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From Fragmented to Joint Responsibilities: Barriers and Opportunities for Adaptive Water Quality Governance in California's Urban-Agricultural Interface

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Abstract: California is facing a critical water supply and water quality crisis, necessitating a clear shift in the way water resources are managed. This study assesses the effectiveness of water law and policy in the urban-agricultural interface, where the two discharge into common waterways but have different regulatory requirements. A case study from one of California's most productive agricultural regions, the Salinas Valley, explores the complexities and inadequacies of current water law in the interface, as well as promising integrated water management schemes. The article's findings are based on archival research, extensive document review and 15 in-depth interviews with key stakeholders. Findings suggest that local, state and federal water policy is severely fragmented, providing little incentive for the multitude of water entities to collaborate on multi-benefit projects and resulting in unsuccessful water quality improvements. There is a strong need for a more integrated policy approach that bridges different types of dischargers (agricultural and urban), water quality and water quantity issues and also incorporates land uses into policy decision making.

Keywords: water law and policy; water resource management; urban-agricultural interface; California

1. Introduction

California is facing a critical water supply and water quality crisis, necessitating a clear shift in the way water resources are managed. Clean water is vital to human health, ecosystem functions and the economy and has never before been in such high demand. In California, water pollution was exacerbated by the most severe drought on record followed by El Niño rains [1]. During the unprecedented five-year dry spell, the state lost roughly 11 trillion gallons of water [2], resulting in the literal sinking of land [3]. Of the limited water the state did have, the vast majority—90% of all assessed waters—had some degree of contamination [4]. While the 2016–2017 winter, the wettest on record, pulled the state out of the drought and ended the drought state of emergency across the entire state, it aggravated water quality issues by increasing water runoff and accompanying contaminants. Additionally, more frequent and severe weather events due to climate change will continue to have a significant impact on water resources [5].

The brunt of health problems related to water pollution has fallen on the most vulnerable and marginalized populations, with nitrates and pesticides being two primary health constituents of concern in California. Over 2 million people in the state, mostly low-income, minority farmworkers, are at risk of drinking nitrate-contaminated water due in large part to agricultural pollution [6]. Schools in the Central Valley's farmland have found such high concentrations of pollutants that they have cut off their drinking fountains to students. Nitrate-contaminated drinking water from agricultural fertilizers is a well-known risk factor for "blue baby syndrome," a potentially fatal blood disorder

resulting in reduced oxygen-carrying capacity of hemoglobin [7]. Because these communities are among the poorest in California, many lack the resources or technical capacity to maintain safe drinking water supplies [6,8], producing a startling water insecurity problem in the country's richest state. Inequitable distribution of agricultural water contamination and its consequences have become top public policy concerns. Yet there is a dearth of studies that have addressed how the existing legal water doctrines have failed to meet basic water quality standards and health protections.

One of the most suitable places to observe this water quality management challenge is in the state's expanding urban-agricultural interface, where exposure to agricultural water pollution is aggravated by sheer proximity and where jurisdiction of common waterways overlap. Urban areas are not without their pollution problems. However, urban runoff is regulated much more stringently than agricultural runoff, creating a rich opportunity to compare and contrast urban and agricultural pollution control management strategies and the emergence of alternative multi-level legal arrangements to clean conjoint waters. These discrepancies create the conditions for a unique "natural experiment" to examine the different and uneven institutional arrangements and implementation practices governing water resources between urban and agricultural sectors. Additionally, the demand for improved water quality in the urban-agricultural interface presents an opportunity to learn from emerging water pollution governance strategies that may allocate benefits more equitably and modify existing legal regimes to adapt to new contexts.

In the urban-agricultural interface, institutions charged with protecting the state's water resources are numerous and fragmented. Urban water quality is generally regarded as a municipal issue and agricultural water pollution, a nonpoint source, is exempt from discharge permitting and shrugged off as near-impossible to regulate due to its diffuse nature.

As the interface expands and pollution flows into different jurisdictions, municipalities, together with agencies that regulate agricultural operators, are forced to devise management plans to comply with federal and state water quality standards. While a variety of management options are available to these newly formed partnerships, the task of selecting and implementing appropriate policies and laws is challenging since the two sectors often have conflicting interests, priorities and socio-hydrologic contexts. Even though California is often viewed as a pioneer in environmental policies, the state's multitude of stakeholders, including a powerful agricultural lobby, often makes California water quality decision-making fraught with tension.

