding. The Santa Clara Valley Water District will be partnering with other local government agencies, social services providers and a group of volunteers that include homeless residents to clean trash and debris at three sites.

CENTRAL CALIFORNIA COASTAL STEELHEAD

Central California Coast (CCC) steelhead are the anadromous form of rainbow trout ("anadromous" means that they migrate from the sea up rivers to spawn). Like Pacific salmon, steelhead are born in freshwater, then emigrate to the ocean, where most of their growth occurs, and return to freshwater to spawn. Unlike Pacific salmon, steelhead do not necessarily die after spawning and may return to spawn multiple years. The post-spawning survival rates of steelhead vary considerably between populations but are generally quite low. Many West Coast salmon and steelhead stocks have declined substantially from their peak numbers and now are at a fraction of their historical abundance. Urbanization has led to degraded steelhead habitat through stream channelization, floodplain drainage, and riparian damage.

Steelhead are not listed under the California Endangered Species Act but have been listed as threatened in California since June 7, 2000 (65 FR 36074) for the Northern California distinct population segment. CCC steelhead are in long-term decline and face extinction in the next 100 years without significant investments in monitoring, habitat restoration and water management. As part of an effort to enhance the quality of steelhead habitat, the CCC steelhead are being treated as an "umbrella species" — a concept used by conservation practitioners to provide protection for other species using the same habitat as the umbrella species. This classification indirectly protects the many other species that make up the ecological community of the CCC steelhead's habitat.

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HABITAT REQUIREMENTS

MIGRATING ADULTS

It has been reported that 7 inches is the minimum depth required for successful migration of adult steelhead, although the distance the fish must travel through shallow water areas is also a critical factor. Excessive water velocity and obstacles that impede the steelheads' swimming and jumping ability are significant in hindering or blocking migration. Optimum temperature requirements vary but generally fall in the range of 46°F to 52°F.

SPAWNING FEMALES

The preferred depth for spawning ranges from 6 to 24 inches with an average of 14 inches. Larger steelhead have the ability to spawn in faster currents than smaller steelhead. Based on the Bovee (1978) classification, steelhead utilize mostly gravel-sized material for spawning but will also use mixtures of sand/gravel and gravel/cobble. Optimum temperature requirements vary but generally fall in the range of 39°F to 52°F.

FRY

Eggs and sac fry require highly permeable gravels to keep the incubating eggs and sac fry well oxygenated. Once fry emerge from the gravel, they utilize water in the range of 2 to 14 inches in depth and prefer water approximately 8 inches in depth. Optimum temperature requirements vary but generally fall in the range of 45°F to 60°F.

PARR (JUVENILES)

Parr prefer a water depth of 10 inches but utilize water 10 to 20 inches deep. Juveniles prefer substrate categorized as cobble/rubble, which is slightly larger than that preferred by adult steelhead for spawning.

SMOLT

Optimum temperature requirements vary but are generally less than 57°F.

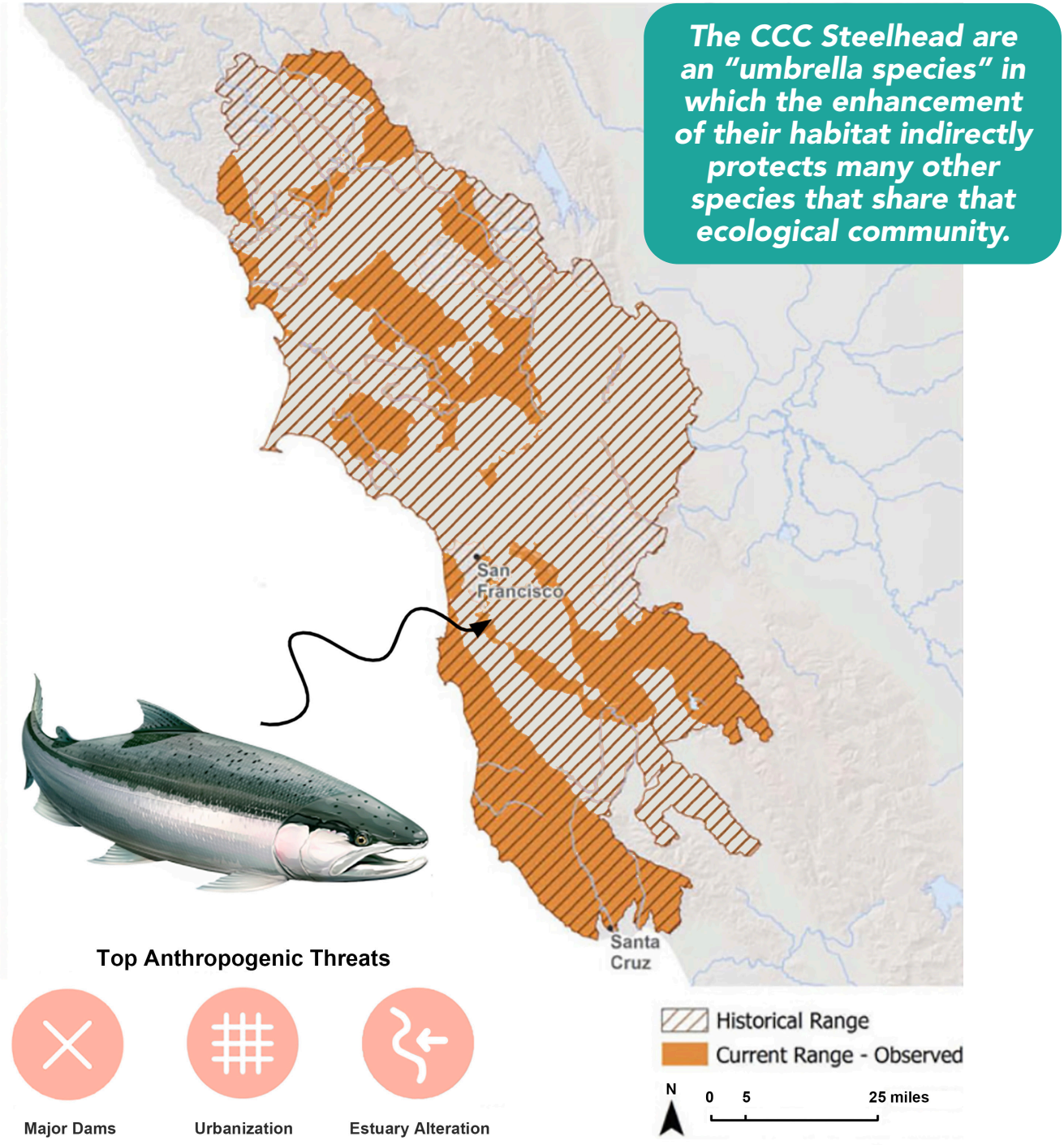

Figure 21: The Central California Coast steelhead's historical and current ranges in the Bay Area, and its biggest threats from human activity .

SHERWOOD
DESIGN ENGINEERS