Stormwater Capture in California: Innovative Policies and Funding Opportunities

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PACIFIC INSTITUTE

June 2018

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ISBN: 978-1-893790-82-7

Cover Photo Source: Lolostock, iStock | Designer: Bryan Kring, Kring Design Studio

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ACKNOWLEDGMENTS

This work was supported by the David and Lucile Packard Foundation. We thank them for their generosity. We'd also like to thank all of those who offered ideas, data, information, and comments on the report. In particular, we would like to thank our reviewers Corinne Bell of the National Resources Defense Council, Sean Bothwell of the California Coastkeeper Alliance, Daniel Schaaf, P.E., and Robin Lee, P.E., both of Schaaf & Wheeler Consulting Civil Engineers, and Alisa Valderrama of Neptune Street. Thanks also for input from Neal Shapiro with the City of Santa Monica, Jill Bicknell with the Santa Clara Valley Urban Runoff Pollution Prevention Program, and Jon Dienst with the City of Dubuque, Iowa.

EXECUTIVE SUMMARY

Stormwater has long been managed with the goals of mitigating flood risk and reducing water quality impairments. Yet, stormwater is increasingly being viewed as an asset in a water-short state, and a growing number of communities are investing in stormwater capture as a means of augmenting their water supplies. With longer drought periods and heavier rainfall events becoming more common, urban stormwater capture represents a significant opportunity to enhance community resiliency to climate change. Moreover, many of these projects, especially those that rely on green infrastructure, have the potential to provide additional co-benefits, such as improved air quality, wildlife habitat, reduced urban temperatures, reduced energy use, community recreation spaces, and higher property values.

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Urban stormwater presents a significant opportunity for local water supply in communities where water shortages and increasing uncertainty in imported supplies due to climate change are challenges.

In this report, we present a summary of pertinent regulations, laws, and statewide initiatives that create the legal framework for stormwater management. While primarily focused on flood control and water quality protection, state policy has also recently begun to address stormwater's supply potential. In recent years, the state has made major efforts to advance stormwater capture, from adopting statewide volumetric goals for stormwater use to clarifying the regulatory framework and dedicating funds for multi-benefit stormwater projects. While obstacles, such as lack of guidance on health and safety guidelines and inadequate funding remain, work at the state-level has supported a more holistic and integrated approach to stormwater management.

A growing number of communities have overcome policy and regulatory barriers and are using stormwater to recharge aquifers, irrigate landscapes, and provide for other uses. Local governments have developed regulations that directly or indirectly support stormwater capture, and we highlight some of those efforts in this report. For example, the City of Gonzales made relatively modest updates to their city code, ensuring that new developments incorporate curb cuts and other low impact development (LID) features that promote stormwater infiltration. The City of Santa Monica adopted a citywide goal to source all water supplies locally by 2022 and identified stormwater as a key water source to meet that goal. San Francisco passed ordinances requiring developers to incorporate direct reuse of stormwater and other non-potable sources onsite. Each of these examples show how communities have taken concrete actions to augment local water supplies through stormwater capture.

Funding stormwater management has been a major challenge, but here, too, communities have proven themselves to be both innovative and pragmatic. For example, the Fresno County Flood Control District uses development fees to ensure future businesses and residents pay their portion of the costs to reduce flood risks, while also replenishing the local drinking water aquifer. San Mateo County adopted an integrated approach to address transportation and its impact on water quality, and Dubuque, Iowa developed partnerships to apply for funding solutions that otherwise may not have been available. Philadelphia offers a creative solution to incentivize stormwater capture on private property that comes at a much lower cost than similar structures on public land. Finally, several communities underscore the importance of careful communication and stakeholder engagement when designing and implementing a dedicated, local funding source.

While the opportunities for stormwater capture depend on site-specific factors, these examples demonstrate that there are options for communities across California to more effectively use stormwater as a local water supply. Based on the insights and lessons from the examples provided in this report, we offer a set of recommendations for expanding stormwater capture in California.

Advance state and regional policies and provide resources to help communities pursue stormwater capture for water supply.

In some cases, local communities only need support in the form of guidelines and model ordinances to advance stormwater capture. For example, statewide health and safety guidelines on stormwater reuse could empower otherwise hesitant communities to pursue policies that support capture. Additionally, state and/or regional coordination could help facilitate public-private stormwater projects, such as through alternative compliance options.

Expand state funding and reduce barriers for local funding of stormwater management.

Many state funding programs now require projects to provide multiple benefits, and stormwater capture typically meets these criteria. However, there is still limited funding available for stormwater management, and additional state and local funding sources are needed. We recommend that the state examine how to improve the usefulness and uptake of the Clean Water and Drinking Water State Revolving Funds for stormwater capture. Additionally, the state should seek ways to reduce the onerous voter-approval requirements for stormwater services. While SB 231 could help local agencies develop dedicated funding sources, it is not a silver bullet and additional policies that increase long-term funding and cover operation and maintenance (O&M) expenses should be explored.

Develop dedicated, local funding sources for stormwater management.

Local funding is needed to effectively manage stormwater. Communities that elect to establish stormwater fees should follow best practice by basing that fee on impervious area. Significant public outreach and engagement are essential for obtaining the necessary support for fees. Non-traditional partnerships can also present opportunities, such as the use of development fees or leveraging funds from the private sector to pay for stormwater projects.

Adopt policies that drive innovative and sustainable approaches for water supply.

Local communities can use a variety of tools to advance stormwater capture. They may opt to use regulatory approaches, as in San Francisco or Gonzales. They may also adopt explicit local water supply goals, as has been done in Santa Monica and Los Angeles.

Use the cross-cutting nature of stormwater management to initiate innovative partnerships.

The multi-benefit nature of stormwater projects can facilitate partnerships between agencies and organizations. Local agencies should seek partnerships that can advance stormwater projects that provide environmental, community, and economic benefits. Local opportunities to partner will be unique. Our example from the Fresno area demonstrates how a flood agency has led stormwater recharge efforts, while in San Mateo County, collaboration on stormwater management has evolved around transportation issues.

Continue research to characterize the true cost and full benefits of stormwater capture projects.

Limited data are available on the cost of stormwater capture for supply, and those that exist often fail to account for the multiple benefits of these projects. Additional research is needed so that communities better understand the opportunities for improved stormwater management and for innovative partnerships and collaborations.

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INTRODUCTION

For more than a century, stormwater has been viewed as a liability, and most urban stormwater systems have been designed to remove this water as quickly as possible.[1] It presents a serious flood risk in urban areas with large expanses of impervious surfaces that aggregate and accelerate flows to channels and drainage systems, leading to larger flood peaks and significant erosion. In addition, as runoff makes its way across urban landscapes, it washes oil, metals, chemicals, and other pollutants into inland and coastal waters. Urban areas cover 6% of California's land area, yet runoff from these areas is the primary source of impairment for 10% of all rivers, lakes, and reservoirs, and 17% of all estuaries (State Water Board, 2010). Both the US Environmental Protection Agency (EPA) and the California State Water Resources Control Board (State Water Board) have determined "that stormwater and urban runoff are significant sources of water pollution that can threaten aquatic life and public health" (State Water Board, 2013).