This research fills a much-needed gap of examining the barriers and opportunities for governing water quality in some of California's most vulnerable and politicized landscapes. This paper is organized into five parts. After a brief description of research methodologies, the paper: (1) describes three pollutants—nutrients, sediments and pesticides—and the harm they inflict on water bodies in urban and agricultural waterways, especially when they accumulate; (2) reviews several key water quality regulations in urban and agricultural land use areas, including three adaptive legislative measures related to state water issues; (3) provides a case study that exemplifies the complexities and inadequacies of current water law in the urban-agricultural interface, as well as promising integrated water management schemes; and (4) concludes by recommending avenues for advancing more coordinated and effective responses to water quality management.

2. Research Design and Methods

The article's findings are based on archival research, extensive document review and 15 in-depth interviews with water resource managers, engineers, city planners and officials, non-governmental representatives and policymakers. Each key informant was personally or professionally involved with and knowledgeable about historic and/or current water governance systems. Semi-structured interviews included topics such as: What factors motivated the regional, state and federal authorities to draft distinctly different rules for water pollution in urban and agricultural areas? What were the goals when creating these protections, or exemptions? Have water quality governance structures evolved and strengthened over time (through amendments, rulings or revisions) and why? Have there

been any efforts to restructure ineffective, disjointed water management strategies and move toward a more collaborative, multiparty approach to improving water quality in conjoint waters? Research was also based on participant observation at conferences and workshops devoted to agricultural water quality and storm water control, as well as review of policy documents and reports.

3. The Cumulative Toxic Brew in the Urban-Agriculture Interface

The water quality problems posed by nonpoint sources are numerous and diffuse in the urban-agricultural interface. When multiple inputs from urban storm drains and runoff from farms accumulate in a single waterbody, the impacts are magnified, causing cumulative effects [9]. Agricultural and urban storm water runoff are two of the top sources of waterbody impairments in the state [4]. Approximately 26,261 miles of streams and rivers and 172,050 acres of lakes are impaired by agriculture [4], while urban storm water likely contributes to 124,557 acres of impairments in lakes. Construction, a predominantly urban activity, accounts for another 88,850 acres of impairments in lakes and an additional 15,469 miles of impairments in California rivers and streams [4].

The three predominant agricultural nonpoint sources of pollution—nutrients from fertilizers, pesticides and sediments from soil erosion—together are the chief impediments to achieving national water quality objectives [10]. A UC Davis report commissioned by the California State Water Board reveals high levels of nitrate contamination in the Tulare Lake Basin and Salinas Valley predominantly from over-application of fertilizers in agricultural areas [6]. Pesticides are another agricultural contaminant of concern due to their more obscure impact on human health and the environment than their nutrient and sediment pollutant counterparts [11]. Pesticide use in California is known to contribute to water column and sediment toxicity [12–14], as well as cause human health problems, such as developmental delays in infants and children [15].

Urban storm water also contains an assortment of pollutants including nutrients and pesticides from landscaping, siltation from development projects and chemicals, oily residue and salt from impervious city surfaces [11]. Urbanization has compromised water quality through pollutant loading and by increasing stream temperatures through reducing shade and converting natural vegetation to impervious surfaces; these activities have negatively affected fish and invertebrate populations [16]. Conventional urban drainage systems often channel runoff directly to nearby waterways, thus exacerbating pollutant inputs and ecological disturbance [17]. During rain events sewage treatment systems can overflow, releasing raw sewage from the collection system before reaching the treatment facility [18]. Trash pollution has long plagued urban water quality regulators and has recently come to the forefront of urban pollution issues due to the 2015 adoption of statewide “Trash Amendments”, which require all municipalities to install trash capture devices or control technologies in priority outfalls throughout their jurisdictional boundaries. Because it is largely an unfunded mandate, city managers are wondering how and where they will find the funds to implement the expensive new infrastructure requirements.

Combining individual discharges from agriculture and those from urban areas can often make a significant, adverse change to the water quality in the interface [9]. For example, if a farmer over applies fertilizer on a crop and an urban landscaper did the same on a lawn within the same watershed, the excess nutrients from each event could multiply, stressing the receiving waterways and/or putting the ecosystem at risk of pollution [9].

