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OREGON STATE UNIVERSITY  
MASTER OF NATURAL RESOURCES  
CAPSTONE REPORT

**EVALUATING THE  
POTENTIAL IMPACTS  
OF HOMELESSNESS ON  
THE WATER QUALITY  
AND RIPARIAN  
HABITAT OF THE  
SANTA ANA RIVER**

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## Acronyms & Abbreviations

CBA	Cost-Benefit Analysis
CCC	Clean Camp Coalition
CCCFCDD	Contra Costa County Flood Control District
CoC	Continuum of Care
CWA	Clean Water Act
DCI	Disadvantaged Community Involvement
DWR	Department of Water Resources
EPA	Environmental Protection Agency
HIPPA	Health Insurance Portability and Accountability Act
HUD	Department of Housing and Urban Development
IEWK	Inland Empire Utilities Agency
MOU	Memorandum of Understanding
MS4s	Municipal Separate Storm Sewer Systems
MWD	Metropolitan Water District of Southern California
NPDES	National Pollutant Discharge Elimination System
OCWD	Orange County Water District
PIT	Point in Time
PSHB	Polyphagous Shot Hole Borer
RCFC&WCD	Riverside County Flood Control and Water Conservation District
RWQCB	Regional Water Quality Control Board
SAR	Santa Ana River
SAWPA	Santa Ana Watershed Project Authority
SBVMWD	San Bernardino Valley Municipal Water District
SCVWD	Santa Clara Valley Water District
SWRCB	State Water Resources Control Board
TMDL	Total Maximum Daily Load
WMWD	Western Municipal Water District
WOTUS	Waters of the United States

## Abstract

This project focuses on the Santa Ana River in Southern California. The 2,650 square mile Santa Ana River Watershed is home to over six million people and the 96-mile river, which flows through three counties: San Bernardino, Riverside, and Orange (SAWPA 2014). The most recent point-in-time (PIT) count numbers for these counties estimated a total of 12,869<sup>1</sup> people experiencing homelessness. Forty-eight percent, or just over 6,100 of those counted, were unsheltered, meaning they live in “streets, parks, or other locations not meant for human habitation” (Mejia et al. 2019; OCHMIS 2019; RCHI 2020; SBCHP 2020). With an estimated over 1,000 people living in encampments along the Santa Ana River (Brousseau, personal communication, 20 February 2019), there is the concern of potential impacts to water quality and sensitive riparian and aquatic habitats. The purpose of this project is to explore the potential impacts of homelessness on water quality and sensitive habitat in the Santa Ana River. Through a comprehensive literature review and interviews with Santa Ana River watershed experts, this project seeks to identify what roles policy and management play in resource agencies’ response to homelessness within their jurisdiction and provide examples of how other communities have addressed these issues in their local waterways. The goal is to provide recommendations for future collaboration and partnerships between local resource agencies, non-profit organizations, and cities and counties to provide adequate services and resources to the homeless population living in the Santa Ana River. Progress can be achieved through the creation of multi-benefit programs and initiatives to address this wicked problem.

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<sup>1</sup> The Riverside and San Bernardino counties had 2020 PIT count numbers available at time of report development. Orange County’s 2020 data were not available, so 2019 data were used in this estimate.

## Introduction

Homelessness in California is a complex issue that has worsened in recent years due to the California housing crisis, slow recovery from the 2008 economic downturn, and federal disinvestment in anti-poverty programs, including the construction of low-income housing in urban areas (DeVuono-powell 2013). There are an estimated 151,278 homeless Californians as of January 2019—nearly one-quarter of the nation’s total (USICH 2020). Homelessness has shifted from a social issue to encompassing aspects of environmental and economic issues that must be addressed through local, state, and federal resources.

This project focuses on the Santa Ana River in Southern California. The 2,650 square mile Santa Ana River Watershed is home to over six million people, and the 96-mile river flows through three counties: San Bernardino, Riverside, and Orange (SAWPA 2014). The most recent point-in-time (PIT) count numbers for these counties estimated 12,869<sup>2</sup> people were experiencing homelessness. Forty-eight percent, or just over 6,100 of those counted, were unsheltered, meaning they live in “streets, parks, or other locations not meant for human habitation” (Mejia et al. 2019; OCHMIS 2019; RCHI 2020; SBCHP 2020). Many people experiencing homelessness are drawn to encampments in urban waterways such as the Santa Ana River for privacy, proximity to resources and services, and easy access to water for bathing and sanitation. With an estimated over 1,000 people living in encampments along the Santa Ana River (Brousseau, personal communication, 20 February 2019), there are potential impacts to water quality and sensitive riparian and aquatic habitats.

The literature research collected for this report relates to the current state of homelessness in the Santa Ana River (SAR) Watershed and the efforts to evaluate the homelessness issue in urban waterways in other California cities, counties, and beyond. Two experts were interviewed<sup>3</sup> on water quality and habitat issues impacting the highly urbanized SAR watershed. Richard Boon, senior flood control planner for Riverside County Flood Control & Water Conservation District (RCFC&WCD), and Megan Brousseau, associate director for Inland

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<sup>2</sup> The Riverside and San Bernardino counties had 2020 PIT count numbers available at time of report development. Orange County’s 2020 data were not available, so 2019 data were used in this estimate.

<sup>3</sup> See Appendix E for interview questions.

Empire Waterkeeper (IEWK), shared their perspectives on the social and environmental challenges in the SAR and were significant contributors to the findings in this paper.

The purpose of this project is to explore the potential impacts of homelessness on water quality and sensitive habitat in the Santa Ana River and to evaluate the existing and potential opportunities for partnerships to address homelessness and the environmental impacts associated with encampments. Through a comprehensive literature review, interviews with watershed experts, and engagement with current research on this topic by the Santa Ana Watershed Project Authority (SAWPA), this project seeks to answer what role policy and management plays in resource agencies' response to homelessness within their jurisdiction and how other communities have addressed these issues in their local waterways.

The goal is to provide recommendations for future collaboration and partnerships between local resource agencies, non-profit organizations, and cities and counties to provide adequate services and resources to the homeless population living in the Santa Ana River through the creation of multi-benefit programs and initiatives to address this wicked problem. The Santa Ana River's water quality and plant and wildlife habitat are already significantly altered by other factors such as increased disturbances and urbanization. Collaborative solutions and political will are needed to address multiple issues simultaneously. Recommendations in policy, management, funding, and monitoring and evaluation will be made to increase awareness of the Santa Ana River homelessness issue and offer insights for streamlined regulatory processes for quicker action.

## **Project Area Description – Santa Ana River Watershed**

The case study area encompasses the riparian areas of the Santa Ana River in Southern California. The SAR is a 96-mile river that runs through San Bernardino, Riverside, and Orange counties and begins in the San Bernardino mountains and ends at Huntington Beach, California. The SAR watershed is highly urbanized and is home to nearly six million people (SAWPA n.d. A). The SAR and its 50 tributaries together drain 2,650 square miles of land (WEF n.d. A).

## Geography

The SAR watershed is divided into two sections. The upper watershed is designated from the SAR origins in the San Bernardino mountains to Prado Dam. The lower watershed is defined as below Prado Dam—a nearly 80-year-old flood control and water conservation structure—to the SAR outflow at the Pacific Ocean in Huntington Beach. A map of the SAR watershed is provided in Appendix A.

## Topography

The SAR watershed is bordered by the Santa Ana, San Jacinto, San Bernardino Mountains, and the Pacific Ocean (RCFC&WCD 2017, 2-1). The San Bernardino Mountains' maximum elevation is 11,502 feet, and the San Jacinto Mountains' maximum elevation is 10,804 feet (RCFC&WCD 2017, 2-1). The topography of the watershed between the mountains and the ocean includes valleys, alluvial plains, granite plateaus, and small mountain ranges (RCFC&WCD 2017, 2-1). The headwaters of the Santa Ana River begin in the San Bernardino Mountains at an elevation of 1,884 feet and meets the Pacific Ocean 96 miles downstream at sea level (Beehler 2008). The Santa Ana River loses 1,884 feet of elevation in just 96 miles. For comparison, the Mississippi River travels from 1,435 feet in elevation to sea level in 2,320 miles (Beehler 2008).

## Climate

The climate of the watershed is defined as semi-arid, characterized by hot and dry in the summer and intermittently wet in the winter. Most of the precipitation comes in the form of rain from November through March and is highly variable from year to year, with an average rate of 16 to 20 inches annually (Bachand and Horne 1993, 1).

## Hydrology

### Historic

Before the 1941 construction of Prado Dam in the middle watershed and Seven Oaks Dam in the headwaters of the SAR in 2000, the SAR was extremely flashy and destroyed entire communities during the floods of 1862, 1938, and others. In the late 19<sup>th</sup> and early 20<sup>th</sup> century, as the population in the SAR watershed began to grow, “consumptive water use led to the river



only flowing seasonally, driven by high surface water runoff and rising groundwater levels in the winter, but drying up in the summer” (Bachand and Horne 1993, 1).

### Current

Several factors have further altered the SAR’s hydrology to bring it to its current state: a year-round flowing river made of 90% wastewater effluent during the dry season (Storrs 2015). Dam construction, diversions, wastewater treatment plants, and decades of litigation regarding SAR water rights between upstream and downstream users have contributed to changes in the SAR hydrograph since the mid-20<sup>th</sup> century.

The Santa Ana River watershed requires water subsidies from outside the watershed, including imported water from the Sacramento-San Joaquin River Delta and the Colorado River to serve the over six million residents. Imported water is brought into the SAR watershed by the regional wholesaler, the Metropolitan Water District of Southern California (MWD), and delivered locally through MWD’s member agencies. The surface flow from the Santa Ana River and the groundwater resources from the large groundwater basins within the watershed, including Chino Basin and the San Bernardino Basin Area, are not enough to supply the water demands of the population. The available groundwater only accounts for 66% of the consumptive water demand (USGS 2016), and the remainder is imported from outside the watershed. Orange County treats and uses approximately 65% of the SAR flows downstream of Prado Dam to recharge their percolation basins and extracts the water from these basins for drinking water for several Orange County cities (OCWD n.d.).

### Disturbances

The decrease in elevation over a relatively short distance causes the Santa Ana River to be susceptible to flooding disturbances and scouring of the river during high winter flows caused by extreme precipitation events. Wildfire in the riparian areas of the Santa Ana River, the San Bernardino Mountains, and in the foothills of the watershed tend to occur often and can have devastating effects on the natural habitat and adjacent urban areas. Wildfire events are often exacerbated by seasonal and severe Santa Ana Wind events that bring hot and dry inland winds from the northeast to the southwest and are characterized by wind gust speeds of between 30-60 miles per hour in some the passes and canyons. Wildfire tends to destroy

riparian native plants and trees such as cottonwood and willows while allowing for quick regrowth of invasive, water-intensive species such as *Arundo donax*, also known as giant reed.

Insect disturbances are also a concern in the watershed. The Polyphagous Shot Hole Borer (*Euwallacea sp.*) or “Shot Hole Borer” is a beetle that “tunnels into host trees and spreads Fusarium Dieback, a disease known to infect over 110 tree species” (University of California 2019). The Shot Hole Borer slowly kills trees by injecting a fungus into the tree that disrupts the transport and water nutrients in the tree (University of California 2019). Evidence of the Shot Hole Borer has been found in the upper watershed areas of the Santa Ana River. Its spread to other areas of the watershed are being monitored, yet, there are no formal efforts underway in the watershed to manage the pest.

### Land Use

Land use in the Santa Ana River watershed is classified as “substantially urbanized” (USGS 2016). The major land uses of the Santa Ana River watershed are commercial, high-density residential, industrial, and transportation (RCFC&WCD 2017), which account for about 32% of the watershed (USGS 2016). Other surrounding land types include wildland, agriculture (approximately 10%), parks, towns, and cities (California Coastal Conservancy 2019).