Source: Aakorotky, iStock

Runoff from urban areas pollutes rivers, lakes, reservoirs, and estuaries. Treating and using this water would reduce its impact on the environment and augment local water supplies.

However, stormwater is increasingly being viewed as an asset in a water-short state (DWR, 2013a). In some communities, stormwater already represents an important source of water. For example, the Inland Empire Utilities Agency manages large-scale stormwater capture projects in the Chino Basin that recharge local groundwater with around 13,600 acre-feet per year (AFY) (IEUA et al., 2010). Likewise, a growing number of communities in both southern and northern California, such as Los

1 For this report, stormwater refers to all urban runoff that could be captured, treated, and reused for supply. This includes runoff generated by precipitation falling on impermeable and semi-permeable urban landscape features, such as roofs and roads, as well as runoff from activities such as irrigation and car washing.

Angeles and San Jose, are implementing smaller, decentralized stormwater capture projects. These projects often use low impact development (LID) or green infrastructure design and require less storage capacity at any single location.[2]

Most green infrastructure projects are designed to improve water quality, rather than to augment water supplies. However, this same infrastructure, if designed and implemented properly, could also capture stormwater for direct use or aquifer recharge. An analysis by the Pacific Institute, UC Santa Barbara, and the Natural Resources Defense Council found that infiltration of runoff to recharge groundwater and rooftop rainwater capture in urbanized southern California and the San Francisco Bay would provide an additional 420,000 to 630,000 AFY to local water supplies (Garrison et al., 2014). This would represent approximately 5% to 8% of the average annual statewide urban water use.[3] While its cost and water supply potential vary from community to community, initial studies suggest that stormwater capture is among the most cost effective new source of water available in California (Cooley and Phurisamban, 2016).

Urban stormwater capture represents a significant opportunity to enhance community resiliency to climate change. Precipitation in California is highly variable from year to year, and a small number of large winter storms deliver the bulk of the state's annual precipitation (Dettinger et al., 2011). Climate change is projected to exacerbate this variability, producing a rapid shift from very wet to very dry conditions in what has been referred to as "water whiplash" (Swain et al., 2018). With longer drought periods and heavier rainfall events becoming more common, effective urban stormwater capture provides an opportunity for addressing flood control and water quality impairments while also improving water supply reliability. Moreover, stormwater capture has additional co-benefits, such as providing habitat, reducing urban temperatures, reducing energy use, creating community recreation spaces, and increasing property values (Brattebo and Booth, 2002; American Rivers, 2010; Odefey et al., 2012; Clements and St. Juliana, 2013; Prudencio and Null, 2018).

Stormwater management is complex because it affects all aspects of urban water management. While flood control and water quality benefits are often incorporated into stormwater management decisions, water supply opportunities are less commonly considered. In this paper, we first provide a summary of pertinent regulations, laws, and statewide initiatives that create the legal framework for stormwater management. Next, we present innovative policies, practices, and funding schemes from inside and outside the state to help expand the use of stormwater as a local water supply option. These projects demonstrate how communities of all sizes can deploy green infrastructure at the city, neighborhood, and site scale; create effective partnerships for managing stormwater; replace impervious surfaces; fund projects; and create incentives for stormwater capture. Based on these examples, we offer recommendations for how municipalities can facilitate community-based efforts in California and inspire further action toward harnessing this viable local water supply.

2 LID and green infrastructure are terms that are used interchangeably in the broader stormwater nomenclature. In this report the terms refer to stormwater management systems that mimic and/or are designed to incorporate natural media and processes. For example, rain gardens, bioretention cells, bioswales, green roofs, rain barrels/cisterns, permeable pavements, and engineered wetlands.

3 Mean annual statewide water use by the urban sector was calculated from data from 2001-2010 (DWR, 2013b).

California's Legal Framework Surrounding Stormwater Capture

California is amid a period of rapid change regarding stormwater management, with recent attention to how it can be used for water supply. In urbanized areas, stormwater management has traditionally consisted of paving and straightening streams and river channels to quickly convey water to larger catchments, or directly into the ocean. Municipal separate storm sewer systems (MS4s) were built to direct water from the community and roadways to these channelized water escape routes.[4] Additionally, local laws and codes were put in place requiring developers to move stormwater away from the base of buildings, reduce and eliminate pooling, and transfer as much of the runoff as possible directly to a storm drain. In a few instances, infiltration and recharge structures were created to move stormwater captured by these systems into local aquifers (e.g., Simes et al., 2016), but this was relatively uncommon.

Channelized urban waters, when forced to run over roadways and other impermeable surfaces, pick up residual pollutants. In California, a combination of state and federal regulations address pollution in surface water and groundwater aquifers, where the degraded storm flows are most commonly directed. The State of California, in advance of major federal regulation on water quality, passed the California Antidegradation Policy in 1968 and the Porter-Cologne Water Quality Control Act in 1969 (Figure 1). Broadly, these two laws work in concert with the federal Clean Water Act (CWA), passed in 1972, to protect surface- and groundwater quality across the state.

In 1990, under CWA regulation, stormwater from MS4s was added to the list of discharges requiring permit coverage through the National Pollution Discharge Elimination System (NPDES). Initially, NPDES permits were only required for communities with MS4s serving populations of 100,000 or more (i.e., Phase I). Later, in 1999, smaller communities with MS4s serving less than 100,000 people (i.e., Phase II) were added to the permit system.[5] NPDES permits, which vary regionally with respect to their requirements and allowances for reaching compliance and monitoring effectiveness, are the main driver for stormwater management in California. In addition, permits are implemented and renewed at different times across the state. This variability has led to a patchwork of stormwater management practices, limiting the transferability of these practices between communities.

In addition to meeting regulatory water quality requirements, entities must also consider whether capturing stormwater is consistent with the state's water rights system. In California, water rights for surface water are allocated based on the application of the water toward a designated beneficial use.[6] Traditionally, stormwater management practices that included the capture, treatment, or percolation of water for flood control or water quality protection have not required water rights permits because these activities were not seen as affecting downstream users. However, a community seeking