4. Divergent Laws in Merging Waters

Policies that regulate discharges from cities are distinctly different than those that regulate discharges from agriculture. While both urban and agricultural industries pollute to common waters, the legal structures that manage those discharges are different. Because cities are considered point source polluters and regulated by discharge limitation permits, municipal laws aimed at water pollution are significantly more stringent and different from agricultural ones. Discharges from irrigated lands (farms) are considered nonpoint sources and, in California, regulated through Conditional Agricultural

Waivers. Water pollution control technologies, such as the implementation of Green Infrastructure programs, are also highly variable between urban and agricultural areas. The following describes the principal regulations affecting water quality in the urban and agricultural landscapes. Table 1 lists a more comprehensive set of water quality policies on the local, state and federal level.

The 1972 U.S. Clean Water Act (CWA) was established to protect the waters of the United States. The CWA regulates the discharge of pollutants into a local water body by setting uniform numeric discharge limits. These effluent limits are calculated based on the type of industry that is discharging as well as the beneficial use(s) (i.e., drinking, swimming, fishing, etc.) of the receiving water body. Restrictions are enforced through National Pollution Discharge Elimination System (NPDES) permits and apply to all point source polluters. Point sources of discharge are defined in the legislation as “any discernible, confined and discrete conveyance, including . . . any pipe, ditch and channel” (CWA § 502). Besides Agricultural Feeding Operations (AFOs), this definition excludes agricultural discharges, considering them a nonpoint source of pollution, thereby requiring states to develop ways of controlling them.

The U.S. EPA delegates to most states, including California, the authority to administer and enforce its own NPDES permits to point source dischargers. California’s comprehensive 1969 Porter-Cologne Act established the State Water Resources Control Board (SWRCB), or “State Water Board” and gave broad authority to nine Regional Water Quality Control Boards, or “Regional Boards,” to regulate water quality at a local level. The Regional Board’s authority includes issuing and enforcing all NPDES permits, as well as waiving those permits for certain polluting industries. All Regional Boards have chosen to waive waste discharge requirements from agriculture by employing what is called “Conditional Agricultural Waivers” or “Orders.”

Table 1. Federal and state water quality regulations and associated goals.

Scale of Governance	Agency	Goal
Federal	1972 Clean Water Act	Regulates water pollution; adopts water quality standards
	Safe Drinking Water Act	Establishes drinking water standards for contaminants that may cause health effects
	Endangered Species Act	Prevent extinction, recover imperiled species
State (California)	Porter Cologne Act	Comprehensive program to protect water quality in California and the beneficial uses of water
	Sustainable Groundwater Management Act *	Established long-term, local groundwater management
	Human Right to Water Act *	Establishes the human right to safe, affordable, clean and accessible water
	Affordable Right to Water Bill (Proposed) *	A Bill proposed to provide financial assistance to communities that lack safe drinking water
Regional (within California)	Conditional Agricultural Waiver	Water pollution control from irrigated lands
	Basin Plan	Acts as a master quality control planning document, setting beneficial uses and water quality objectives
	MS4 General Permits	Water pollution control from municipal runoff

* Legislation that necessitates collaboration between urban and agricultural water quality agencies (described below).

This approach has not gone uncontested. The program requires Boards to attach conditions to waivers and review them every five years. In a recent Central Coast Conditional Agricultural renewal, scientists, the California Department of Public Health, environmental justice groups and environmentalists called into question the effectiveness of this more lenient form of regulation in protecting water quality. A particularly frustrated coalition of environmental groups, together with an elderly woman who could not drink water from her tap due to agricultural contamination, filed and won a lawsuit in Sacramento’s Superior Court challenging the legitimacy of the Central Coast Regional Conditional Agricultural Waiver. The coalition claimed that the Ag Order was “so weak it did not comply with state law” [18]. In his ruling on 11 August 2015, Superior Court Judge Frawley, agreed that the Central Coast’s Conditional Agricultural Waiver was doing an inadequate job of protecting regional water quality and needed to develop more stringent conditions [19].