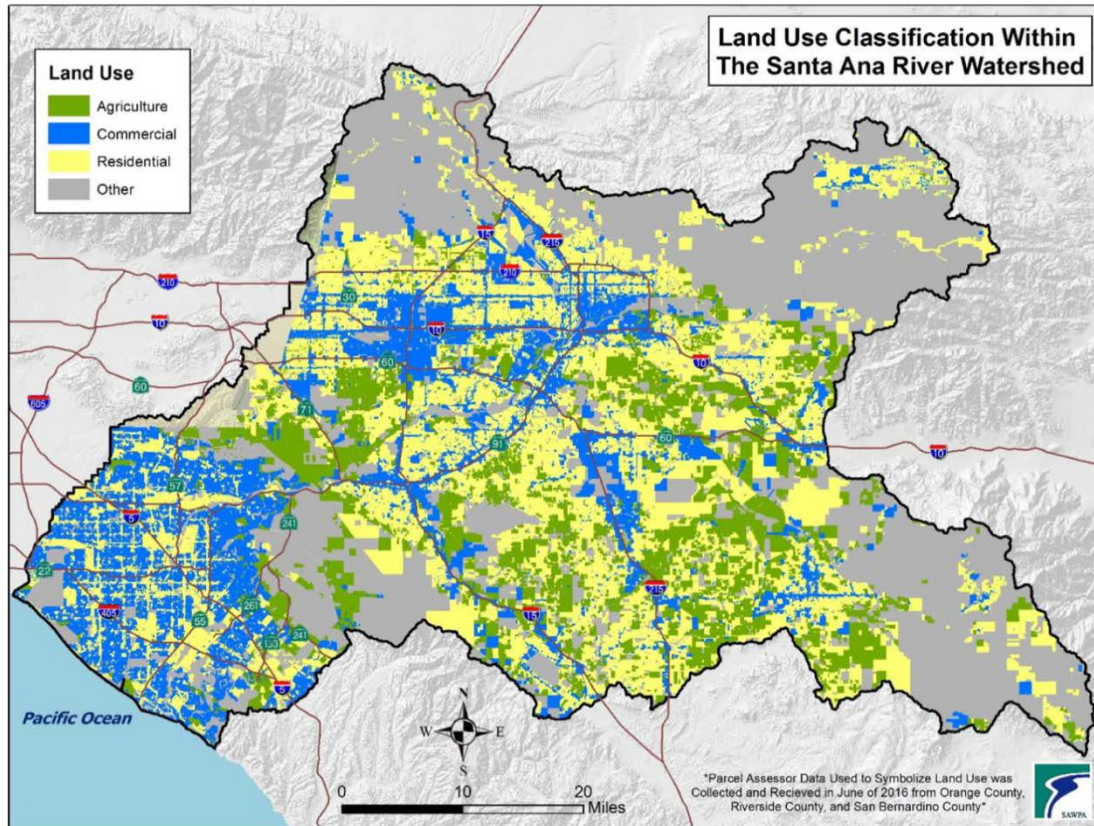


Figure 1: Land Use Classification within the Santa Ana River Watershed (SAWPA OWOW Plan 2018).

## Biology

Wildlife species found in the SAR include aquatic species such as the endangered Santa Ana Suckerfish, Arroyo Chub, and invasive species such as large-mouth bass and catfish. Terrestrial species found in the SAR riverbed area include the endangered San Bernardino Kangaroo Rat, coyotes, rabbits, and migratory birds with the major predators of the area being coyotes, snakes, owls, hawks, and feral pigs.

Due to the size of the Santa Ana River watershed, a majority of the species find the watershed accommodates critical habitat needs. There may not be preferred habitat, as in the case of the endangered Santa Ana Sucker fish that prefers gravel and cobble substrate for spawning but has acceptable habitat in sandy areas of the river with small gravel patches. Migratory birds use the Santa Ana River and the constructed Prado Wetlands in the middle watershed area as a stop along the Pacific Flyway—one of the four major migration routes that extend from Alaska and Canada to Mexico (WEF n.d. B). These birds, especially waterfowl, use

the watershed as a temporary habitat but require cool-weather habitat in the summer and warm-weather habitat in the winter.

Primary vegetation in the unlined portion of the SAR riverbed (upper and middle SAR) include black willow (*Salix gooddingii*), mule fat (*Baccharis salicifolia*), cottonwood (*Populus deltoides*), Santa Ana River Woollystar (*Eriastrum densifolium*), and giant reed (*Arundo donax L.*) (*Arundo*). *Arundo* is a significant problem in the Santa Ana River watershed. It destroys native habitat and consumes an extraordinary amount of water—approximately 56,200 acre-feet per year in the SAR compared to 18,700 acre-feet that would be consumed by native vegetation (CISR n.d.). The high vegetation consumptive use is an issue for a highly regulated river in a semi-arid climate. Also, *Arundo* does not provide any valuable habitat to the wildlife community of the SAR riparian areas and poses a fire risk. In 2015, a wildfire burned through the Prado Basin (middle SAR watershed) and damaged some areas of the Prado Wetlands—a 450-acre constructed wetland behind the Prado Dam that is owned and operated by Orange County Water District (OCWD). Natalia Doshi, a field biologist at the Prado Wetlands, explained how *Arundo* burns at such a high temperature that it ultimately kills native plants surrounding it (Natalia Doshi, in-person communication, 10 May 2019). Managing and monitoring *Arundo* has become a part of the day-to-day operations in SAR riparian habitat management. OCWD contributed 1 million dollars to create the Santa Ana Watershed Association to lead in the removal of *Arundo* from the watershed (OCWD 2018). Furthermore, regional water agencies within the Santa Ana River watershed have secured an additional 1.5 million dollars in California Proposition 84 grant funding to remove an additional 640 acres of *Arundo* throughout the watershed, with a large portion of the removal occurring in the Prado Basin near the Prado Wetlands (SAWPA 2019). The *Arundo* removal effort with Proposition 84 grant funds is estimated to save 2,400 acre-feet of water (SAWPA 2019).



*Figure 2: Mulefat Vegetation in the SAR  
(Personal Photo, May 2019)*



*Figure 3: Black Willow Vegetation in the SAR  
(Personal Photo, May 2019)*



Figure 4: *Arundo donax* (USDA Forest Service n.d.)

### Cultural and Social Status

As of 2010, the Santa Ana River watershed has a population of 5.9 million and is expected to reach 9.9 million by 2050. The upper portion of the SAR watershed, including Riverside and San Bernardino Counties, known as the Inland Empire region of Southern California, is one of the fastest-growing areas of the U.S. The housing boom of the early 2000s was very successful in this area. However, the region was plagued by sub-prime mortgage debt during the Great Recession. The Inland Empire was ahead of the financial crisis curve and was hit incredibly hard during this period with a “collapse in home prices, a sharp decline in sales and new home construction, as well as job losses and rising unemployment” (Kleinhenz 2018, 3).

### Social Demographics

The median household income of the three counties within the SAR watershed in 2018 dollars is \$60,164 in San Bernardino County, \$63,948 in Riverside County, and \$85,398 in Orange County (U.S. Census n.d.). The median monthly housing rent between 2014-2018 was

\$1,230 in San Bernardino County, \$1,311 in Riverside County, and \$1,777 in Orange County (U.S. Census n.d.). The percentage of persons in poverty is 14.9%, 12.7%, and 10.5%, respectively (U.S. Census n.d.). According to the Santa Ana Watershed Project Authority’s One Water, One Watershed (OWOW) 2018 report, 25% of the watershed’s population is considered “disadvantaged” (SAWPA 2018, 7-15). As the data suggests, the upper portion of the SAR watershed, including San Bernardino and Riverside counties, have lower household income levels and a higher rate of poverty than their lower-watershed neighbor, Orange County. It should be noted that San Bernardino and Riverside Counties are the largest and fourth-largest counties geographically in California at 20,057 and 7,206 square miles, respectively (CSAC n.d.). In comparison, Orange County ranks 47<sup>th</sup> on the list of California counties by size at 791 square miles (CSAC n.d.). Riverside and San Bernardino counties, partially due to their large size and a higher percentage of persons in poverty, may contribute to the higher number of people experiencing homelessness in the upper watershed. Housing services and homelessness resources are stretched thin in these counties because of the large area to service and the number of people in need.

Political/Governance

The SAR Watershed has often been referred to by local watershed experts as one of the most heavily regulated watersheds in the country. There is a multitude of federal, state, and local agencies responsible for different areas and have specific, and sometimes conflicting, goals for the Santa Ana River. The following table provides the major water-related entities in the watershed.

Agency	Jurisdiction	Responsibility/Interest in the SAR
<b>Army Corps of Engineers</b>	Federal	Landowner and operator of Prado Dam on the SAR
<b>US Fish and Wildlife Services</b>	Federal	Protect the wildlife of the SAR – requires permits for projects affecting fish/wildlife
<b>California Department of Fish and Wildlife</b>	State	Protect the wildlife of the SAR – requires permits for projects affecting fish/wildlife
<b>State Water Resources Control Board</b>	State	Oversees regional board activities and oversees water rights allocations.
<b>Department of Water Resources</b>	State	Manages CA water resources, systems, and infrastructure. A

		significant source of grant funding for water projects in the SAR Watershed.
<b>Santa Ana Regional Water Quality Control Board</b>	Local/Regional	Protect water quality and permit projects that affect water quality
<b>Cities and Counties</b>	Local	Landowners adjacent to the SAR
<b>Water Agencies</b>	Local	Provide water and wastewater services to end-users.

A challenge when it comes to effectively addressing the homelessness issue in the SAR is the multi-jurisdictional nature of the land on either side of the river. The high number of landowners adjacent to the SAR causes confusion and conflict regarding which agency or landowner is responsible for addressing encampments in the waterways. Because of the patchwork nature of the parcel owners, one parcel may be owned by a local entity, and the next parcel over is owned by a state or federal entity. Encampments can simply move a short distance and avoid some local agencies' patrolling or management efforts to an area rarely visited or patrolled. The map on the next page shows the middle portion of the SAR where encampments have been located by the Riverside County Flood Control & Water Conservation District (RCFC&WCD) with an overlay of the land parcel owners along the river.

#### [Additional Resources](#)

Included in this report are several appendices that provide background on the SAR Watershed's role in the state of California and additional political, social, ecosystem, and economic considerations. Specifically, Appendices B, C, and D offer visual representations of the interconnected systems comprising the homelessness issue from a state, watershed, and situation-specific lens.



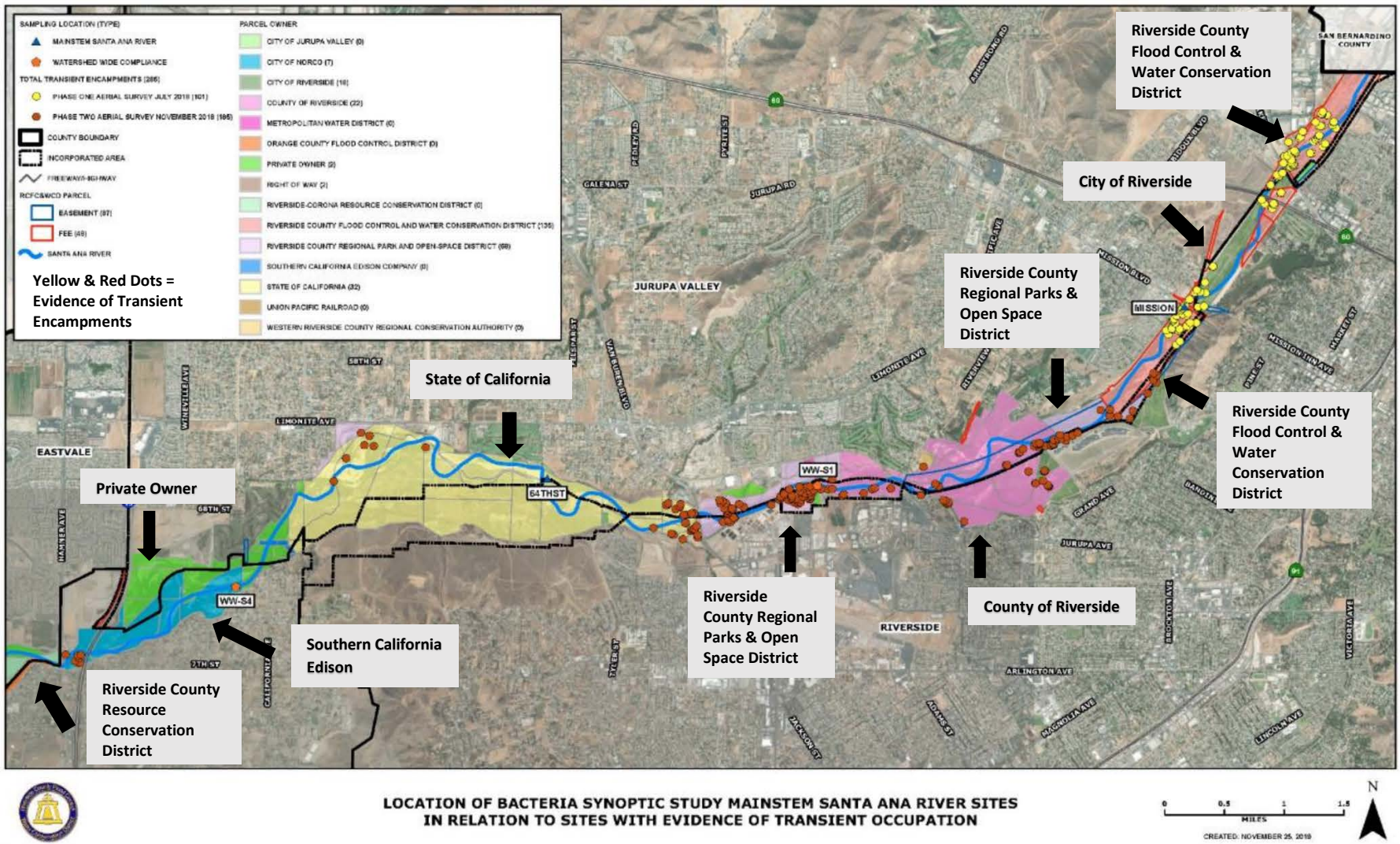


Figure 5: SAR Jurisdiction and Encampment Location Map (GEI & CWE 2020, map provided by RCF&WC). Edited for clarity by Mallory Gandara.