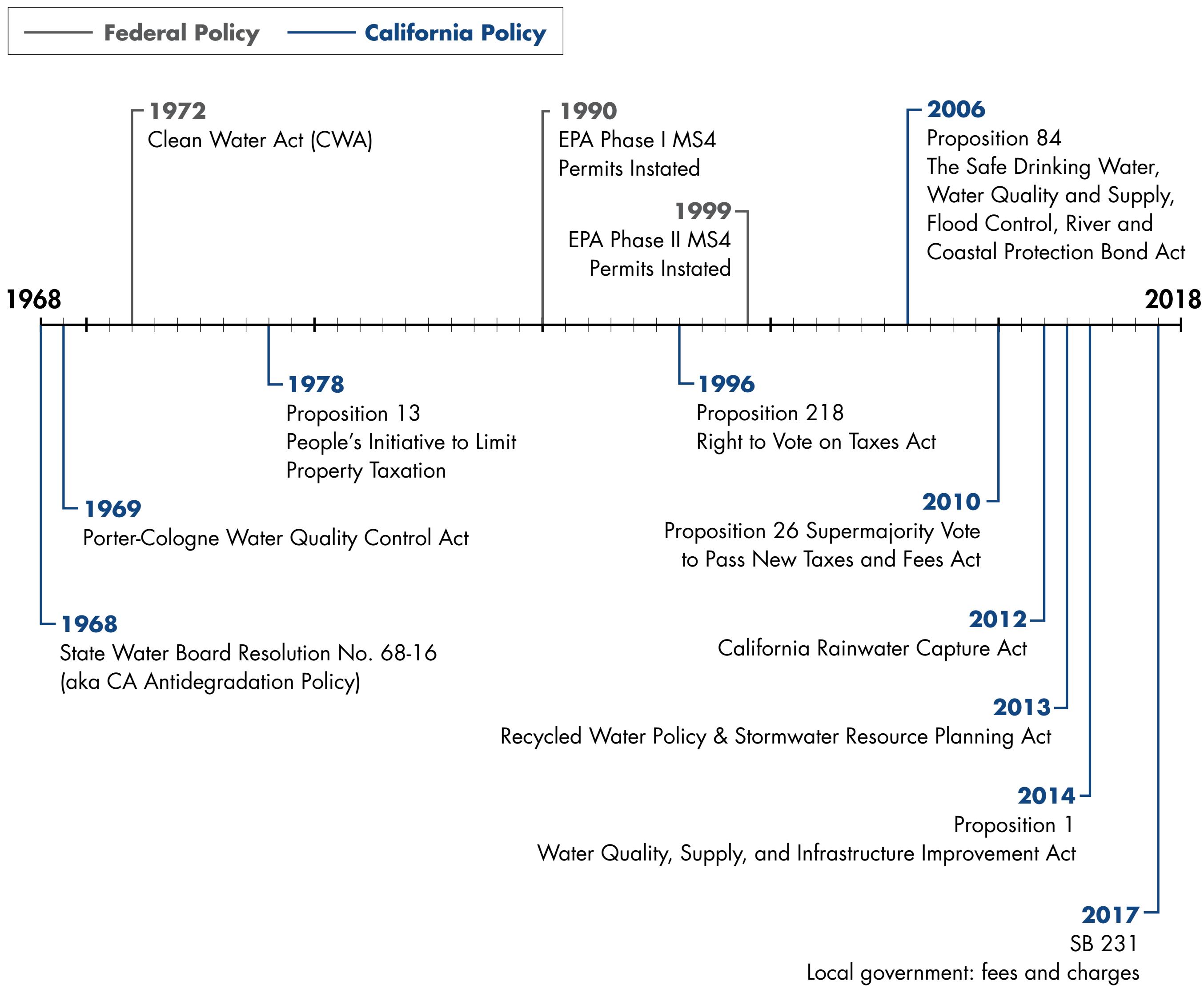
4 The vast majority of California's municipalities own and operate MS4s. The storm drain systems in San Francisco and Sacramento are the notable exceptions. These cities collect stormwater in what is known as a combined sewer system (CSS), which directs the captured water to the wastewater treatment plant along with sanitary sewer water, where both are treated before being discharged back into the environment.

5 The EPA has delegated NPDES and other CWA authority to the State Water Board. While the State Water Board oversees some NPDES permits, the majority of NPDES permits are managed by each of the nine Regional Water Quality Control Boards.

6 Beneficial uses include drinking water supply, industrial and agricultural use, power generation, navigation, and preservation of fish and wildlife (State Water Board, 2017a).

Figure 1

Major Stormwater Regulatory and Policy Events



to use stormwater directly as a water supply, or to store and then access recharged groundwater, may need to apply for a water right permit. A program within the Division of Water Rights provides temporary water rights permits, which may be used to expedite permitting for specific projects.[7] In addition, a 2017 executive order directed the State Water Board to prioritize temporary water rights permits that enhance the ability of local and state agencies to capture stormwater from flood events for local storage and groundwater recharge.[8] Obtaining permanent rights to capture and use stormwater may involve following permit requirements that exist for the use of any surface water; however, recent legislation, such as the Rainwater Capture Act of 2012, indicates that meaningful steps are being taken to address issues specific to stormwater usage.

7 Information on temporary water rights permits can be found here: https://www.waterboards.ca.gov/waterrights/water_issues/programs/applications/#temporarypermitting

8 State of California Executive Order B-39-17

Once a community has the necessary water rights in place, it must also address health and safety regulations. The California Plumbing Code contains minimum water quality requirements for designated "alternative water sources" to be used for non-potable applications.[9] While alternative sources typically refer to water from domestic uses, such as showers, laundry, and air conditioning, stormwater used for non-potable applications within a building or for irrigation must also conform to these requirements. Local jurisdictions often also have county or municipal health and safety codes; however, in many instances, there are no explicit guidelines for treating and using stormwater for non-potable indoor or outdoor uses, leaving many local entities hesitant to advance stormwater capture. Fortunately, legislative efforts are seeking to address this gap. Senate Bill (SB) 966, introduced by Senator Scott Wiener, would require the State Water Board to adopt health and safety standards to help local jurisdictions implement on-site reuse programs (Wiener, 2018).

To encourage stormwater capture and use for urban water supply, the State of California has taken several concrete actions. First, in 2013, the State Water Board adopted Resolution No. 2009-0011, known as the Policy for Water Quality Control for Recycled Water. This resolution set an explicit goal to increase the use of stormwater over 2007 levels by at least 500,000 AFY by 2020, and at least 1,000,000 AFY by 2030. These goals set measurable objectives that could drive additional stormwater capture policy, funding, and research. While these goals help encourage uptake of stormwater capture the legislation lacks specific guidance on how they will be achieved.

9 California Code of Regulations, Title 24, Part 5

Second, two recent policies have helped to establish the legality for and provided regulatory steps to facilitate stormwater capture across the state. The Rainwater Capture Act (2012) clarified that the capture and use of rainwater from rooftops is a legal practice on private and public property. Additionally, the Stormwater Resource Planning Act (2013) defined stormwater as dry-weather runoff and water from storm events, identifying both as potential water supplies. In addition, it explicitly allowed for public entities in urban areas to capture and use stormwater on their own properties before reaching natural channels (so long as water rights are not impacted), creating the legal structure for its use as a municipal water supply. And finally, it created a requirement that entities seeking state grant funding for water projects must create a stormwater resource plan. These plans must identify multiple uses and management strategies for stormwater, considering, among other things, local water supplies, habitat restoration, and groundwater infiltration and storage.

Third, to incentivize capture, the state has created several funding opportunities. Proposition 84 (The Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal Protection Bond Act, 2006) included $82 million for matching grants to communities for efforts to reduce and prevent stormwater contamination of local water bodies. This round of funding also supported updates to municipal codes to reduce barriers to LID. In 2014, the State Water Board authorized $200 million of Proposition 1 (Water Quality, Supply, and Infrastructure Improvement Act) grant funds for multi-benefit stormwater management projects, including stormwater capture. Combined, these two efforts have helped pay for nearly 100 stormwater projects, including many for capture and groundwater recharge (State Water Board, 2017b).