While agricultural nonpoint discharges are conditionally waived, urban sources of water pollution, including urban storm water, are regulated as point sources through NPDES permits, as described above. The 1987 amendments to the CWA broadened the definition of “point sources” to include municipal and industrial storm water runoff, adding section 402(p) to the Clean Water Act. In subsequent years, the EPA developed the municipal separate storm water systems (MS4) program in two phases (Phase I: 1990; Phase II: 1999). The 1990 Phase I regulation required medium and large cities or certain counties with populations of 100,000 or more to obtain MS4 NPDES permit coverage for their storm water discharges. There are approximately 855 Phase I MS4s covered by 250 Individual Permits across the country. In 1999, the Phase II regulation established storm water control mandates for small cities with a population of fewer than 100,000. Rather than issue individual storm water permits for every municipal discharger, the California State Water Resources Control Board, as authorized by the Phase II rule, adopted a “General Permit” for all small the Municipal Separate Storm Sewer Systems (MS4s), which include all storm drains that discharge into local waterbodies (Order No. 2003-0005-DWQ). As such, municipal storm water systems obtain coverage under the general permit from their Regional Board.

There are several types of permits, which differ in their requirements. The requirements of the MS4 general permit include developing and implementing a comprehensive Storm Water Management Program (SWMP), outlining management practices to reduce pollutant discharges. An additional requirement of the general permit is that local governments must also inspect construction sites and industrial facilities for compliance with the *industrial* general NPDES permit (which includes construction activities). The general permit has its own set of requirements, including a separate plan, called the storm water pollution prevention plan (or “SWPPP”), detailing how and when the responsible party will implement erosion and sediment control among other Best Management Practices (BMPs). This involved set of requirements and permits means that urban storm water (sewers, construction sites, commercial and industrial facilities, etc.) are regulated by the U.S. EPA, the California EPA, the Regional Water Quality Board and local governments. Management of these complex water systems and laws can be very challenging due to the multitude of separate entities without much coordination [20]. Table 2 lists the major agencies charged with water quality in California and their associated responsibilities.

Table 2. Major water agencies and their associated roles and responsibilities.

Scale of Governance	Agency	Responsibilities
Federal	U.S. EPA	Regulates water quality through the Clean Water Act, Safe Drinking Water Act and other laws
State	Water Resources Control Board	Implement CWA provisions; administers state water rights
	Department of Water Resources	Oversees state water planning
	Department of Public Health	Regulates drinking water
	Department of Pesticide Regulation	Regulates statewide pesticide use
Local	Public Utilities Commission	Regulates water rate structures for private utilities
	Regional Water Quality Control Boards	Regulates water quality
	Agricultural Commissioners	Local administration of pesticide use enforcement
	Offices Natural Resources Conservation Districts	Local financial and technical assistance to farmers
	County Environmental Health Department	Local administration of domestic water systems
	Municipal governments	Local administration of MS4 General Permit

Note: List not exhaustive.

The discrepancies between urban and agricultural water quality regulations have not gone unnoticed. Facing increasingly stringent urban storm water pollution control regulations, municipalities have begun to question the fairness of waiving discharges from agriculture. Municipalities have voiced their concerns about pollutants from agricultural areas being deposited into receiving waterbodies within city boundaries. One former City Manager, Fred Meurer of Monterey, suggested that agricultural industries and cities should be held to the same high water quality standards [21].

One mechanism California has employed to improve water quality conditions in complex landscapes is through the proposal and passage of Legislative Bills aimed at particularly acute water issues, such as the right to clean drinking water. While these bills do not directly address agriculture’s

relatively lax water quality regulations or the fragmentation that exists between agricultural and urban water agencies, they have forced more collaboration between agencies on these issue-based mandates. The following section examines three legal protections—the Sustainable Groundwater Management Act, the Human Right to Water Act and the Affordable Drinking Water Bill—all separate bills aimed at addressing specific water quality issues in California.

5. Adaptive Legal Frameworks

In geographic areas where jurisdiction overlaps and health hazards are evident, new multi-level institutional arrangements are being developed and implemented to address water quality challenges [22]. Each of the following examples offers valuable insights in both the water pollution issues (i.e., human health, affordability, access) and challenges (i.e., multitude of different actors, who will pay) faced in the growing urban-agricultural interface.