## Case Study Background – Homelessness in California

California has long dealt with the issue of homelessness in its major cities. Los Angeles is the home of Skid Row, a 54-block area in downtown, where 12,000 sheltered and unsheltered homeless people reside (LA Chamber 2008). What is more concerning is homelessness in California has moved away from large city centers and is rising in suburban areas, mainly due to “urban renewal initiatives [which] have pushed homeless to areas outside of city centers where they are less visible” (DeVuono-powell 2013). As housing prices in California cities soar to unattainable heights, local and state officials are working to provide additional services. However, even as resources increase, the need continues to exceed the availability of services. Some areas within California are struggling to handle homelessness because of limited resources and little experience on complex social issues.

The current increase in people experiencing homelessness is attributed to a few key factors, including the California housing crisis, slow recovery from the economic downturn of 2008, and federal disinvestment in anti-poverty programs, including the construction of low-income housing in urban areas (DeVuono-powell 2013). Many of those experiencing homelessness are drawn to urban waterways for a multitude of reasons. Some of the reasons include the proximity of urban waterways to centers and services, the ability to build encampments just outside of public view, and the complex web of local, state, and federal jurisdictions within waterways, which can make it easier to be left alone.

## Literature Review and Other Research

This topic of the connection between homelessness and water quality is a relatively new area of research. There have not been many formal studies conducted, but the information available has illustrated the challenges in connecting water pollution or contamination to a single source. Studies that highlight habitat degradation and trash from homeless encampments are more readily available, and the impacts are easier to quantify. The research shows that the level of environmental impact is primarily influenced by the size and type of encampment. Existing research regarding impacts to water quality and the environment was conducted in several counties in Northern California and San Diego County. Riverside County

and San Bernardino County have conducted small-scale research projects on this topic and are currently evaluating the effectiveness and weighing the costs and benefits of entering into full-scale studies and monitoring plans for the region.

### Riparian and Aquatic Habitat Impacts of Homeless Encampments

#### Guadalupe River – San Jose, California

Courtenay White's 2013 master of science thesis on environmental impacts of homeless encampments on the Guadalupe River riparian zone categorized impacts by three distinct types of environmental degradation: streambank alteration, riverbed and stream course alteration, and all other parameters which include the destruction of vegetation, trail building, fire building, and wildfire (White 2013). By sampling four sites along the Guadalupe River—a control site, and sites with a minimal, moderate, and heavy use by encampments—White categorized the amount and type of trash found at each site, type of alteration discovered, and type of encampment.

White's onsite research and literature review determined riparian zone alterations such as terracing, vegetation removal, and trail building can cause streambank degradation by "displacing naturally occurring sediments and increasing erosion leading to ongoing sedimentation" into the stream (White 2013, 49). Sedimentation into a river may have multiple impacts on aquatic species, including changes to "algal, fish, and invertebrate populations [through] decreased light penetration, smothering and scouring, and decreased habitat diversity" (White 2013, 49). White's sampling efforts at the four sites yielded 48 observed alterations determined to be caused by encampments, which she highlighted may have impacts on Guadalupe River's endangered fish populations. As mentioned in the biology section of the project area description, the SAR has several endangered and threatened fish, bird, and plant species, including the Santa Ana Suckerfish, Arroyo Chub, Least Bell's Vireo, and the Santa Ana River Woollystar (IEWK 2018; CDFW 2015). These species may be negatively impacted by similar riparian zone alterations found in White's observations.

#### Contra Costa County, California

A 2013 study and report by UC Berkeley graduate student Saneta DeVuono-powell sponsored by Contra Costa County Flood Control District (CCCFCFCD), categorized encampments and their occupants into three types—old-timers, newcomers, and veterans. Old-timer camps

are well established and structured yet tend to have the most trash and materials because they have been in the same area for so long (DeVuono-powell 2013, 13). Newcomer encampments have occupants who do not identify as being homeless and look at their situation as being temporary and tend to be more transient. As such, the amount and treatment of human waste is the most concerning issue with newcomer camps. Finally, veteran camps are those with occupants who have likely served in the armed forces. The characteristics of the veteran camps build off of the occupants' former training. The camps are small (1-2 people), nearly invisible to the public, and generally practice a "leave-no-trace" policy for waste (DeVuono-powell 2013, 13).

### Water Quality Impacts

The current research of direct impacts on water quality due to homeless encampments is nascent and mainly based on anecdotal evidence. However, there are several studies underway that are exploring if there is a direct connection between water quality degradation and the presence of encampments near water bodies. Highlighted below is some of the work that has been completed or is currently underway.

#### *Dr. Phil Gedalanga – Santa Ana River Water Quality and Homelessness*

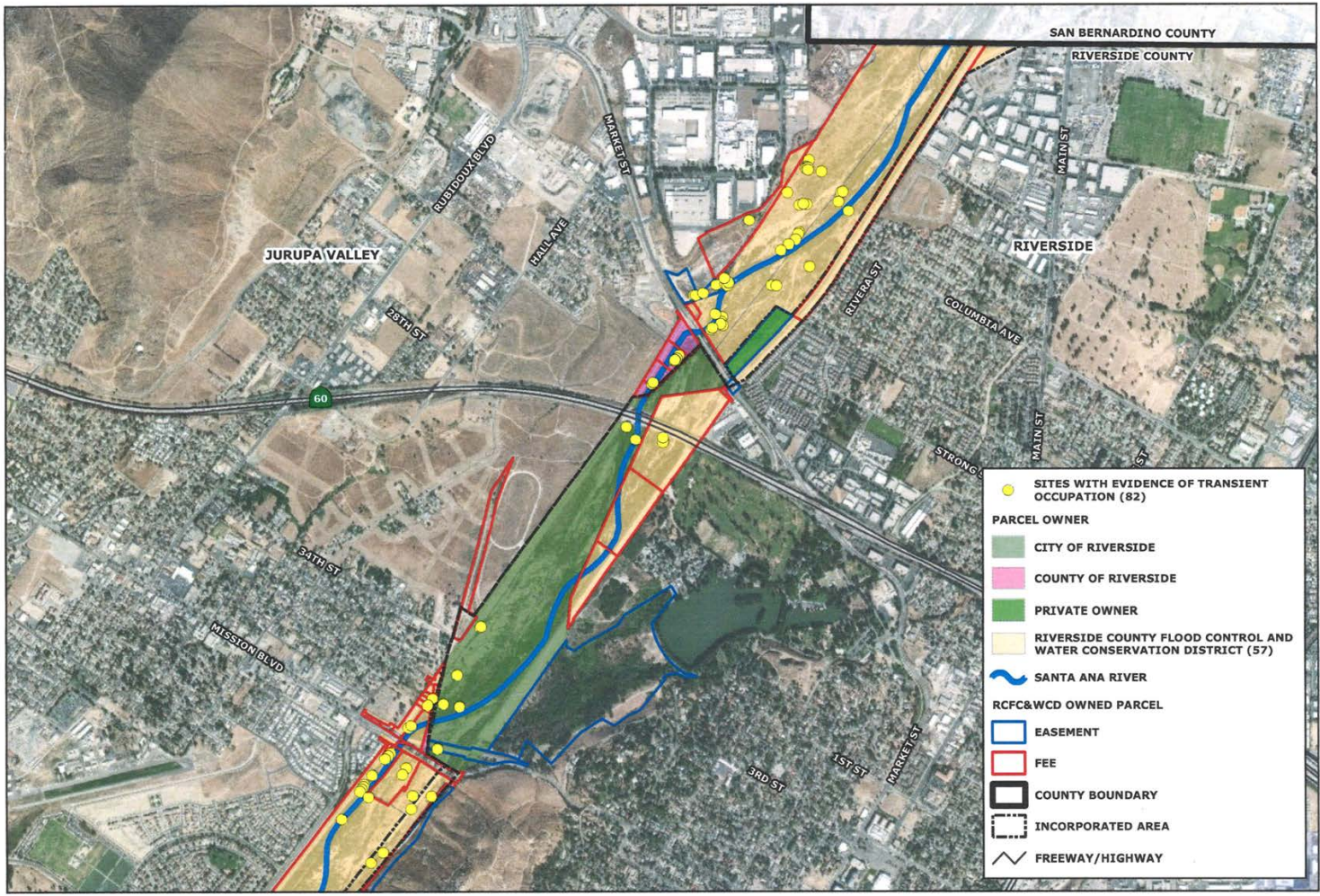
Human impacts on water quality of waterways come from a variety of activities, including recreation, wastewater effluent, industrial and agricultural runoff, and homeless encampments (Gedalanga 2019). Local agencies know water quality is degrading in certain reaches of the SAR, but what is challenging is determining at what levels human sources are contributing to the water quality decline compared to other sources of water quality degradation. Locally in the SAR, Dr. Phil Gedalanga at California State University, Fullerton is performing research with IEWK to determine "fecal contamination 'hotspots' in the Santa Ana River [and] develop a microbial community approach to MST [microbial source tracking]" (Gedalanga 2019). With the data collected, his goal is to assign a microbial footprint related to a specific course of pollution in four critical locations along the SAR. Initial results of the study show there are notable wet versus dry weather influences, which include a heightened HF183 concentration—the human source marker—during Southern California's unusually wet winter 2018-2019. Dr. Gedalanga did not discuss if the increase in HF183 can be 100% attributed to

human waste coming directly from encampments. However, one can hypothesize the increases may be tied, at least partially, to the increased flows of the SAR where encampments may have been previously located and where human waste remained after the occupants of the encampment moved to another location.

*Richard Boon – Riverside County Flood Control and Water Conservation District*

Richard Boon's interview took place at the Riverside County Flood Control & Water Conservation District (RCFC&WCD) office in February 2019. During the interview, Boon explained, "the Santa Ana River, especially the middle reaches of the river, is gaining bacteria even in areas without known encampments based on the Total Maximum Daily Load (TMDL) annual reports" (Boon, Personal Communication, 15 February 2019). Boon and his RCFC&WCD team closely monitor the effects of Southern California's drought-busting winter 2019 season and expect to see increased runoff and heightened bacteria levels in the SAR. In order to understand and analyze the current locations of encampments within their service area, RCFC&WCD has undertaken a two-phase aerial mapping project using GIS and high-resolution aerial imagery to survey and map the visible encampments located along the SAR. While still underway at the time of the interview, Boon explained RCFC&WCD had already mapped dozens of encampments in the reach of the SAR near the RCFC&WCD office in the city of Riverside (Boon, personal communication, 15 February 2019).