Finally, the State Water Board has also begun to identify barriers and solutions to help advance stormwater capture. The Strategy to Optimize Resource Management of Storm Water program is using research and outreach to establish the value of stormwater as a resource and encourage its application for beneficial uses (State Water Board, 2016). In addition to research the program offers regular, free seminars on relevant stormwater capture topics, with accessible online recordings from past presentations.[10]

INNOVATIVE STORMWATER POLICIES AND PRACTICES

Despite recent advances in stormwater policy and support at the state level, there are still barriers to implementing stormwater capture in California. State and local regulations and codes are among the most commonly-cited barriers (SCWC, 2012; State Water Board, 2016; CASQA & SCI Consulting Group, 2017; Gebhardt, 2017). In addition, there are regulatory hurdles for communities seeking to create dedicated, reliable funding sources for stormwater programs.

While these and other barriers exist, many communities have been able to overcome them. With this report, we draw lessons and insights from communities in California and elsewhere that have (1) created regulations that either indirectly or directly support capture, and (2) developed funding mechanisms to pay for stormwater infrastructure on both public and private land. While not intended to present all means and paths for advancing stormwater capture, they demonstrate a variety of practical and innovative regulatory and policy options.

10 To access past seminar recordings and slides go to: https://www.waterboards.ca.gov/water_issues/programs/stormwater/storms/seminar_series.shtml

Source: Conservation Design Forum

Municipal codes dictate how curbs must be designed, as well as the type of pavement and vegetation that must be used. Updating municipal codes to promote stormwater capture can provide many benefits to the community, such as recharging aquifers, reducing the urban heat island effect, and improving community aesthetics.

GONZALES, CALIFORNIA

Municipal Code Update to Support Low Impact Development

Many LID techniques were developed after municipal codes were established. Requirements within these codes may inadvertently prohibit these new techniques. For example, a 2013 assessment in the Los Angeles area by the EPA and the Council for Watershed Health found that size requirements for residential street and road widths, cul-de-sacs, and sidewalks were common barriers for LID projects (EPA and CWH, 2013).

Efforts are underway across the state to update municipal codes to include provisions for and remove barriers to LID, making distributed

Source: Shutterstock

Stormwater pooling on an urban street in Los Angeles. The Los Angeles County Department of Public Health's guidelines apply the fit-for-purpose concept to alternative water source treatment, enabling the 88 municipalities within the county to efficiently and safely treat stormwater as a water supply.

stormwater capture more feasible in communities of all sizes. As one example, the City of Gonzales, a small agricultural town along Highway 101 in Monterey County, was one of 25 communities that received grant funding through Proposition 84 to update their municipal codes to remove barriers to LID implementation. Using these funds, the City of Gonzales updated the design conditions for curbs and planters with language specifying that bioretention facilities are intended to receive stormwater and shall not have curbs surrounding them that impede sheet flow from the adjacent area.[11] The city, as required by their NPDES permit, also adopted stormwater management requirements for the period after construction (i.e., Post-Construction Stormwater Management), facilitating the installation of permanent LID features at new development and redevelopment sites.[12]

LOS ANGELES COUNTY, CALIFORNIA

Creating Health Guidelines for Alternate Source Non-Potable Water Use

Stormwater collects sediment and other debris from sidewalks, parking lots, and street surfaces. While treatment may be required to remove pollutants and other harmful constituents, not all water uses have the same treatment needs. Stormwater treatment systems can be designed following the concept of "fit-for-purpose," whereby water for human consumption would require more intensive treatment than water used for irrigation or other non-potable uses. If fit-for-purpose health and safety guidelines are developed then communities can more confidently support stormwater capture projects while addressing potential health concerns.

The Los Angeles County Department of Public Health's Guidelines for Alternate Water Use is a good example of the application of the fit-for-purpose concept (LACDPH, 2016). The guidelines address four water sources (rainwater, graywater, stormwater, and recycled water) and include the acceptable indoor and outdoor uses for each source, minimum water quality standards, treatment processes, and monitoring and reporting requirements. Stormwater, defined in the guidelines as "rainwater that has left a distinct parcel and entered a municipal storm water system," can only be used at commercial, institutional, municipal, and industrial facilities. By contrast, rainwater

11 Gonzales City Code 10.24.060.D

12 Other detailed examples of code updates that have been adopted in towns across the state are presented in the California Stormwater Quality Association's LID Portal: https://www.casqa.org/resources/california-lid-portal/lid-code-updates

can be used indoors and outdoors at residential and some commercial, industrial, and municipal sites. With these guidelines, homes and businesses across the county are able to legally and safely use stormwater.

SANTA CLARA VALLEY, CALIFORNIA

Alternative Compliance Option to Support Public-Private Stormwater Capture Projects

Not all sites are ideal for stormwater capture. For example, soil type and other geologic conditions can prohibit infiltration. Since 2009, the San Francisco Bay Regional Water Quality Control Board has incorporated a mechanism known as "alternative compliance" into their Phase I municipal regional stormwater NPDES permit (MRP) to allow permittees more flexibility to meet their on-site stormwater management requirements. For projects that qualify under the MRP as a regulated project, alternative compliance allows them to consider off-site stormwater capture and mitigation options.[13] These options include retrofits to existing infrastructure to incorporate an equivalent amount of stormwater capture or treatment, or participation in a regional stormwater capture or treatment project. Additionally, the alternative compliance option has no special eligibility requirements, such as proving that onsite LID or treatment is infeasible. This characteristic eliminates one barrier for businesses seeking this compliance option, possibly reducing total project costs. By allowing regulated projects to consider offsite stormwater treatment options, opportunities can arise to build partnerships between private and public entities whose efforts and needs are aligned around stormwater capture.

For regulated entities with significant landholdings, alternative compliance projects are achievable. For example, Stanford University has been able to find sites across their properties that capture enough stormwater to cover the requirement of other projects that have less room for green infrastructure. According to the Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP), an association of Phase I MS4 permittees, developers with less space are challenged to find appropriate offsite locations, especially sites where they want to create permanent stormwater capture features (J. Bicknell, personal communication, 2018). To address this barrier, SCVURPPP agencies are exploring how the alternative compliance option could be better applied toward projects such as green infrastructure in the public right-of-way. The local agencies need funding for these projects and alternative compliance possibly creates a pathway to raise funds both for the capital and operation & maintenance (O&M) costs.

SANTA MONICA, CALIFORNIA

City Water Independence Goal Driving Stormwater Capture

The City of Santa Monica demonstrates how water supply goals can drive stormwater capture. In response to ongoing droughts in southern California, high costs of imported water, and climate change, Santa Monica adopted a goal of water self-sufficiency by the year 2022. This means finding an additional 6,500 AFY of water from local sources, or approximately 30% of the city's annual

13 Under San Francisco Bay Area NPDES MS4 permit, regulated projects can be on both public and private land and include: (1) special land uses, such as auto services and gasoline stations, that create and/or replace 5,000 square feet or more of impervious surface; (2) development or redevelopment projects that create and/or replace 10,000 square feet or more of impervious surface; and (3) projects that create and/or replace 1 acre or more of impervious surface and modify the natural hydrology within certain watersheds. All regulated projects must provide a stormwater control plan that includes LID site design, pollutant source control, and treatment, as well as hydromodification management where applicable, to control stormwater.

water demand ([City of Santa Monica, 2014](#)).