5.1. Sustainable Groundwater Management Act

For the first time in state history, the Sustainable Groundwater Management Act (SGMA) established a framework for long-term, local groundwater management. Passed in 2014, this was a multi-faceted three-bill package that makes progress in restricting groundwater over-extraction. In the state's high and medium-priority groundwater basins, which account for 96% of the state's groundwater use, local water districts are now required to bring their basins into balanced levels of pumping and recharge. The Act identifies six categories of actions that could have an “undesirable result” on sustainable groundwater management, including: persistent lowering of groundwater levels, significant and unreasonable reductions in groundwater storage, significant and unreasonable salt water intrusion, significant and unreasonable degradation of water quality, significant and unreasonable land subsidence and surface water depletion having significant and unreasonable effects on beneficial uses. While two goals focuses on water quality, because SGMA was a drought-driven piece of legislation the prime focus has been on water supply/quantity. SGMA established the formation of locally-controlled groundwater sustainability agencies (GSAs) to adopt management plans tailored to their community's circumstances and needs. The strategy of delegating control to local agencies. However, some question whether these newly-founded GSAs will have sufficient regulatory authority to be effective.

5.2. Human Right to Water Act

In 2012, California became the first state to legally recognize the human right to water [8]. The Human Right to Water Act recognizes that “every human being has the right to safe, clean, affordable and accessible water adequate for human consumption, cooking and sanitary purposes”. Under the new law, the California Water Code now requires all relevant agencies, specifically the Department of Water Resources, the State Water Board and the California Department of Public Health, to *consider* the human right to water when making policy decisions. The duty to consider includes taking into account several substantive factors—quality, quantity, affordability and accessibility—that may impact access to safe water.

California's human right to water policy was born out of a devastating lack of clean drinking water for numerous communities, the most pervasive of which are in disadvantaged rural areas with agricultural runoff [8]. The State Water Board estimates that roughly 300 disadvantaged communities in the State receive water from public systems that do not meet drinking water standards [8]. Because the policy only provides guidance, the bill does not create a right of action for customers to demand clean water. However, the “duty to consider” directive does create a legally binding mandate for administrative state agencies to think about how their decisions might impact drinking water quality and public water systems.

5.3. Affordable Drinking Water Bill (Proposed)

Senate Bill 623 (As of 1 September 2017, the Bill remains active and under review by the Rules Committee). addresses a gaping hole in the Human Right to Water Act—who will pay for clean water in disadvantaged communities who lack access? Many of the State’s small public water systems with polluted drinking water lack the technical, managerial and financial capacity to clean and deliver safe water at affordable rates. The State has provided Proposition 1 Funds, which offers \$7.5 billion to fund watershed protection and water supply projects throughout the state, as well as Drinking Water State Revolving Funds for assisting disadvantaged communities with paying for treatment systems. However, these are short-term solutions and currently no such funding mechanisms are available for longer-term operational improvements. If passed, the Bill would generate \$2 billion over 15 years for the Safe and Affordable Drinking Water Fund in the State Treasury. The Fund would provide emergency water and longer-term system fixes for hundreds of communities whose tap water is not in compliance with safe drinking water standards. While most agree with the Bill’s goal—assisting disadvantaged communities that lack potable water, public water agencies strongly oppose the Bill’s proposed funding mechanism: taxing local water bills (95 cents per month per water customer). Another funding mechanism that would be employed is a fertilizer fee to address contamination from farms. Interestingly and despite the cost to some farmers, agricultural and environmental groups have come together in an unusual coalition to support this bill.

6. Case Study

California abounds with urban-agricultural interfaces that are well-suited for highlighting these issues. A case study from one of California’s most productive agricultural regions, the Salinas Valley, was carefully selected based on the presence of polluted water bodies in adjoining agricultural and urban landscapes as well as the presence of a new joint initiatives aimed at addressing water quality.

Salinas, California

The Salinas Valley in California’s Central Coast Region is known as the “salad bowl of the world” for its productive lettuce heads and mixed greens. Once a small agricultural community, the City of Salinas is now the largest in the Central Coast, boasting a population of over 160,000 residents. Within its approximately 14,400 acres, the City has become “a suburban community nestled in an agricultural setting” [23], as depicted in their City logo (Figure 1) and land use patterns (Figure 2), making it an ideal case study for this research.

Because the City is surrounded by agricultural land uses, it is closely linked to the agricultural industry. Farmworkers reside in the City and commute to work in nearby agricultural operations and agricultural products, like the Valley’s famous bagged salad greens, are transported into the City for industrial processing. Additionally, farming occurs in the Carr Lake area located within City limits, illustrated in the aqua-colored bulls-eye in the center of the City in Figure 2.



Figure 1. City of Salinas logo.