The map on the next page shows Reach 3 of the SAR. This reach of the SAR is one of the more populated areas of the SAR for encampments in Riverside County because of its proximity to commercial areas within the City of Riverside and the favorable mix of thick vegetation for privacy and stable gravel as opposed to the loose, sandy banks found downstream.



**SITES WITH EVIDENCE OF TRANSIENT OCCUPATION WITHIN THE SANTA ANA RIVER  
IN RIVERSIDE COUNTY - AERIAL SURVEY JULY 2018**

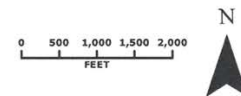


Figure 6: Source Riverside County Flood Control and Water Conservation District

### *Santa Ana Watershed Project Authority (SAWPA)*

SAWPA is a joint powers authority is comprised of five-member water agencies that focus on a wide variety of water resource issues within the SAR watershed. Initially developed in 1968 to manage integrated water resources planning and maintain regional plans, SAWPA's role has expanded over the last several years. SAWPA's efforts include developing programs and facilitating partnerships with water agencies and regional organizations to protect the water quality and beneficial uses of the Santa Ana River and its tributaries. The evolution of the agency's mission and purpose has led SAWPA to be involved in studies and partnerships to evaluate homelessness along the Santa Ana River. Two recent efforts have provided some insight into the potential connection between water quality and homelessness in the Santa Ana River.

#### ***1. Middle SAR Synoptic Study***

SAWPA facilitates the Middle SAR Task Force to implement the TMDL for fecal coliform bacterial indicators adopted by the Santa Ana Regional Water Quality Control Board (RWQCB) in the middle SAR, specifically Reach 3, in December 2004 (SAWPA n.d. B). In 2019, the task force undertook a six-week water quality sampling study to evaluate compliance with the bacteria TMDL. At one of the sampling sites near the Mission Boulevard bridge, where a high density of homeless encampments was documented during several surveys, the sampled indicated the presence of human source bacteria at the sample site on 14 August. A few weeks later, the site was resampled, and there was no presence of human source bacteria (GEI and CWE 2020, 4-2). Again, while indicators of human waste were present at certain times of the study period, there was no consistent presence found in high-density encampment areas and could not provide a direct link to water quality conditions and encampment locations.

#### ***2. Study on Homeless Encampments in the Santa Ana River Watershed***

In early 2019, the five SAWPA member water agencies came together to discuss the need and scope of what it would take to evaluate the impacts of homelessness on Santa Ana River water quality and riparian habitat. Western Municipal Water District (WMWD) is one of the five SAWPA member agencies and is also my current employer. WMWD management asked me to participate in this homelessness and water quality discussion. SAWPA used Proposition 1 Disadvantaged Community Involvement (DCI) grant funding from the Department of Water

Resources (DWR) to study the potential impacts of homelessness on the SAR and also design a monitoring program to evaluate potential water quality effects over a multi-year period. I began to research this topic for several of Master of Natural Resources courses here at Oregon State University. At the same time, SAWPA hired consultants GEI Consultants, Inc. and CWE to develop the report and monitoring program. In January 2020, the initial report titled “Homeless Encampments in the Upper Santa Ana River Watershed” was released. The findings of this report are similar to the findings in my research and include some of the same sources of information. The findings of the report will be mentioned several times in this paper. The general findings from the SAWPA Homeless Encampment report by GEI and CWE, specifically on water quality impacts, are found to be mostly anecdotal. The most probable water quality impacts from encampments are primarily from human waste and toxic chemicals found in the trash (GEI and CWE 2020, 4-1).

#### *San Diego County, California*

In 2011, San Diego County formed a workgroup with the county’s permitted municipal separate storm sewer systems (MS4s) and a consultant to develop a source prioritization process. The workgroup developed conceptual models to analyze water quality data in wet and dry weather conditions, as well as categorize sources of pollution as direct human origin, anthropogenic (non-human origin) which result from human activities but are not directly from the human body, and non-anthropogenic (Clary, Pitt, and Steets 2014, 42). The group then associated the potential sources with other parameters such as human health risk, magnitude, geographic distribution, controllability/implementability, and frequency to assign a weighted factor to the sources.

Based on the model as applied to conditions in the San Diego River, human waste from homeless encampments was the number two highest-scoring dry-weather contributor for fecal indicator bacteria in the San Diego River (Clary, Pitt, and Steets 2014, 45). Fecal bacteria from homeless encampments tied for the highest-ranking with sanitary sewer overflows—both received scores of 105. For comparison, illegal discharges and MS4 infrastructure (biofilm and regrowth) dry-weather scores were 40 and 33, respectively. The information from San Diego County is telling because especially during dry-weather conditions without regular storm flows



to dilute surface water, the bacteria levels from human waste can affect the localized water quality of rivers.

### Policy and Regulatory Implications

Policy and regulation play a significant role in how resource agencies, cities, and countries address homelessness. Many local agencies are grappling with the homelessness issue by implementing short-term solutions either due to capacity limitations, funding shortfalls, or lack of support and cooperation from neighboring entities. In this section, I will explore how policy and regulation play into the homelessness crisis, and how some agencies have found success working within political and regulatory constraints while highlighting the struggles other agencies face with changing policy and stringent regulation.

### Challenges

The 1972 Clean Water Act (CWA) plays a significant role in and can pose serious challenges to addressing encampments along water bodies. CWA's goal is to regulate discharges into the waters of the United States (WOTUS). Many sections of the law require even minor interference in waterways to undergo federal review and obtain a permit for the activity. There is good reason for these sections; however, they can come with unintended consequences for local agencies. The CWA has, in some cases, become a regulatory roadblock that affects an agency's ability to address large encampments or those with hazardous materials promptly. Before addressing pollution from an encampment, an agency must first determine if a permit is required for the proposed work, and delays in obtaining any required permits may occur. Agencies with jurisdiction in and along rivers are generally allowed to perform trash removal by hand and small equipment without any regulatory intervention. However, anything beyond these efforts, such as grading of access ramps, roads, or vegetation removal, will likely require a Section 401, 404, or streambed alteration agreement under the CWA (San Diego RWQCB 2017).

During Richard Boon's interview, he explained RCFC&WCD's challenges to expedite encampment cleanups, particularly when a storm is approaching in the days ahead. Current practice at RCFC&WCD's is to provide the encampment occupants with a 72-hour notice to vacate before attempting to perform a cleanup (Boon, personal communication, 15 February

2019). However, the clearing/cleanup attempts can be delayed if a permit is required to do the work to clean and clear the site properly.

DeVuono-powell's report for CCCFCD stated camps in urban creeks and rivers "are increasingly drawing flood control districts into the social services realm as they contend with water pollution caused by these camps" (DeVuono-powell 2013, 3). She continues to say the CCCFCD is "very well equipped to deal with environmental and structural challenges of maintaining the water supply; it is arguably less equipped to deal with the social challenges posed by the encampments set by the creeks" (DeVuono-powell 2013, 7). As such, DeVuono-powell highlights the disconnect between the needs and goals of local agencies and state and federal resource agencies such as the Department of Fish and Wildlife and Army Corps of Engineers, which have the primary function of species and infrastructure protection (DeVuono-powell 2013, 20).

Contradicting policy has also posed challenges for agencies such as regional water quality control boards (RWQCB) throughout the state of California. A 2017 symposium hosted by the SAWPA and IEWK on the connection between homelessness and water highlighted a disconnect between new policies and implementation. For example, AB 685 "Human Right to Water", signed into California law in 2012, states that "every human being has the right to safe, clean, affordable, and accessible water adequate for human consumption cooking, and sanitary purposes"; yet section one of the bill states the current section "does not expand on any obligation of the state to provide water or require the expenditure of additional resources to develop water infrastructure beyond the obligations that may persist pursuant to subdivision (b)" (California Assembly Bill 685, 2012).

At the 2017 symposium, representatives for the Environmental Justice Coalition for Water and the Santa Ana RWQCB commented on the difficulties of putting this legislation into practice. Because "of the way it currently is written" and the need for significant policy work to be done before permitting—which is the regional board's primary function—the legislation could be used to address the human right to water (SAWPA 2017). This kind of legislation places the responsibility on local entities to address the human right to water without a clear plan for

funding and implementation. Unfortunately, agencies and cities often find themselves trying to interpret policy with little state or federal assistance.

### Successes

A few years ago, the San Francisco Bay Regional Water Quality Control Board passed a new resolution that requires Bay Area cities and counties to achieve virtually trash-free storm drains by 2022. The resolution includes trash explicitly from homeless encampments, which falls under the stormwater permit (Meadows 2016). While this was a considerable undertaking, Bay Area cities, counties, and water agencies have been able to work within the permitting requirements to develop solutions to address the encampment trash issue. The City of San Jose, City of Oakland, Contra Costa County, Santa Clara Valley Water District, Santa Clara County have formed partnerships under tightened regulations to improve water quality and habitat along their local waterways. The exploration of these efforts is detailed in the following section. While this has not solved the homelessness issue in these areas due to the cyclical pattern of homelessness, it has served as an example to other areas on the power of coordination and resource sharing for complex programming.

### The intersection between Policy and Public Perception

Megan Brousseau's interview was conducted in February 2019. Just weeks prior, her organization, IEWK, hosted the 2018 Solving Homelessness in the SAR Watershed Symposium at a local university. I attended, and there was a good discussion surrounding the efforts of the three counties along the SAR and what could be consolidated and improved. When we met, Brousseau mentioned that she felt the symposium was a success in terms of attendance. It was a particularly stormy morning in Southern California, and the event was at capacity. However, Brousseau expressed disappointment because the influential people and key decision-makers within the SAR watershed were not in attendance to commit to the next steps and action items required to facilitate real change (Brousseau, personal communication, 20 February 2019).

Brousseau explained how some local entities face adverse reactions when the word is made public about an agency's trash collection efforts or providing services in exchange for agreeing to leave the encampments. The adverse reactions tend to come in the form of disapproving comments in community forums on social media websites like Facebook and Nextdoor. Generally, the comments criticize these efforts and discuss how the services are

likely encouraging people experiencing homelessness to stay put and not seek help because they are benefitting from regular trash collection and waste removal. Further, Brousseau commented on how some neighboring cities along the SAR do not cooperate well due to the fear of negative public perception. This fear may be driving entities to undertake enforcement or cleanup projects along the SAR quietly, and this is where a lack of coordination and duplicate efforts tend to occur (Brousseau, personal communication, 20 February 2019). A significant point Brousseau made towards the end of our discussion is about California being a progressive state when it comes to environmental legislation, referencing camping on public lands, and safe drinking water legislation. However, she explained, “legislation is vague and difficult to implement, [so] how can these resource agencies begin to implement policy when there is no defined implementation strategy or funding mechanism” (Brousseau, personal communication, 20 February 2019).

## Successful Programs and Partnerships

### Project Clean Water

Project Clean Water is “a web-based portal that provides a centralized point of access to water quality information and resources for San Diego County, South Orange County, and South Riverside County” (Project Clean Water n.d.). The project started in the year 2000 to provide a forum for discussing regional water quality issues and for local agencies to work together to address these issues. The organization and website were made even more robust when in 2013, the San Diego RWQCB updated the region’s National Pollutant Discharge Elimination System (NPDES) permit for the MS4s. The new permits required a regional clearinghouse to provide the public with information on water quality and protection efforts (Project Clean Water n.d). Today, the website serves as a user-friendly database for water quality improvement plans, annual reports, urban runoff management plans, and other projects and studies. This kind of “one-stop-shop” for water quality resources of water quality information across several watersheds in the Southern California region is an example of how more data should be available to all to maintain transparency and trust of government agencies.

### San Diego River Trash Cleanup Mapping Tool and Database

The San Diego River Park Foundation developed the San Diego River Trash Cleanup Mapping Tool to provide the public with information on trash location and cleanup efforts in

the San Diego River. This 52-mile river flows through dense urban areas of San Diego County. As shown below, the mapping tool is easily navigable to search for specific types of trash by source, encampment locations, and spatially displays the work completed or currently underway by the River Park Foundation volunteer teams. This kind of tool would be valuable to have available for the Santa Ana River system to guide informed decision-making across jurisdictions and agencies. More on this is discussed in the Recommendations section.