Stormwater capture is on the list of options for meeting this goal. Since its announcement, the city has advanced several stormwater capture projects. For example, in 2016, in a collaboration with Santa Monica Malibu Unified School District and Metropolitan Water District of Southern California, the City of Santa Monica began the Los Amigos Park Stormwater Harvesting and Direct Use Demonstration Project ([City of Santa Monica et al., 2017](#)). This project captures water from a storm drain near the park, then treats the water with several processes before storing it for irrigation and toilet flushing. The underground storage system can hold up to 53,000 gallons of water at a time. Annually it will replace approximately 550,000 gallons of potable water demand. The city has planned for quarterly evaluations of the amount of runoff captured and treated, maintenance required, and cost of the water supply created by the project. The city has additional stormwater capture projects underway, with the goal of adding more than 500 million gallons to their annual supplies from stormwater.

SAN FRANCISCO, CALIFORNIA

City Ordinance Driving Stormwater Capture

The City of San Francisco has adopted two ordinances, one motivated by state requirements and the other by local supply and sewer system constraints, that have expanded stormwater capture in meaningful ways. The Stormwater Management Ordinance, adopted in 2010 and updated in 2016, sets requirements for new and redevelopment projects that create or replace (1) more than 5,000 square feet of impervious surface in separate and combined sewer areas; or (2) greater than or equal to 2,500 square feet of impervious surface in separate sewer areas. Projects meeting these requirements must install

Source: Bureau of Land Management, Esri, HERE, Garmin, USGS, NGA, EPA, USDA, NPS

In this map of San Francisco, locations of installed stormwater projects are shown. Green pins are projects that have been installed, while orange pins are projects that are in progress. (Image is from May 2018.)

and maintain green stormwater infrastructure for capture on-site.[14] This ordinance was required by the state in those areas that had a separate storm sewer system, which represented only about 10% of the city. Nevertheless, San Francisco applied the ordinance to the entire city. The city also requires property owners to sign long-term maintenance agreements to ensure continued care over the lifetime of the system. Because of this ordinance, an estimated 350 on-site green infrastructure projects that collectively manage over 100 million gallons of stormwater annually have been constructed to date ([SFPUC et al., 2018](#)).

The Non-potable Water Ordinance, adopted in 2012 and updated in 2015, goes a step further than the Stormwater Management Ordinance by

14 San Francisco Public Works Code, Article 4.2 Sections 147-147.6

Source: B.M. Noskowski, iStock

San Francisco's Stormwater Management Ordinance and Non-potable Water Ordinance put the responsibility of designing, constructing, capturing, treating, using, and maintaining stormwater capture features on property owners.

requiring on-site capture, treatment, and use of alternative source water on construction projects of 250,000 square feet or larger.[15] Alternate water sources include rainwater, stormwater, graywater, blackwater, and foundation drainage. The ordinance requires that property owners maintain these projects in perpetuity. Since the ordinance was passed in 2012, hundreds of projects have been permitted, and at least 67 projects that reuse an estimated 400,000 gallons of water per day have been completed (SFPUC et al., 2018). While the water captured represents only a small fraction of the city's total water use, it typically represents a significant fraction of the site's water use. For example, a rainwater harvesting system at the James R. Herman Cruise Terminal at Pier 27 has reduced potable water use by 50% (SFPUC, 2017). These projects demonstrate how city-level regulations can be driving factors in initiating stormwater capture and reuse.

A key feature of San Francisco's approach is that it places the responsibility for implementing and paying for the system on property owners. Data on the cost of these systems are limited. A recent report by SFPUC provided 14 case studies, but only 6 had capital cost estimates, and only 2 provided operation and maintenance costs (SFPUC, 2017). In many cases, the cost of the on-site system was not separated from the total cost of the building. Even for those provided, the data were highly varied because of differences in the types of projects. Additional data are needed to evaluate the costs of constructing and maintaining onsite non-potable water capture, treatment, and reuse.

PAYING FOR STORMWATER CAPTURE

While policies supporting stormwater capture are advancing rapidly in California, funding the capital and ongoing O&M costs remains a major challenge. Most California communities rely on general funds and other non-dedicated sources, such as bond proceeds and state grants, to cover their stormwater management costs (Gebhardt, 2017) (Table 1). Opportunities for establishing dedicated sources, such as a property-related fees, are limited due primarily to several statewide propositions passed by California voters over the last several decades (see Box 1).

The funding available for stormwater management is inadequate and varies greatly from year to year. In a 2014 study, the annual funding gap was estimated to be between $500 million and $800 million for managing urban stormwater for water quality alone (Hanak et al., 2014). While many of the grant programs or short-term funding sources

15 San Francisco Health Code, Article 12C

Table 1

California Stormwater Management Funding Sources

Funding Source	Description	Community Example**
Non-Dedicated and/or Short-Term Funding Sources		
General Fund	A municipality's general fund is used to provide the community with a variety of services, one of which can be stormwater capital, operations, and maintenance.	Most stormwater programs in California are currently funded, at least in part, with this source.
General Obligation Bonds*	Local-level voter-approved bonds to fund capital projects.	Los Angeles County
State Proposition Bond Fund Programs	State-level voter-approved bonds that create discrete funding opportunities, such as Proposition 1.	Hermosa Beach
State Grants and Loans	Examples including Drinking Water State Revolving Fund, Clean Water State Revolving Fund, and Nonpoint Source Fund.	Santa Monica
Dedicated Funding Sources		
Water/Sewer/Trash Utilities*	Revenue from utility-based service fees that provide a potential funding pool from which a portion could be drawn for stormwater capture.	City of San Francisco
Development Impact Fees	One-time fees charged to new development for capital projects.	Fresno
Regulatory Fees	Revenue earned by regulatory agencies from their plan review and inspection programs.	None identified***
Property-Related Fees, Parcel Tax*	Fee on individually-owned parcels of land. It is often based on the amount of impervious area within the parcel, either measured or averaged over the service area by parcel type (residential, commercial, etc.).	Culver City, Palo Alto
Community Facilities Districts and Assessment Districts*	Voter and/or property-owner approved funds for capital and/or maintenance efforts. Assessment districts usually only apply to a defined area within a larger community.	San Mateo County

*These funding sources require voter approval.

** Communities listed in this column derive at least a portion of their stormwater program funding from the associated source. Their inclusion does not indicate that they only receive funding from the associated source.

*** This funding source was cited in a pamphlet created by a consulting firm for California communities investigating funding options for their stormwater programs (Boehler and Seufert, 2018). While the authors could not identify a community that used this source, it is likely that many do, but do not publicize it.

can be used for capital investments, they do not typically pay ongoing O&M costs. Fortunately, efforts are underway to address these funding barriers. For example, SB 231, signed by Governor Brown in 2017, clarified that the definition of sewer water includes stormwater, opening the door to levying fees for providing stormwater services without obtaining voter approval.[16]

16 It is widely accepted that a judicial verdict from California courts to officially overturn past related court cases will need to be presented before any widespread adoption of stormwater fees without prior voter approval will occur.

Box 1

Propositions 13, 218, and 26

Under Proposition 13 (People's Initiative to Limit Property Taxation), passed in 1978, two-thirds of local voters must approve of any local taxes deemed "special taxes." Stormwater taxes often fall under this designation.