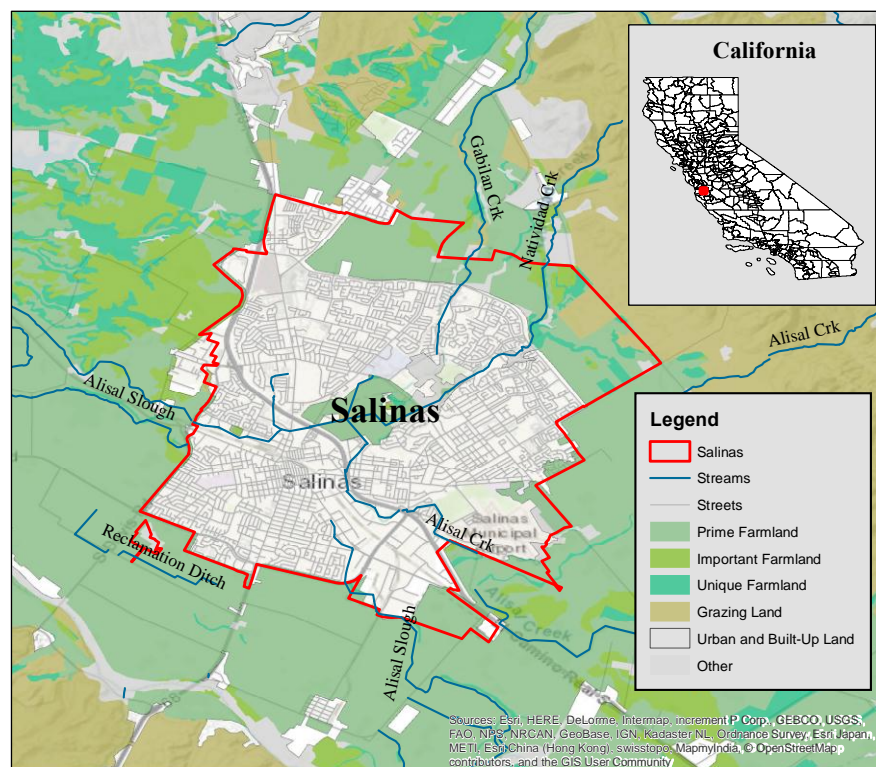


Figure 2. Salinas, CA: A city engulfed by agriculture.

Numerous waterways run through the city limits and are part of two sub watersheds that are pertinent to this case study: The Reclamation Ditch sub watershed and the Lower Salinas River watershed. The Reclamation Ditch sub watershed drains to the Old Salinas River and contains Tembladero Slough and its tributaries: The Reclamation Ditch, Espinosa Slough/Santa Rita Creek, Gabilan Creek, Natividad Creek, Alisal Creek and Towne Creek. The Lower Salinas River sub watershed drains to the Salinas River Lagoon and contains the Salinas River and its tributaries: Blanco Drain, Toro Creek, Quail Creek and Chualar Creek [24]. Both of these sub watersheds empty into the Monterey Bay. The Reclamation Ditch sub watershed, one of the most polluted systems in the region (see Figures 3 and 4), flows, on an incoming tied, into the Elkhorn Slough, a Marine Protected Area and National Estuarine Research Reserve. Nearly all of these waterways are impaired for one or a variety of pollutant parameters including ammonia, fecal coliform, low dissolved oxygen, nitrate, chloride and sodium. Figure 3 depicts a Water Quality Index calculated by the Surface Water Ambient Monitoring Program (SWAMP) for federally defined Central Coast Region watersheds, with green being good, yellow slightly impacted, red impacted and dark red severely impacted. Figure 4 shows data collected from the Central Coast Ambient Monitoring Program (CCAMP) water quality monitoring program [25], illustrating the water toxicity (based on invertebrate survival) in Salinas and nearby waterbodies.

As previously mentioned, larger cities are required to comply with a more rigorous Phase I MS4 NPDES permit. Salinas, with a population of over 100,000, is the only city in the Central Coast region that is big enough to qualify as Phase I (all other municipalities are regulated as Phase II). In 2012, the State Water Board and Central Coast Regional Board approved Salinas' most recent MS4 Phase I NPDES Permit (Order No. R3-2012-005), superseding the prior 1999 and 2004 orders. The 132-page document contains a description of regulations and best management practices (BMPs) that the City intends to employ to meet Permit requirements. When complying with its MS4 NPDES permit, the City is responsible for reducing discharges to the maximum extent practicable (MEP).