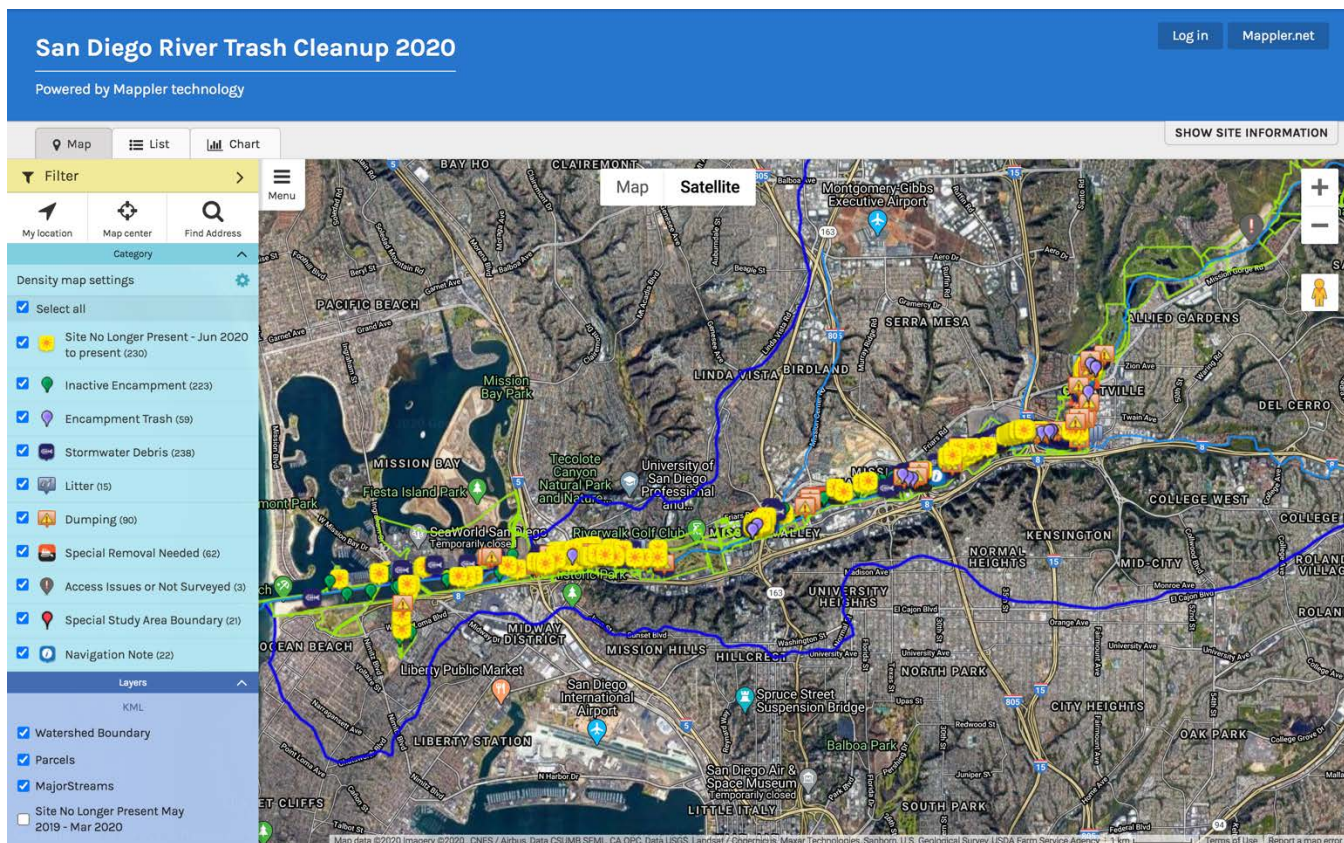


Figure 7: San Diego River Trash Cleanup Mapping Tool

### City of San Diego

To round out the resources the San Diego area has for people experiencing homelessness and living in the area’s urban waterways, it is worth mentioning the progress the City of San Diego has made to provide resources for the city’s homeless community. San Diego’s mayor, Kevin Faulconer, spoke about the city’s progress at the Central Coast RWQCB’s day-long symposium titled “Challenges & Solutions: The Intersection of Water Quality and People Experiencing Homelessness on the Central Coast” held in October 2019. Mayor Faulconer attributed the city’s success in the San Diego River to bringing together all parties monthly to

address the homelessness issue, including city, county, and federal representatives, as well as private property owners. He explained the importance of including the private property owners along the San Diego River as they can assist local public entities with the process of identifying new encampments and providing updates on existing encampments. Finally, forging partnerships with the San Diego River Park Foundation and the San Diego RWQCB has allowed for extensive volunteer work, the mapping tool detailed in the section above, and regulatory support for the homeless services provided in the San Diego River. Through these partnerships, Faulconer claimed a 90% reduction in the number of encampments in the San Diego River (Faulconer 2019).

Mayor Faulconer also stressed having resources available for the homeless community once the encampments are cleared. The city currently has four bridge shelters with 750 beds, which offer comprehensive services for people experiencing homelessness (Faulconer 2019). The city temporarily stores unsheltered individuals' belongings, provides safe parking lots for overnight parking, and administers a family reunification program that the mayor credits as being the key component to the overall success in the city. Finally, Faulconer explained how important it was to work with community members unwilling at first to have bridge shelters in their neighborhoods, by promising the community that the streets in their neighborhood will be cleaner and healthier with a bridge shelter in it.

#### *Trash Cleanup Pilot Program in "The Jungle"*

Bay Area cities and agencies were faced with increased water quality regulation by the San Francisco Regional Water Quality Control Board. They found ways to work within the regulation to form partnerships, secure funding, and begin to make progress towards cleaning up the urban waterways. In 2011, the City of San Jose partnered with the Santa Clara Valley Water District (SCVWD) and Santa Clara County to look for a possible solution to address the homelessness issue in their area, including the massive encampment called the Jungle. The entities developed a pilot program to combine cleanup efforts with the offering of social services. The one million dollar and the four-year program received a significant grant from the Environmental Protection Agency (EPA) and successfully cleared "618 tons of debris, 2,850 gallons of biowaste, 1,200 needles, and 315 shopping carts" (Meadows 2016). Brett Calhoun, a water quality specialist for SCVWD, saw this effort as an unexpected new path towards

improving water quality. “I was personally shocked that the homeless population was going to be addressed through the stormwater program—that this was the strongest regulatory driver” (Meadows 2016).

#### *Russian River Clean Camp and Education Program*

After recognizing the tremendous effort required of local agencies to coordinate encampment evictions and subsequent cleanups only for the encampments to return days or weeks later, the Russian Riverkeeper in Northern California formed a successful program called the Clean Camp and Education program. They found a way to address the amount of trash coming from encampments by “teaching the people along the [Russian] river to use leave-no-trace camping practices and provides bags for a weekly trash pickup service at the camps” (Adams 2018). The program has been so effective at clearing trash from the Russian River that Sonoma County contributed \$150,000 of hotel tax revenue from tourism towards the program.

#### *Clean Camp Coalition – Santa Ana River*

Megan Brousseau of IEWK saw the success of the Russian River program and wanted to bring the same concept to the SAR Watershed. IEWK partnered with the Rivers and Lands Conservancy to bring the Clean Camp Coalition (CCC) to the SAR. CCC program components include the mapping of encampments, water quality testing using Dr. Gedalanga’s work, outreach to camps about the program, trash collection, trash data collection (RAPID), and coordination with resource providers to offer services, including housing (Brousseau 2019). The program outlines strict trash collection protocols for the encampment occupants to follow in order to participate in the program. Brousseau said these strict rules were beneficial in creating boundaries and healthy rituals for the people experiencing homelessness in the SAR.

The photos below show the trash bags distributed as outreach to the encampment occupants with the pickup rules provided. The trash bags are picked up from designated locations weekly, and thus far, the outreach and relationship building has proven to be a successful, however, staff intensive solution.



Photo Source: Inland Empire Waterkeeper Presentation to SAWPA Commission 19 February 2019



Photo Source: Inland Empire Waterkeeper Presentation to SAWPA Commission 19 February 2019

In Brousseau’s interview and at the 2018 Solving homelessness in the SAR Watershed symposium, she cited funding, agency cooperation, and securing partners as challenges in getting the CCC up and running. We discussed why she feels this program is such a step forward and why, despite all the challenges she faces, does she keep fighting so fiercely for these issues in the watershed. Her answer stood out to me. She said, “We have got to stop the bleed. We cannot fix [the] societal issues of homelessness in 20 years, but we can meet the basic needs of clothes, food, and shelter. The trauma and addiction can be addressed [as needed]” (Brousseau, personal communication, 20 February 2019). She continued to explain that



Riverside County can build shelters, but they cannot build them fast enough to offer housing to everyone that needs it. Brousseau's team at IEWK is doing work to bridge the gap between city and agency contributions through providing trash collection, porta-potties, and connecting individuals to available resources (Brousseau, personal communication, 20 February 2019). As we left the interview, Brousseau reminded me of what she sees herself and mission to be a "facilitator of non-traditional partnerships" (Brousseau, personal communication, 20 February 2019).

### COVID-19 Implications

During the initial stages of my research for this capstone, I could not have anticipated the situation the world is currently facing with the COVID-19 (Coronavirus) pandemic. The spread of this virus and the portions of the population it is affecting most severely brings forth the need to acknowledge how the unsheltered homeless are a particularly vulnerable population and discuss the challenges and possible opportunities this pandemic may bring.

#### Challenges

Even before the COVID-19 pandemic, the lack of access to clean, drinkable water for unsheltered people experiencing homelessness was a top concern. According to a 2017 case study in Phoenix, Arizona, the primary water source for people experiencing homelessness and living in encampments was a surface water source such as a river, rainwater, floodwater, and irrigation water from nearby business used for light cleaning, bathing, and cooling off on hotter days (DeMyers et al. 2017, 76). Public health officials state that one of the main ways to prevent the spread of COVID-19 is to wash hands frequently and sanitize the hard surface items in which you come into contact. Many people living in encampments rely on access to public restrooms and water fountains in parks, public plazas, convenience stores, and even restaurants to keep clean and hydrated. It likely was challenging enough pre-COVID-19 for those living in encampments to have enough water for drinking, cooking, and sanitizing. The additional water needed to adequately sanitize and prevent spreading COVID-19 is likely more challenging to secure, considering that in many states—at one time or another—closed public park facilities, restaurants, and retail stores. The study in Phoenix found that approximately 15% of available public water resources were unusable due to being "unsanitary to the point of

dysfunction, closed or locked during open hours, or inaccessible due to other factors such as a private event” (DeMyers et al. 2017, 75). The percentage of unavailable or unusable public water resources and facilities has likely increased due to COVID-19.

An additional concern is that encampments involve a group of people living in close quarters, which can cause the spread of COVID-19 to run through encampments quickly. There is past evidence that demonstrates how infectious diseases can spread through homeless encampments at an alarming rate. In 2017, San Diego experienced an outbreak of hepatitis A among the homeless population and drug users. In just over ten months, 584 people were diagnosed with hepatitis A, nearly 400 were hospitalized, and 20 died (Pitzer 2019). COVID-19 is proving to be very infectious and possibly more deadly than other diseases such as hepatitis A because of the number of asymptomatic individuals and severe complications with older people and those with underlying health conditions. According to Megan Brousseau, encampments in the SAR typically have between two and four people (GEI and CWE 2020, 2-27). Fortunately, the amount of people per encampment is about how many people typically reside in a single-family household. However, with little to no access to clean water and many of the public facilities closed or unusable at this time, this may increase the amount of human waste entering the SAR for the duration of the COVID-19 pandemic.

Volunteer groups in the area that routinely distribute bottled water to encampment occupants and collect trash from the encampments may not be performing these services at this time to minimize risk for the volunteers. Between the reduced number of volunteers available to distribute water and hygiene supplies and the shortage of personal protective equipment and medical supplies, supporting the homeless population through the pandemic has become increasingly challenging. The SAR watershed’s resource agencies were informed that Inland Empire Waterkeeper (IEWK), based in Riverside, CA ceased all local watershed services and operations effective March 2020. The details of the closure are unknown at this time; however, the loss of the watershed advocates and volunteers places a greater strain on the already challenged system of homelessness services.