Proposition 218 (Right to Vote on Taxes Act), passed in 1996, amended the state constitution to change voter requirements for general taxes and property-related assessments. This has affected stormwater funding in three key ways. First, it sets strict cost-of-service requirements for all water-related services. Second, it mandates property-owner protest hearings for water-related service fee additions. Third, for fees or assessments related to flood water and stormwater, it requires an affirmative vote of a simple majority of property owners or two-thirds of the general public to pass. California courts have upheld the voting requirements for stormwater taxes and fees.[1]

Proposition 26 (Supermajority Vote to Pass New Taxes and Fees Act), passed in 2010, added stricter requirements on the definition of non-property related fees, making it more likely that these fees would be designated as a tax.

1 Howard Jarvis Taxpayers Association vs. City of Salinas, Ca. Court of Appeal, Sixth District, June 3, 2002.

While the true cost of stormwater capture for water supply has not been well characterized, there are several studies that provide broad cost estimates for projects. Cooley and Phurisamban (2016) examined 10 projects and found that large (>6,500 AFY) stormwater capture projects averaged $590 per acre-foot, while small (≤1,500 AFY) projects averaged $1,500 per acre-foot, making it among the least expensive water supply options available. A recent analysis by the Southern California Water Coalition (2018) found significant variability among 32 stormwater capture projects in southern California.

A key limitation of the aforementioned studies is that they don't account for the co-benefits of these projects. Without accounting for co-benefits, the full cost of the project is attributed to a single benefit. For example, in the cases above, the total cost is attributed to a water supply benefit. Yet, stormwater capture also provides water quality and flood control benefits. Furthermore, green stormwater infrastructure, such as green roofs and bioswales, provide additional benefits to the local community, including carbon sequestration, heat-island effect reduction, air quality improvements, energy savings, heightened neighborhood aesthetics (with corresponding evidence of raised real estate values), habitat creation, recreational opportunities, and other ecosystem benefits (TreePeople, 2007; Center for Neighborhood Technologies and American Rivers, 2010;

Prudencio and Null, 2018). Forthcoming work by the Pacific Institute (2018) will provide a detailed cost-benefit analysis of stormwater capture projects in California, including the quantifiable co-benefits.

The cross-cutting, multi-benefit nature of stormwater capture is key to finding adequate funding. These additional benefits enable partnerships and collaborative efforts that can pursue diverse capital opportunities and creative or shared O&M responsibility. While the appropriate options and associated costs for stormwater capture are community- and location-specific, communities should examine whether stormwater capture may be a cost-effective alternative water supply option. The following case studies provide examples of communities that have found effective methods to fund their stormwater programs, including several that demonstrate how non-traditional agency partnerships have helped cover the costs. While stormwater capture for water supply is not the primary goal of many of the examples, the variety of funding approaches taken could be used by communities that seek to gain a water supply benefit, along with the other co-benefits associated with stormwater capture.

FRESNO, CALIFORNIA

Finding Funding at the Intersection of Flood Control and Groundwater Recharge

Stormwater capture has been a key element of the Fresno area municipal water supply for decades. In 1956, in response to significant flooding concerns, the Fresno Metropolitan Flood Control District (FMFCD) was formed as a special district to help manage stormwater and other surface water flows in Fresno, Clovis, and the surrounding agricultural area. There are currently 165 stormwater retention basins throughout the area that largely serve to reduce flooding and mitigate water quality impacts from urbanization, although many also recharge groundwater aquifers. Each stormwater basin captures runoff from approximately one to two square miles. To ensure that stormwater basins are installed as the community expands, FMFCD coordinates with land use planners and land developers to oversee proper and effective construction. To cover construction and land acquisition costs of these basins, FMFCD charges developers a onetime fee that is increased regularly to keep pace with the rising cost of materials, labor, and land in the area (FMFCD, 2018a). Placing the cost of the construction and land purchase with the development community ensures that future property owners benefiting from the service are paying their share. Ongoing O&M costs for the basins are funded through a voter-authorized property tax (FMFCD, 2018b), thereby distributing those costs across the entire community.

While these basins are technically gray infrastructure projects, their multi-purpose design provides significant benefits to the community.[17] In a typical year, the basins infiltrate 70% to 80% of the average annual stormwater runoff (FMFCD et al., 2013). Between 2006 and 2014, stormwater recharge from these basins averaged 16,600 AFY (FMFCD, 2015). FMFCD also uses these stormwater basins to direct imported surface water into their aquifer, and during that same period, they recharged, on average, an additional 26,500 AFY. Some of the drainage basins also collect enough water to provide space for water sports and wildlife habitat. By capitalizing on the opportunity presented by seasonally-high surface

17 Gray infrastructure refers to more traditional infrastructure used to manage stormwater, such as dams, levees, and spreading grounds.

water flows, FMFCD has created a means for distributed groundwater recharge, recreation, and habitat with sustained funding through future growth of the community.

SAN MATEO COUNTY, CALIFORNIA

Finding Funding at the Intersection of Transportation and Stormwater Management

In San Mateo County, a joint powers authority, the City/County Association of Governments of San Mateo County (C/CAG), provides municipal services to its member agencies. Stormwater management was added to its list of responsibilities in the early 1990s when MS4 Phase I permits were issued. To raise funds for the stormwater program, C/CAG enacted a $4 per vehicle registration fee, collected annually by the Department of Motor Vehicles (Chappelle et al., 2014). This fee, in effect from 2005-2013, supported both traffic-related efforts and the stormwater program. In 2010, the California State Legislature, recognizing the environmental degradation caused by stormwater runoff from road surfaces, passed a law allowing countywide transportation planning agencies to request voter approval for vehicle registration surcharges of no more than $10 annually to pay for traffic congestion and pollution prevention.[18] That same year, voters in San Mateo County passed Measure M to increase and continue their vehicle registration fee. Today, money raised from this fee can be used for measures that reduce pollution from roads, such as permeable pavement (C/CAG, 2016). Although stormwater capture for water supply is not the intent of this fee, it does provide one example of how a transportation-related fee can be used for stormwater projects that yield groundwater recharge.

18 California Government Code 65089.20

Source: City of Dubuque

Permeable pavement installed in alleyways in Dubuque, Iowa reduces stormwater runoff and the associated flooding across the community. To fund this program, the City of Dubuque partnered with several agencies, helping them to access the state revolving fund.

DUBUQUE, IOWA

State Revolving Fund & Wastewater Utility Fees

Dubuque, Iowa is a town of about 60,000 residents on the banks of the Mississippi River that faces significant flooding challenges. Until 2006, when the mayor and city council adopted a sustainability initiative, the local wastewater treatment agency focused flood projects on directing stormwater into the sewer system as quickly as possible. The initiative created a framework through which all capital improvement projects were planned and built, driving the wastewater treatment agency to consider options beyond traditional, gray infrastructure solutions. Since then, Dubuque has begun the Green Alley Program with the goal of reducing stormwater runoff by 80% through subsurface infiltration. To date, 70 alleys have been retrofitted with permeable, interlocking pavers, with the goal of ultimately converting 240 alleys (SCN, 2018).