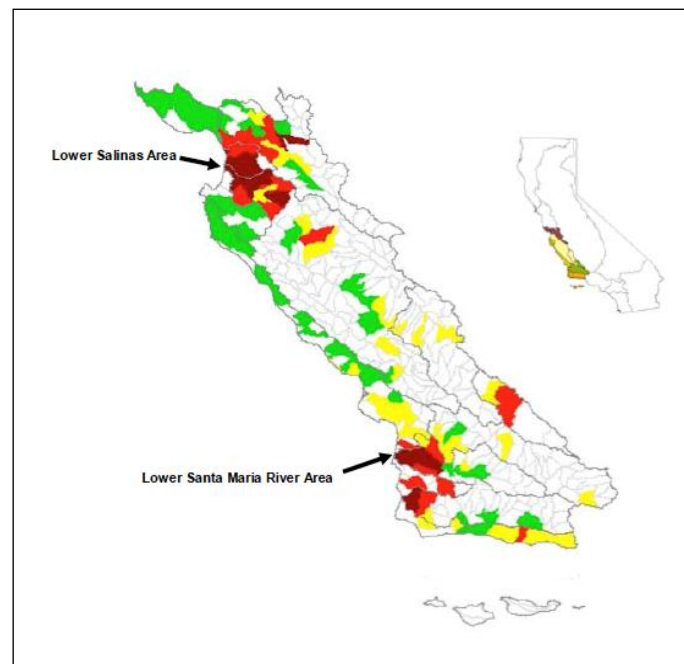


Figure 3. Water Quality in Central Coast. Source: [26].

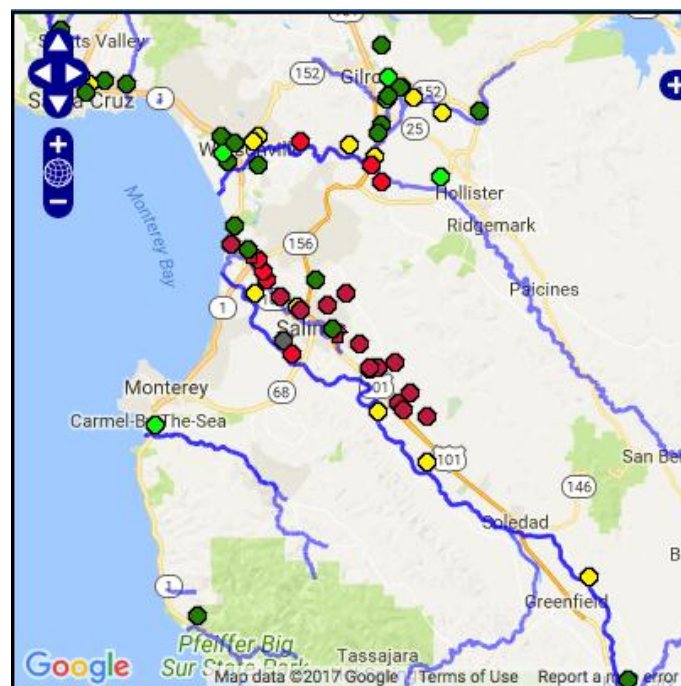


Figure 4. Water Toxicity in Salinas. Source: [25].

One of the biggest challenges urban water quality regulators face is when water entering their city is already polluted when they receive it, which, in Salinas, it usually is. Water entering into Salinas often has very high sediment and pollutant loads. According to Salinas' Stormwater Master Plan, "water flowing into the City is as much a concern for Salinas as water flowing downstream from the City. This is especially true for stakeholders furthest downstream who inherit the effects of the good, as well as the poor watershed management practices of their upstream neighbors". According to City of Salinas staff, "the major existing drainage problems occur at the boundary of the City where

runoff from adjacent agricultural fields flows into the City” [23]. An early report (1994) prepared by the California Department of Fish and Game, Marine Pollution Lab and the Moss Landing Marine Laboratory, found similar pollution causes: “Agricultural lands receive higher levels of known poisons than any other landscape in the state. Year after year, farm chemicals drain into a ditch system that empties directly into the Monterey Bay Marine Sanctuary. Urban runoff is less important in the Salinas Valley than farm sources.” It should be noted that while urban runoff has been deemed less of a pollution source than agriculture, it is not without its own problems, including trash, sediment, nutrient and pesticide contamination.