California’s wildfire risk and the threat of COVID-19 has required the state to plan for and think closely about the safety of firefighters and evacuees during the pandemic. There is

certainly a higher risk of wildfire in the SAR due to dry conditions, thick vegetation, and the presence of homeless encampments. It will be necessary for local cities and counties to plan to educate the homeless population living in the SAR on the wildfire risks and consider the strain on financial and firefighting resources due to COVID-19. The additional risk of fire in urban waterways increases the vulnerability of SAR riparian habitat and wildlife.

### Opportunities

While the effects of COVID-19 are severe, the pandemic appears to be providing an opportunity to address the homelessness issue in the SAR watershed counties with increased urgency and funding. California's governor, Gavin Newsom, signed S.B. 89 on 17 March 2020, authorizing up to \$1 billion to provide emergency assistance to help fight the spread of COVID-19. Of the up to \$1 billion in emergency funds, \$100 million in funding was allocated to local cities and counties to help protect people experiencing homelessness from COVID-19 (Riverside DPSS 2020). The funding is "intended for investments into COVID-19 prevention and containment efforts for shelters, including, but not limited to, medically indicated services and supplies, such as testing and handwashing stations, and enhancements to existing shelter facilities" (Riverside DPSS 2020). In March 2020, the County of Riverside Continuum of Care (CoC) was awarded a grant for these COVID-19 protections for \$547,812.48 (Riverside DPSS 2020). The County of Riverside was allocated \$504,002.12, and the city of Riverside \$1,135,237.64 (Highland Community News 2020). The City of San Bernardino and CoC received an allocation of \$508,056.61, and the County of San Bernardino was allocated \$467,425.66 (Highland Community News 2020). Orange County's allocation, if any, could not be identified in my research. While the accelerated plans and boosting of funding will not solve the long-term homelessness issue in the SAR riparian areas and watershed, it is a step in the right direction to offer people experiencing homeless immediate temporary housing services and transition to more permanent support.

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*“Although COVID-19 has forced everyone in our community to make difficult decisions, it has also provided us with an unprecedented opportunity to support people experiencing homelessness...Our hope is that through this crisis, homeless individuals will recognize the county and community’s commitment to end homelessness and seek extended services which lead to permanent housing, employment, wellness, and resiliency.”*

*– Gary McBride, San Bernardino County Chief Executive Officer (S.B. County 2020)*

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## Recommendations

While a direct and definite link between homeless encampments and water quality impacts cannot be made by science at this time, we know there are direct impacts to riparian habitat from trash and streambank alterations and have seen evidence of it in the SAR and other watercourses in California. Based on what regions have done to mitigate these impacts, coupled with the resources and recommendations provided at the previously mentioned Central Coast Water Board’s symposium on homelessness and water quality in San Luis Obispo, California, below are recommendations for the SAR watershed. The areas covered are policy, management, funding, and monitoring and evaluation recommendations to enhance homelessness services and reduce impacts on the SAR.

### Policy Recommendations

#### Eliminate barriers to data sharing among agencies

There is a substantial need to coordinate efforts to study the impacts of encampments in the SAR, increase awareness of the services available to those vulnerable populations, and enable the sharing of data across jurisdictions. As mentioned in a previous section, in January 2019, I attended the 2018 Solving Homelessness in the SAR Watershed Symposium held at California State University, San Bernardino. Through group discussions, it was discovered that the county of San Bernardino has difficulties sharing data between county departments. Eliminating these barriers would help provide a link to which services an individual may be eligible for or may be already receiving within the county. San Bernardino County

representatives cited bureaucratic red tape and technological, legal, policy, and privacy (HIPPA) hurdles between law enforcement and social services departments as the most significant barriers for a successful homelessness services program.

Local agencies, including counties and cities, should push through these barriers by developing data-sharing agreements, non-disclosure agreements, and memorandums of understanding (MOUs) to facilitate data sharing across jurisdictions. The largest encampments along the SAR are located near the Riverside County and San Bernardino County border. Sharing the information across counties would be beneficial to make multiple jurisdictions aware of the encampment locations and their status, as well as determine if an individual is already receiving services from a particular agency.

Many agencies use ERSI software such as ArcGIS and ArcMaps to organize and spatially display their data. Because a large number of agencies in the region already use this software, the ability to share data is available without significant or costly effort. It will require policy changes from executive management of these agencies to eliminate the barriers and proceed with data sharing tools to ensure multi-jurisdictional access to valuable data.

#### *Identify and discuss regulatory constraints in encampment cleanups*

The regulatory constraints discussed in the Policy and Regulatory Implications need to be identified and discussed with the regulating agency if the issue of encampment cleanup and relocation is to be effectively addressed. One suggestion would be to invite representatives of the regulatory agencies and local SAR agencies together in a neutral setting well in advance of any permitting needs to have an open discussion. The local agencies may find ways to expedite any required permits or documentation by knowing what the regulatory agencies expect and when it is expected. In this case, preparation and a frank conversation on from all sides on what the challenges and limitations are and the effects may help all parties see the issue more clearly and come up with solutions.

#### *Reconsider law enforcement as initial service providers to homeless encampments*

Police officers and sheriffs are often the first onsite to calls of encampments in waterways. This procedure may not prove to be the best option as many people experiencing homelessness do not trust law enforcement or believe they will be punished if they accept assistance. A better option for the first approach of encampments in waterways to provide services is a

representative from housing services and behavioral health. The City of Temecula in Riverside County, which does not have jurisdiction along the SAR but does along smaller creeks and watercourses Riverside County have a dedicated homeless outreach team consisting of four law enforcement officers. Temecula dedicated \$1.4 million in homelessness-related public safety costs in 2016 when the PIT count recorded only 37 unsheltered individuals within the city (RCFC&WCD 2017). Additionally, the Riverside County Sheriff's department has two dedicated homeless outreach liaisons as of early 2019, which spread their resources throughout the county (Vasquez and Espinoza-Martinez 2019). A better approach for the large geographic areas would be to spend the funding resources available on trained non-law enforcement personnel to offer assistance and help build relationships and trust with the encampment residents in hopes they eventually accept assistance.

#### *Remove barriers to accepting shelter and aid*

Many shelters and housing facilities in the area do not allow pets to accompany their owner, which can be a significant barrier to between 5 - 25% of the homeless population accepting housing services (S.B. Sun 2016). Pets provide companionship and comfort to people experiencing homelessness. Many consider their pets like family, and they may be the only regular and consistent part of their lives, particularly if they are struggling with mental illness. Both the City of Los Angeles and Los Angeles County recently moved closer to approving a motion to require any city or county-funded housing to allow pets (Ogilvie 2019). Many shelters and housing facilities in the area do not allow pets to accompany their owner, which is one of the significant barriers to the homeless population accepting housing services. Fortunately, the City of Riverside has a pet kennel located at its homeless shelter.

Additionally, consider updating outreach efforts and strategies to make assistance more appealing. For example, DeVuono-powell's 2013 report touched upon the idea of timing outreach for housing and social services during the winter rather than the summer, when the need for shelter from cold temperatures and storms is greater and the offer more likely to be accepted (DeVuono-powell 2013, 20). The wet weather season is the most dangerous time for people living in encampments within waterways due to the chances of flood events that often come on quickly in the SAR watershed. Anticipating the increased need for shelter during this time and targeting outreach in advance of a severe storm event could increase the number of

individuals willing to accept offsite shelter and may help clear the waterway of occupants before the storm event.

#### Use collective political power for effective change

Larger agencies in the SAR use lobbyists to support or deter potential legislation. Agency lobbyists should focus on rallying support for more federal and state funding and resources for this social and environmental issue as they have in the past decades. As mentioned in the introduction, California's homeless population is approximately 25% of the nation's homeless population. Local entities cannot do this alone. "While there is a willingness to address systemic issues, there is a problem with the lack of capacity to implement meaningful measures on their own" (DeVuono-powell 2013, 25).

#### Management Recommendations

##### Create a watershed-wide clearinghouse for homelessness data

Opportunity exists to bring the data together in one place and share it on a semi-private or public platform for the benefit of all. As mentioned in the policy subsection above, there are challenges in sharing data even *within* county departments. To promote data sharing and transparency across agencies and the public, an easily accessible clearinghouse of data collected by county, city, water agency, law enforcement, and non-profit entities is recommended to reduce the number of duplicate efforts being conducted within the SAR watershed. For example, in my research, I discovered several agencies are currently using drone footage to assess, map, and track the number of encampments near their facilities in the SAR. The City of Rialto, OCWD, San Bernardino Valley Municipal Water District (SBVMWD), and RCFC&WCD are some of the agencies undertaking their efforts to track and map encampments and storing this data in private and separate databases. There are likely more agencies within the watershed conducting this type of data collection as well.

There is an opportunity for partnerships for regional water quality control boards, flood control districts, non-profits, and water agencies to come together to cost-share in efforts to maintain water quality standards and protect SAR riparian habitat. Working towards developing a clearinghouse for this data is key to maintaining transparency and gaining the trust of the public in the SAR watershed. Non-profit organizations in the watershed such as the River and

Lands Conservancy, academic institutions like the University of California, Riverside, or a joint powers authority such as SAWPA are possible locations for the data clearinghouse.

#### *SAR restoration/mitigation projects to assist in encampment services*

At any given time, mitigation and restoration projects are occurring along the SAR's 96 miles from the mountains to the coast. Often, these projects are implemented to mitigate for infrastructure projects or water projects that change wastewater discharge locations along the river or to comply with permitting requirements. With these projects, there is an opportunity to consider the encampments that may be within the vicinity of the restoration or mitigation project and plan for the effect the project may have on the encampments and vice versa. In the CCCFCD study by DeVouno-powell, she recommended using low-lying native grasses for mitigation projects in waterways, which are less desirable to the homeless population than large trees and shrubs (DeVouno-powell 2013, 22). Additionally, the hiring of full-time ranger positions to monitor the project area for the future has been recommended as a part of the Upper Santa Ana River Habitat Conservation Project restoration sites along the SAR.

However, it is essential to understand and consider that by restoring and protecting certain areas of the river for conservation and recreation, there is the possibility of pushing out individuals in encampments that may have nowhere else to go at the time. Thus, in the efforts to preserve the wilderness and restore areas to a "pristine" state, it may inadvertently exacerbate the encampment situation elsewhere on the river and lead to additional habitat disturbance and water quality impacts in other areas. This challenge is something to keep in mind for future projects, and it is recommended that restoration and mitigation project proponents make additional effort to ensure homeless services are ready and available to assist during and post-project implementation.

#### **Funding Recommendations**

Securing funding for programs and projects to protect water quality and habitat while also providing services to the people living in urban waterways is possible. Funding is often the next obstacle to tackle once management and policy decisions have been made. As explained in several of the meetings I attended on this issue, there is money to develop partnerships and



further collaborations. However, creativity and an openness to non-traditional partnerships are key.

#### Federal Funding Opportunities

The CoC funding through the U.S. Department of Housing and Urban Development (HUD) is available to non-profits and local government agencies to provide housing services and enhance access to existing social programs for people experiencing homelessness (HUD Exchange n.d.). In my research of the three counties in the watershed, all have a CoC program and receive funding from this federal resource.

#### State Funding Opportunities

California has a variety of water-related grant opportunities available that require or prioritize projects with multiple benefits. These are the types of funding opportunities that local entities in the SAR Watershed should be looking to partner together to apply for to study the long-term impacts of homelessness on SAR water quality. For example, California's Proposition 1 has a second round of funding that opened in April 2020. The State Water Resources Control Board (SWRCB) will administer \$100 million in grant funding for this round and are seeking multi-benefit stormwater management projects with a nexus between stormwater quality, stormwater permits, and water quality protection (Gomberg 2019). With some creativity, a proposal that addresses these topics, as well as homelessness, may be eligible. Additionally, the California Natural Resources Agency is currently in the process of awarding over \$92.5 million in grant funding for urban flood protection projects (C.A. Natural Resources Agency n.d). Again, with a nexus to providing flood protection and services to relocate vulnerable populations in the SAR, these projects could receive substantial funds even though they are considered water project grant funds.

As mentioned in the COVID-19 implications section, emergency funding for COVID-19 prevention and assistance is available in California and was awarded to the SAR watershed counties. The timing and availability of this funding present a unique opportunity for local water entities and homeless services providers to collaborate and have funding dollars available immediately for quick action.