Funding the Green Alley Program has been a significant challenge for the small community. Yet building partnerships with state agencies and accessing revolving fund dollars enabled them to pursue their innovative stormwater management approach. The program partners include the local wastewater treatment agency, which is the main sponsor, the Iowa Department of Natural Resources, and the Iowa Department of Agriculture and Land Stewardship. With help from these partners, the program sponsor was able to secure funding through the Iowa Clean Water State Revolving Fund. This fund provides low-interest loans to finance publicly-owned capital projects that help protect water quality in the environment.

Dubuque's local wastewater treatment agency also took advantage of a recent Iowa state-level code update that allows sewer revenues to be used for addressing nonpoint source water quality issues. In effect, this update created a new and potentially dedicated funding source for the City of Dubuque's stormwater program. This code change is an example of how state-level policy can promote integrated water management.

California's Clean Water State Revolving Fund (CWSRF) and Drinking Water State Revolving Fund (DWSRF) provide similar opportunities for financing stormwater projects. Indeed, California's CWSRF contains a Green Project Reserve that can offer principal forgiveness loans for certain projects, including the use of green infrastructure to mitigate stormwater runoff. Yet these funds are rarely used for stormwater projects (CASQA, 2016) because most California-based MS4 permittees lack the dedicated source of revenue needed to repay these loans.

CULVER CITY, CALIFORNIA

A Parcel Tax for Clean Water and Clean Beaches

Developed properties drive the generation of stormwater runoff in urban areas, so a tax based on property ownership is a reasonable basis for assessing stormwater program funding. Parcel taxes are one mechanism that links property ownership, and associated runoff generation, to the cost of stormwater services provided. In California, parcel taxes must be passed with support from two-thirds of the voting public or from at least half of all property owners. One advantage of a parcel tax is that the revenue can be used for project capital and/or maintenance costs. Culver City, in Los Angeles County, passed The Clean Water, Clean Beach Parcel Tax in 2016 (Measure CW) to pay for stormwater management projects that help reduce and prevent water pollution in local water bodies. Under their parcel tax structure, single-family property owners pay $99 annually, multi-family property owners pay $69 per dwelling unit annually, and non-residential customers pay $1,096 annually per acre of land or portion thereof. In general, these rates are such that those who own more property, and generate more runoff, pay more for the city's stormwater management program.

Another important aspect of a parcel tax in California is that it qualifies as a "special tax." A special tax is imposed for a specific purpose and the revenue from it is restricted to projects directly related to that purpose. Culver City has identified augmenting the local drinking water aquifer with captured stormwater as one of the projects to be funded by their parcel tax (Culver City, 2016). This identification recognizes stormwater capture for water supply as a legally acceptable pollution prevention measure in Culver City.

SAN ANTONIO, TEXAS

Property-Related Stormwater Fee

San Antonio established a stormwater fee in the early 1990s. The original fee was based on lot size and type (i.e., single-family residential, commercial, multi-family residential, and government), but in 2012, the city council began raising concerns about the fairness of the fee structure.[19] For example, under the old system a property owner with a 10-unit multi-family building on an acre of land would pay the same amount as a property owner with the same number of units on two acres. The city worked with a consulting firm to analyze different fee structures and found that fees based on impervious area would be the most equitable and are considered a best practice within the industry (Hammer and Valderrama, 2018).

Changing fee structures can be contentious, because some end up paying more and others less. To minimize public backlash, San Antonio developed a tiered fee structure and implemented a credit program to help those with large impervious areas reduce their fees. The fee is divided into two categories: residential and non-residential (Table 2). The residential fee has three tiers based on the extent of impervious area (in square feet), whereas the non-residential fee has four tiers based on percent of impervious area. As the tiers increase for non-residential properties, the cost per 1,000 square feet of impervious cover increases. This creates a significant incentive for larger commercial property owners to reduce their impervious cover. At the same time, the city created an LID credit as an incentive for property owners to reduce impervious cover. The credit provides a discount of up to 30% of the stormwater fee to the property owner once LID features have been installed on a property. To remain eligible for the credit, the

19 City of San Antonio Ordinance No. 2015-09-10-0761

Table 2

San Antonio's Stormwater Fee Schedule

Residential Stormwater Fee Schedule		
Tier	Impervious Area (Sq. Ft.)	2018 Fee
1	≤2,750	$3.60
2	>2,750-4,220	$4.74
3	>4,220	$10.02

Non-Residential Stormwater Fee Schedule Base Fee (per month, flat fee): $64.53		
Tier	Percent Impervious Area	2018 Fee (per 1,000 Sq. Ft.)
1	≤20%	$0.29
2	>20% – 40%	$0.43
3	>40% – 65%	$0.56
4	>65%	$0.71

Source: http://www.sanantonio.gov/TCI/Projects/Storm-Water-Fee

LID structures must be maintained to a certain standard. Fee credit programs can both incentivize voluntary retrofits with green infrastructure and ongoing maintenance (Hammer and Valderrama, 2018).

SALEM, OREGON

Property-Related Stormwater Fee with Community Outreach

Salem, Oregon's journey to instate a stormwater fee highlights the importance of outreach and public relations for agencies considering this funding mechanism. Salem is a city of approximately 150,000 people in an agricultural region of Oregon. In the 1980s, city officials attempted to create a stormwater utility; however, the public relations campaign failed to clearly articulate the need for and reasoning behind the associated fee, and it was blocked after significant public outcry (Reese et al., 2015). In 2010, city officials decided to try again.

Like their counterparts in San Antonio, City of Salem officials felt that creating the stormwater fee based on impervious area would be the most equitable means of funding their program. They focused on community relations and outreach to minimize public backlash. Key aspects of their successful outreach campaign included more than 12 months of engagement with neighborhood associations, trade and business organizations, citizen boards, the city council, and interested individuals and business owners. In addition, they focused a portion of their research on comparing their fees to those in other Oregon communities with similar characteristics, such as population, economic, and cultural characteristics. This enabled city officials to demonstrate that their fees were in line with similar communities from across the state.

Through their community engagement effort, they learned several valuable lessons that they were able to apply to the rollout of the fee as well. First, they learned that they needed more time to get adequate support from the community. Second, they decided to phase in the fee rather than institute it all at once. And third, they added a base charge that is applied equally across all accounts to cover street sweeping, billing, debt collection, public works personnel, and impervious areas of public streets. Public engagement and city leadership were key, throughout the process and after the fee was passed, to prevent backsliding (Reese et al., 2015).

PALO ALTO, CALIFORNIA

Two Components, One Stormwater Management Fee

An example of success on a voter-supported stormwater fee in California comes from the City of Palo Alto. Since 1989, Palo Alto has charged residents a "storm drainage fee," similar to fees for other utilities, such as for drinking water and wastewater services (City of Palo Alto, 2016). Palo Alto voters supported the continuation of this fee in 2005, and then in 2017, they supported an update to this fee. The update ensures continued funding for stormwater management, including new efforts to use green infrastructure. The updated fee, which is based on actual impervious area, includes an amount to be paid in perpetuity, as well as an amount that will sunset within 15 years. The portion of the fee that is set to sunset will only be extended if needed, and again, only with voter approval. The decision to divide the fee into two separate components may have helped voters to find the fee more palatable, allowing the measure to successfully pass.

PHILADELPHIA, PENNSYLVANIA

Incentivizing Cost-Effective Stormwater Capture on Private Property

The City of Philadelphia is nationally recognized as a leader in stormwater management (e.g., AAEES, 2014), installing over 200 public projects and incentivizing nearly 500 green infrastructure projects on private land since 2011 (Stutz, 2018). Driven by water quality concerns and high stormwater costs, the Philadelphia Water Department (PWD) took a bold approach to their combined sewer overflow (CSO) issues when it launched its Green City Clean Waters program. The program tackles local water quality challenges by both fixing problems with the existing storm drain system and executing a comprehensive strategy to deploy green infrastructure. From the beginning, PWD acknowledged that it was seeking a solution to the water-quality impacts of the CSO system that would also provide co-benefits to the community, local economy, and environment (PWD, 2009a). Using a triple-bottom-line analysis, PWD found that combining gray and green infrastructure would provide nearly $2.85

Source: Bonnie J., iStock

The City of Philadelphia is a national leader in implementing green infrastructure. Since 2011, the Philadelphia Water Department has installed over 200 public projects and incentivized nearly 500 projects on private land.

billion dollars in benefits to the city, compared to only $122 million in benefits from using traditional gray infrastructure alone (PWD, 2009b). This holistic, watershed-based approach has been key to the city's success in large-scale implementation of green infrastructure.

Greening of publicly-owned land is a key part of meeting their overall goal. However, PWD has also put significant funding and effort into programs that support voluntary greening of private land. An in-depth program analysis by the Natural Resource Defense Council (Valderrama and Davis, 2015) examines how PWD was able to incentivize green infrastructure on private land for less than half the cost of applications on public land. Using data collected from their early efforts, PWD found that green infrastructure on publicly-owned land cost $250,000 to $300,000 per acre, compared to $100,000 per acre on privately-owned land.

Initially, PWD offered a more standard incentive program, with direct subsidies to property owners for the capital costs of green infrastructure. After several years, PWD realized that the paperwork required to receive the subsidy was a barrier for some property owners. In response, the city launched the Greened Acre Retrofit Program, which has several innovations to reduce the cost of green infrastructure. In particular, funds are limited to companies and project aggregators that can assemble projects over large areas (the minimum conversion requirement is 10 acres). In addition, projects compete with one another, with the city awarding the most cost-effective projects.[20] With this program, PWD effectively reduced the cost of green infrastructure on private land to approximately $90,000 per acre.

CONCLUSIONS AND RECOMMENDATIONS

Stormwater has long been considered a liability. Communities have traditionally managed stormwater with the goals of mitigating flood risk and reducing water quality impairments. Yet stormwater is increasingly being viewed as an asset in a water-short state, and a growing number of communities are investing in stormwater capture as a means of augmenting their water supplies. As droughts become longer and heavy rainfall events more common in California, effective urban stormwater capture can enhance community resilience to climate change. Moreover, many of these projects, especially those that use green infrastructure, provide additional co-benefits, such as enhancing community livability and improving air quality.

20 To learn more about the Green Acres Retrofit Program and other PWD stormwater grant programs go to: http://www.phila.gov/water/wu/stormwater/Pages/Grants.aspx.

Over the past decade, the state has made major efforts to advance stormwater capture, from adopting statewide volumetric goals for stormwater use to clarifying the regulatory framework and dedicating funds for multi-benefit stormwater projects. Yet communities still struggle with inadequate and unreliable funding sources, a lack of state guidance on health and safety standards, and a host of other barriers. To overcome these barriers, many communities in California and elsewhere have adopted innovative policies and programs that can be applied more broadly. We highlight some of those efforts in this report.

Local governments can play a key role by developing regulations that directly or indirectly support stormwater capture. For example, the City of Gonzales made modest updates to their city code, ensuring new developments could incorporate curb cuts and other LID features that allow stormwater runoff to enter bioswales and other distributed infiltration structures. Others have taken a bolder approach. The City of Santa Monica, for example, adopted a citywide goal to source all water supplies locally by 2022, and identified stormwater capture as a key element to meeting that goal.

Funding stormwater management remains a major challenge. Yet here, too, communities have proven themselves to be both innovative and pragmatic. San Mateo County's integrated approach to address transportation and its impact on water quality and Dubuque, Iowa's use of partnerships opened the door to funding solutions that otherwise may not have been available. San Antonio, Texas and Salem, Oregon highlight the importance of careful communication and stakeholder engagement when designing and implementing a dedicated, local funding source. Finally, Philadelphia offers a creative solution to incentivize stormwater capture on private property that comes at a much lower cost than similar structures on public land.

While the opportunities for stormwater capture will depend on site-specific factors, there are options for communities across California to more effectively use stormwater as a local water supply. Below, we offer six recommendations for increasing stormwater capture in California.

Advance state and regional policies and provide resources to help communities pursue stormwater capture for water supply.

In some cases, local communities only need support in the form of guidelines and model ordinances to advance stormwater capture. For example, statewide health and safety guidelines on stormwater reuse could empower otherwise hesitant communities to pursue policies that support capture. Additionally, state and/or regional coordination could help facilitate public-private stormwater projects, such as through alternative compliance options.

Expand state funding and reduce barriers for local funding of stormwater management.

Many state funding programs now require projects to provide multiple benefits, and stormwater capture typically meets these criteria. However, there is still limited funding available for stormwater management, and additional state and local funding sources are needed. We recommend that the state examine how to improve the usefulness and uptake of the Clean Water and Drinking Water State Revolving Funds for stormwater capture. Additionally, the state should seek ways to reduce the onerous voter-approval requirements for stormwater services. While SB 231 could help local agencies develop dedicated funding sources, it is not a silver bullet and additional policies that increase long-term funding and cover operation and maintenance (O&M) expenses should be explored.

Develop dedicated, local funding sources for stormwater management.

Local funding is needed to effectively manage stormwater. Communities that elect to establish stormwater fees should follow best practice by basing that fee on impervious area. Significant public outreach and engagement are essential for obtaining the necessary support for fees. Non-traditional partnerships can also present opportunities, such as the use of development fees or leveraging funds from the private sector to pay for stormwater projects.

Adopt policies that drive innovative and sustainable approaches for water supply.

Local communities can use a variety of tools to advance stormwater capture. They may opt to use regulatory approaches, as in San Francisco or Gonzales. They may also adopt explicit local water supply goals, as has been done in Santa Monica and Los Angeles.

Use the cross-cutting nature of stormwater management to initiate innovative partnerships.

The multi-benefit nature of stormwater projects can facilitate partnerships between agencies and organizations. Local agencies should seek partnerships that can advance stormwater projects that provide environmental, community, and economic benefits. Local opportunities to partner will be unique. Our example from the Fresno area demonstrates how a flood agency has led stormwater recharge efforts, while in San Mateo County, collaboration on stormwater management has evolved around transportation issues.

Continue research to characterize the true cost and full benefits of stormwater capture projects.

Limited data are available on the cost of stormwater capture for supply, and those that exist often fail to account for the multiple benefits of these projects. Additional research is needed so that communities better understand the opportunities for improved stormwater management and for innovative partnerships and collaborations.

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ISBN: 978-1-893790-82-7