#### Private Funding Opportunities

One often overlooked funding resource by public entities is private funding from funders

such as foundations and faith-based organizations. Foundations such as the S.D. Bechtel, Jr. Foundation and The Campbell Foundation specifically fund projects that benefit water quality and the environment. A well-developed project proposal could bring private funding into the SAR watershed for this purpose.

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*“The ingredients for success are political will, the effective use of adequate resources, a collaborative approach, and a ‘never give up’ attitude.”*

*– Helene Schneider, U.S. Interagency Council on Homelessness, Central Coast Water Board Symposium “Challenges & Solutions: The intersection of Water Quality and People Experiencing Homelessness on the Central Coast.”*

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## Monitoring and Evaluation Recommendations

The homelessness crisis is ever-evolving. Local agencies in the SAR watershed should have monitoring and evaluation programs in place to establish baseline conditions in the SAR riparian areas where long-term encampments are known to be located and also to monitor how those areas in the riverbed are changing over time. Having these data will allow agencies to collaborate and adaptively manage as conditions and needs change over time.

### Cost-benefit Analysis of Potential Bacteria-reduction approaches

Though many approaches are available to improve water quality in water bodies by reducing the bacteria load in the water, it is important first to evaluate how these approaches measure up against each other in terms of the benefits and the associated costs of each approach. I do not believe the SAR watershed has evaluated the costs and benefits of bacteria reducing efforts in the river at this time. However, there is a practical example of a cost-benefit analysis for reducing bacteria TMDLs in the San Diego region south of the SAR watershed.

In May 2020, I spoke with Megan Chery, a senior associate at the consulting firm Environmental Incentives. She informed me about a cost-benefit analysis (CBA) performed for the San Diego region to evaluate options to achieve Bacteria TMDL goals in water bodies in San Diego County and southern Orange County. Ms. Chery was not directly involved with this CBA effort; however, she provided background information on how the analysis has allowed for

decision-makers in the counties to prioritize programs and strategies to improve public health and recreation in the San Diego region.

The 2017 CBA performed by Environmental Incentives and sponsored by several regional and local entities analyzed 14 scenarios for reducing the bacteria load in local waterways. The 14 scenarios were grouped into four scenario types which included the following:

- *Stormwater Implementation* – Implementing traditional stormwater programs and practices to reduce runoff and bacteria
- *Change of Schedule Compliance* – Adjusting the TMDL compliance deadline beyond 2031 and aligning capital improvement projects with other municipal agencies for cost savings and multi-benefits.
- *Target Human Waste Sources of Bacteria* – Focus on reduction of human sources of bacteria from “leaking sewer pipes, failing septic systems, and transient camps through structural repairs and social programs” (Environmental Incentives 2017a)
- *Bacteria Reduction through Stream Restoration* – the restoration of riparian wetlands and streams to filter bacteria.

The CBA report findings suggest the most cost-effective way to reduce bacteria in urban waterways for the San Diego region is through targeting human waste sources of bacteria and implementing strategies to “improve public health and increase recreational opportunities following rain events” (Environmental Incentives 2017a). Specifically, the analysis found the “Human Sources: High” category had the most benefits per \$1 million spent in programming, which is designated as the areas with the highest bacterial “hot spot” potential (Environmental Incentives 2017b, 116). The following table from the CBA report demonstrates just how much greater the benefits of targeting human waste sources compares with the other strategies in terms of public health.

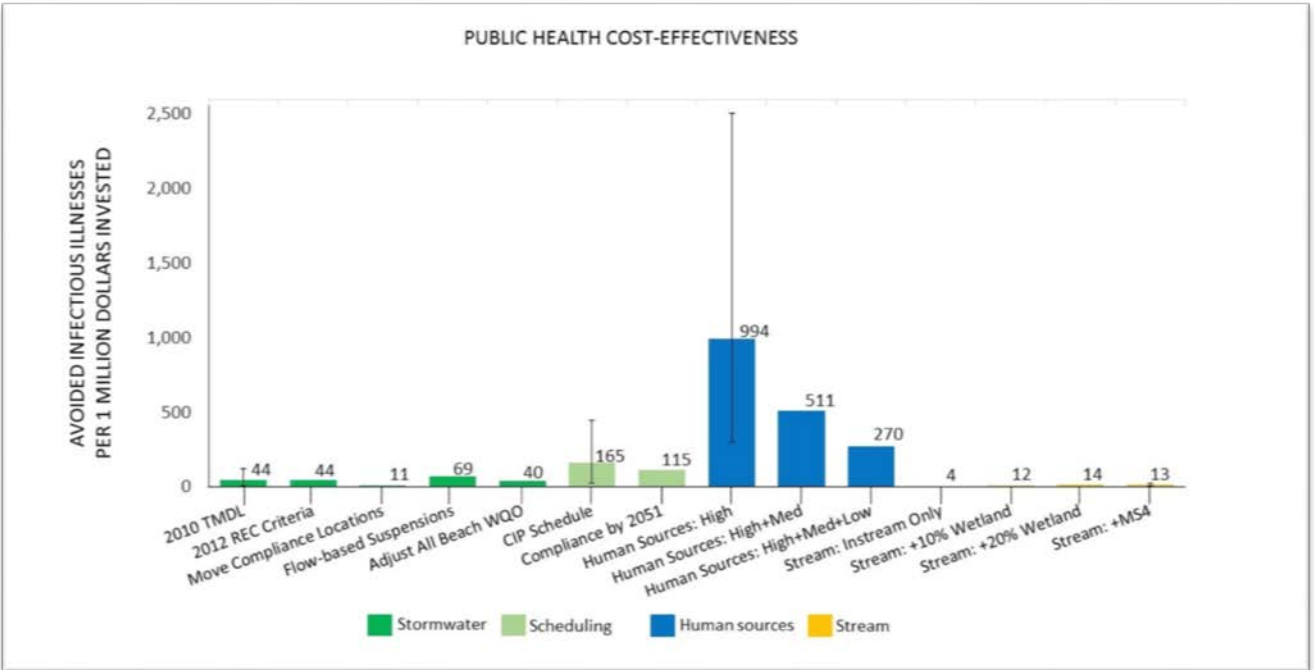


Figure 8: Source - San Diego Bacteria TMDL Cost-Benefit Analysis, Environmental Incentives, October 2017

Promote a monitoring plan in the SAR Watershed

Since 2019, the SAR watershed has been moving forwards with efforts to identify and quantify the potential impacts to the river from current encampments. As described in the Water Quality Impacts section, SAWPA applied Proposition 1 – Disadvantaged Community funding administered by DWR towards a two-phased program to investigate the potential impacts of homeless encampments in the SAR, and the development of a monitoring program to assess impacts over time.

In January 2020, SAWPA released the report of the potential water quality and habitat impacts. In July 2020, SAWPA released the report on a potential monitoring program design to evaluate the encampment impacts over multiple years for SAWPA commission consideration. At this time, no decision has been made on the future of the monitoring program, but it is recommended that some version of a monitoring program be implemented in the SAR. Implementation of the monitoring program should move forward with considerable partnerships and funding assistance.

Actual data must be collected in the SAR beyond what are collected for SAR Reach 3 bacterial TMDL compliance efforts. The monitoring program estimated cost provided in the

report ranges from a single-phase approach estimated at \$88,800 to a multi-year dry and wet season monitoring program estimated at \$846,500. These costs may be eligible to be offset with grant funding or private partnerships discussed in the Funding subsection of recommendations and should be closely considered by water managers in the SAR watershed.

## Conclusions

This capstone project has brought forth the many challenges of addressing the homeless encampments in the SAR Watershed's waterways. The problem cannot be characterized as a homelessness problem or an environmental problem. Effectively addressing homelessness in our urban waterways starts first with the acknowledgment that this is a complex social, economic, and environmental problem with many challenges and many possible solutions.

Key findings from my research are that water quality is likely affected by encampments to some degree; however, there is no published data at this time that shows there is a direct connection between encampments and water quality degradation. Despite ongoing efforts to study this topic by research institutions, many studies have encountered challenges, and funding for long-term study of water quality data near encampments is expensive and difficult to scope. Water quality and riparian habitat effects from encampment trash and pollution are much easier to confirm visually and quantify progress.

Finally, recommendations to address potential homelessness impacts to water quality and riparian habitat in the SAR must come from a combination of changes in management and policy decisions, creative exploration of funding sources to study and address these challenges, and long-term monitoring and evaluation water quality and riparian habitat health in the most significant areas of concern in the SAR.

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## Appendices

Appendix A – Map of the Santa Ana River Watershed

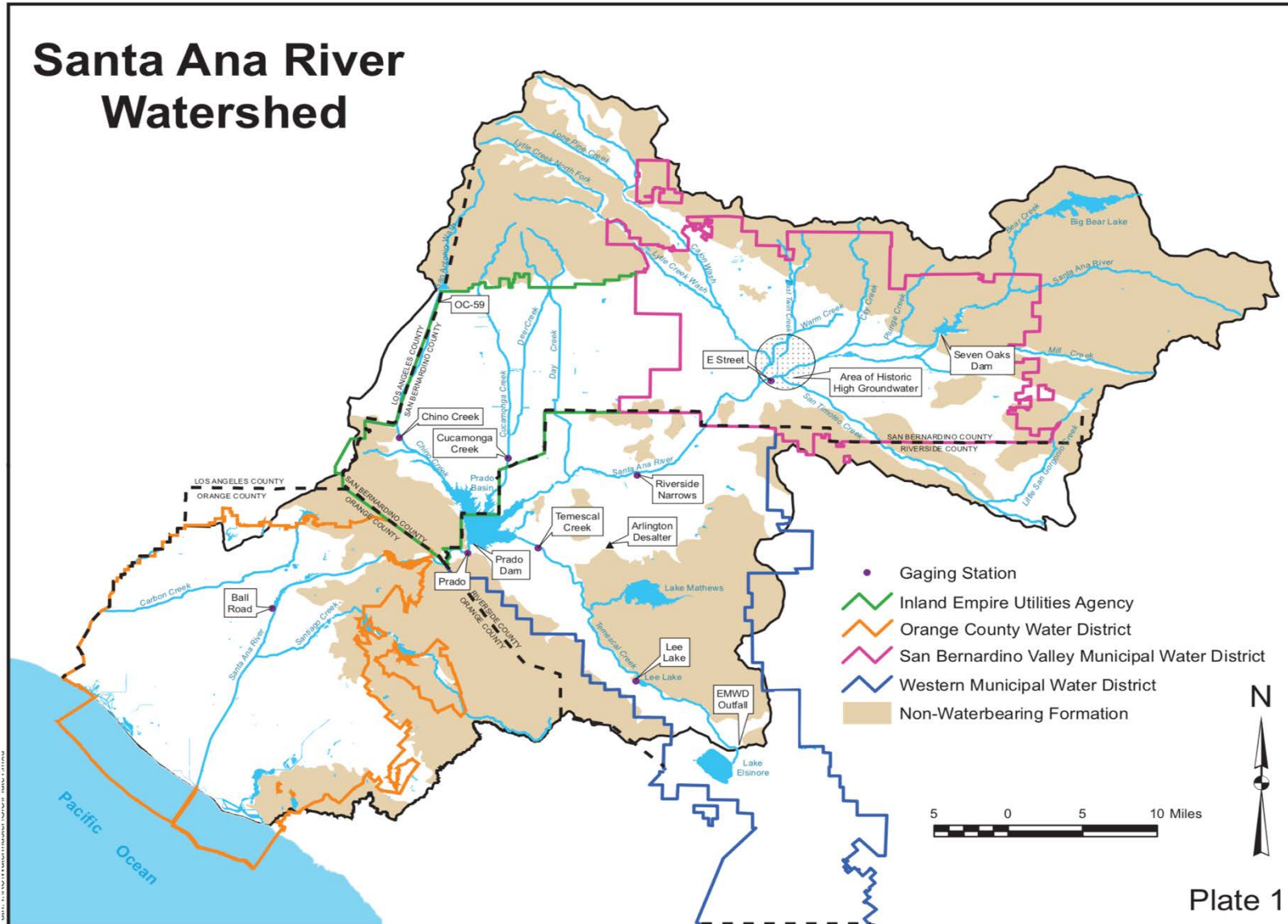
Appendix B – Situation Diagram (Topic Specific)

Appendix C – Interaction Web (Watershed Level)

Appendix D – Situation Matrix

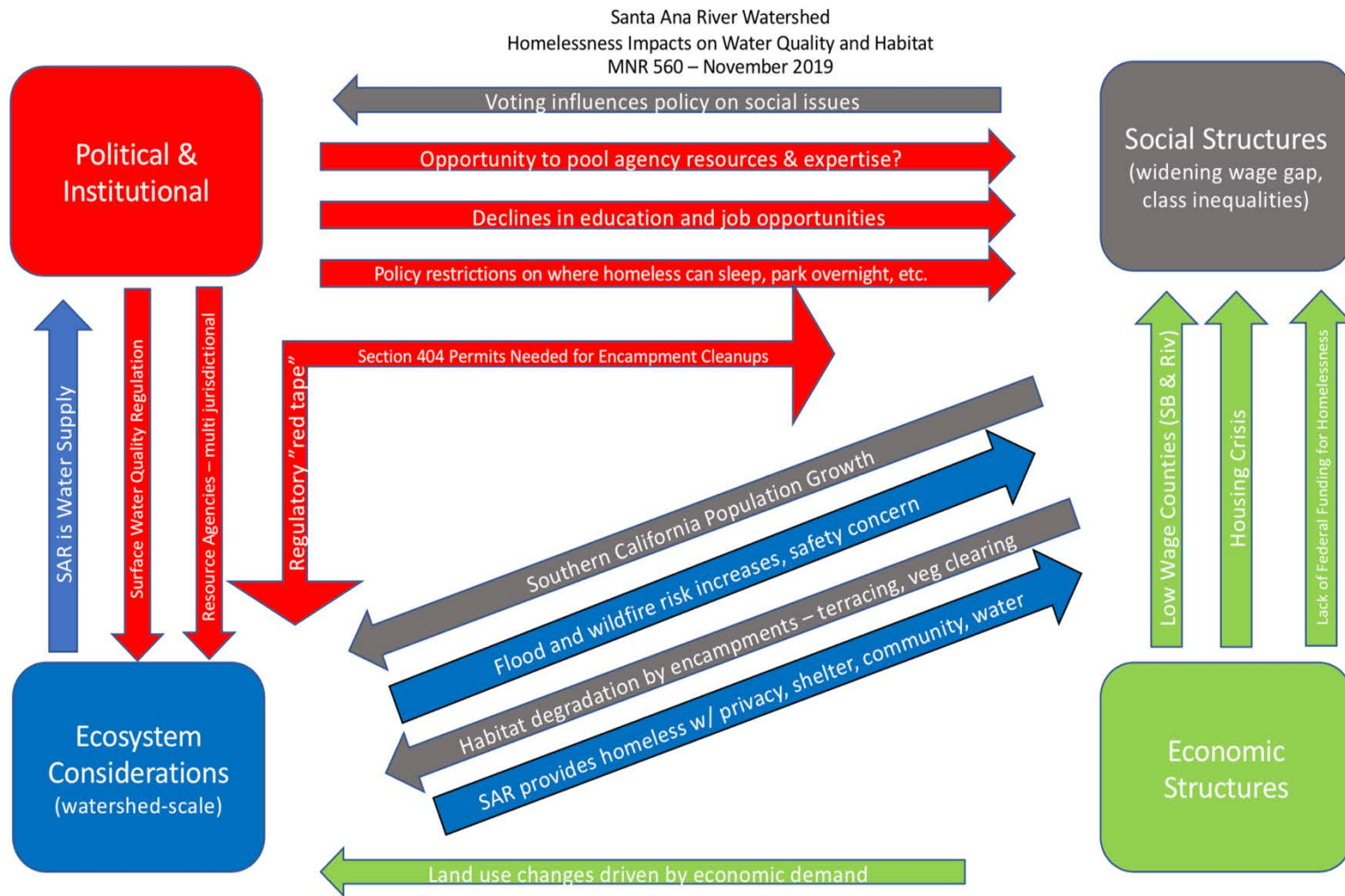
Appendix E – Interview Questions, Megan Brousseau and Richard Boon

Appendix A – Santa Ana River Watershed Map

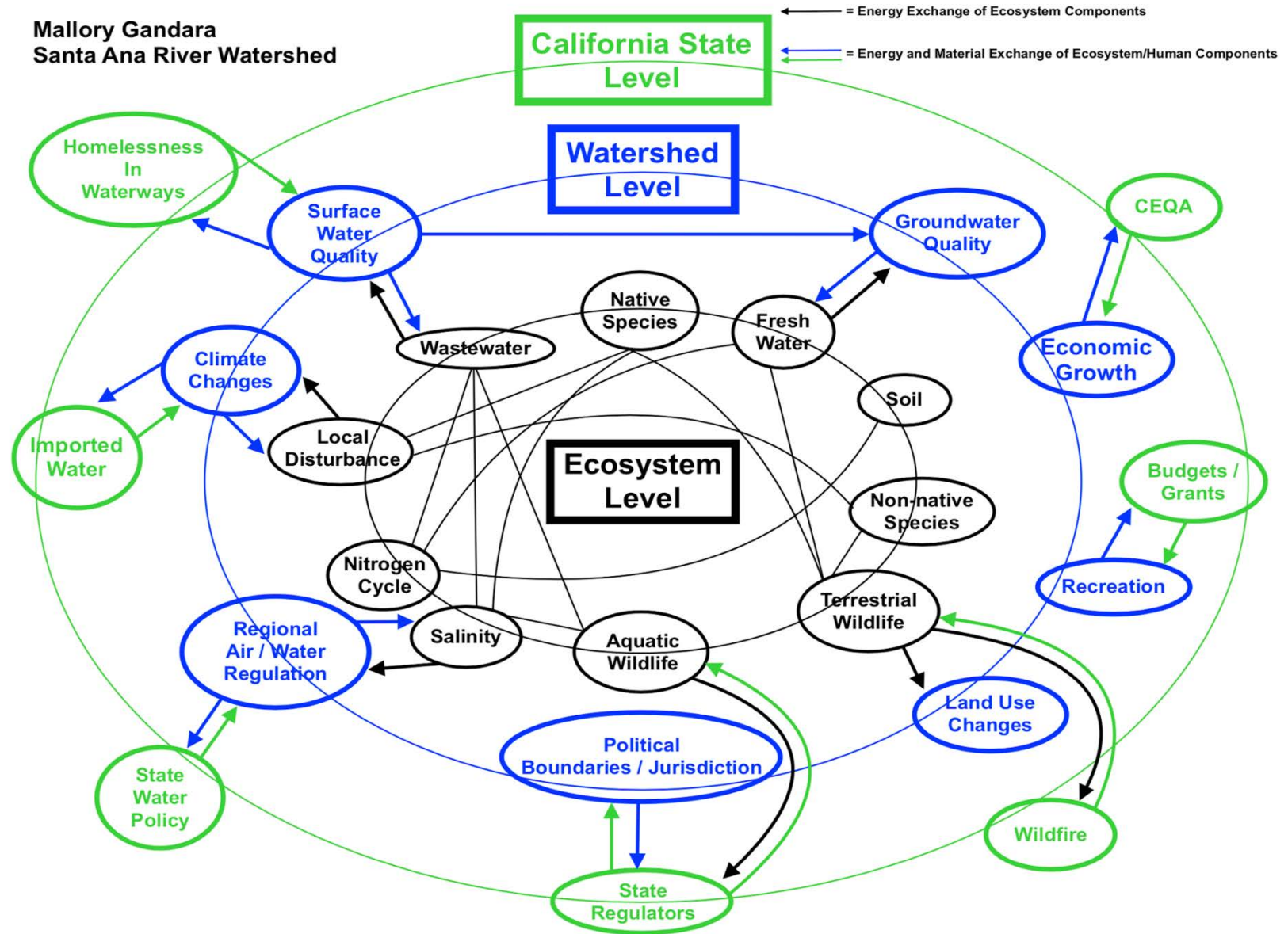


Source: Santa Ana River Watermaster Annual Report 2018

Appendix B – Situation Diagram (Topic Specific)



Appendix C – Interaction Web (Watershed Level)



Appendix D – Situation Matrix

System Type	Issue	Cause	Effect	Recommendation	Success Indicators
Economic	Lack of recreation area along SAR	Little funding, slow public process	No formal patrols, illegal activity, not safe	Fast-track riverside parks, public-private partnerships	Sufficient parking, toilets, pathways to river, educational signage
Ecological	Protect and conserve native aquatic and terrestrial species	Invasive species, urbanization, declines in water quality	Habitat loss, native species becoming threatened/ endangered, stricter regulations	Develop programs to incentivize species protection. Public education. Maintain habitat restoration as a condition for river-affected projects.	Increased numbers of aquatic species like Santa Ana Suckers and Arroyo Chub. Additional spawning areas for future populations
Ecological	Declines in SAR water quality	Climate change, extreme precipitation variability, non-point source pollution	High salinity, TDS, and nitrogen levels. Less native aquatic species, more invasive that can thrive	Mandating salinity-management programs, enforcement of river-adjacent industry. Restoring the natural flow regime. Constructed wetlands for water treatment.	Increased water quality in downstream SAR reaches. Collective basin-funded research on causes and solutions



Social/Economic	Homelessness	Lack of resources and federal funding, housing crisis, slow economic recovery	Over 80 encampments along SAR and growing, damaged river banks, increased trash in the water, human waste contributing to localized water quality declines	Integrated resources and streamlined communication between cities, counties, land management agencies, and water agencies.	Indoor beds, mental health/employment/permanent housing services provided to accommodate growing unsheltered populations. Reduction in large riverside encampments
Social	Data gaps or duplicate data collection	Lack of communication across organizations, privacy laws, bureaucracy	Organizations waste funds collecting existing data or data is not collected at all	Large, open databases for public and non-profit agencies. Designate one regional agency as a collection point	Reduction in duplicative efforts, increased partnerships, MOUs for data sharing
Social	Lack of quality, consistent, and relevant public education and outreach on SAR issues	Political will, funding, conflicting organizational priorities	Public not aware of all factors involved in complex SAR issues. Little public buy-in on important projects.	Watershed-wide consistent and relevant messaging. Public meetings held in a more transparent and accessible way.	Engaged public stakeholders, public "champions" of SAR projects. Empowered community with knowledge of the issues in their communities/watershed.

## Appendix E – Interview Questions

### **Richard Boon – Senior Control Planner, Riverside County Flood Control and Water Conservation District**

1. What are the responsibilities of Riverside County Flood Control when it comes to water quality?
2. You have worked both in the United States and the United Kingdom, are there similarities and/or differences in the way water quality is monitored and protected?
3. Are water quality and riparian/aquatic habitat concerns from homeless encampments an issue in other areas you have worked?
4. Based on the number of recorded homeless encampments along the Santa Ana River (SAR), and the wet winter we have had thus far, how much of an impact do you believe these encampments have on water quality immediately downstream?
5. Are there any regulatory challenges you have experienced in being able to address water quality issues related to homelessness encampments?
6. What are Riverside County Flood Control's needs when it comes to addressing this issue?
7. What do you see as the next steps in addressing homelessness as a contributor to water quality? Are there any actions happening now that you feel are leading in a positive direction?

### **Megan Brousseau – Associate Director at Inland Empire Waterkeeper**

1. What are the responsibilities of the Inland Empire Waterkeeper? When did Waterkeeper realize homelessness along the SAR was becoming an issue?
2. What do you envision as Waterkeeper's role in helping to address the issue of homelessness in the watershed, especially when it comes to water quality, riparian/aquatic habitat concerns?
3. Are there any regulatory challenges you have experienced in being able to address water quality issues related to homelessness encampments?
4. Whom do you feel needs to be involved with homelessness in the watershed issues? Who are the top players already involved, or should be the top players? There are many different agencies responsible for different aspects of the watershed, how do you see them contributing?
5. Are there opportunities that exist for public-private partnerships? How do you feel these connections can be made?
6. What are Waterkeeper's goals in addressing these issues over the next 5-10 years? What can resource agencies in the region do to further these goals?
7. What do you see as the next steps in addressing homelessness as a contributor to water quality? Are there any current actions in the SAR watershed or elsewhere that you feel are leading in a positive direction?