Because the City is responsible for the quality of water leaving its boundaries, it begs the question: is the City responsible for cleaning the polluted agricultural water it inherited from further upstream? A statement from the Stormwater Management Plan Update (2013) explains the nuanced difference in what it is and is not responsible for:

“As operator of the MS4, the Permittee cannot passively receive and discharge pollutants from third parties. By providing free and open access to an MS4 that conveys discharges to waters of the U.S., the Permittee essentially accepts responsibility for discharges into the MS4 that it does not prohibit or control. These discharges may cause or contribute to a condition of contamination or a violation of water quality standards. However, discharges from agricultural lands that are comprised solely of return flows and/or storm water are exempt from NPDES permitting. As such, the Permittee is not responsible for these discharges that enter its MS4. The Permittee is responsible for other agricultural-related discharges into its MS4.”

In summary, Salinas cannot passively receive upstream discharge pollutants, unless they are from agriculture, in which case they can acquiescently allow agricultural contaminants to flow through their city’s waterways. Lacking little to no control of the agricultural pollutants that come into the City’s jurisdiction and little incentive or regulatory authority to clean them up, the situation leaves what one water manager describes as “futile” (Personal Communication, 15 November 2017). The intricate hydrologic structure in and out of the City further complicates the variance in urban and agricultural regulatory systems. The following description depicts the convoluted physical flow of water and tangled assemblage of urban and agricultural dischargers in Salinas’ waterways:

“Water that begins its journey in the relatively undisturbed Gabilan and Santa Lucia Mountains drains farmlands and other cities and developed areas before entering Salinas. Once in the City, water passes through municipal neighborhoods before re-entering farmlands, then flows on to more urban uses. Water flows out of Salinas to re-enter more farmland before draining ultimately to Monterey Bay. On its journey, water flows through several different land uses, some more than once and often through several different jurisdictions” [23].

If the City of Salinas is not required to clean up agricultural storm water but urban and agricultural discharges mix into a complex stew of amalgamated pollutants, how do regulators know which pollutants are from agricultural lands and which are from urban and other land uses? The short answer is: they do not. Leaving the unknown sources of pollutants subject to the blame game of different stakeholders pointing fingers at one another defending that the problem is not theirs to clean up. However, with the emergence of several listings of impaired waterbodies in the area, efforts are underway to tease out who polluted and how much. Recent 303(d) listing in the Salinas River watershed include: chlorpyrifos and diazinon Total Maximum Daily Load (TMDL) (2011), fecal coliform TMDL (2010), nutrient TMDL (2013), salts TMDL (in development), sediment toxicity TMDL (in development) and turbidity TMDL (in development). While water quality agencies (in the city, region and state) are ramping up monitoring efforts in these contaminated hotspots to gain a better understanding of the major polluters, another key element to consider in the TMDL

process is that it is not just the total amount of pollution reaching the water body but also the amount of water present to “dilute” or to “assimilate” those waters [27]. Consequently, the TMDL program “cannot work properly if water quality agencies limit pollutant discharges while the water rights department simultaneously—and without coordination—allows more water withdrawals” [27], making the chemicals in the waterbodies more concentrated.

An example from Salinas illustrates the increased need to couple water quality and water quantity when designing policies and programs. Until very recently (before the adoption of the SGMA in 2014), farmers in California have always had unlimited access to groundwater for irrigation. If they can drill a well, they can use the groundwater. In Salinas, however, that all changed a few years earlier than in the rest of the state when farmers begun sucking saltwater instead of freshwater out of their wells. In a frenzy, farmers led the charge to improve groundwater quality so they could irrigate their crops. With the dire need to mitigate saltwater intrusion (a water quality issue) and with fresh impetus from the Groundwater Sustainability Management Act (a largely water quantity-driven piece of legislation), Salinas rapidly developed more integrated approaches to connecting water quality and water quantity. One particularly noteworthy project is “Pure Water Monterey”, which is a coordinated effort between the City of Salinas, Castroville, the County of Monterey, the Monterey Peninsula Water Management District and the Monterey Regional Water Pollution Control Agency (“Monterey One”). Pure Water Monterey is intended to be a multi-benefit, integrated, regional solution that provides water recycling, improved water quality and groundwater recharge [28]. The goals are manifold. Wastewater from industrial processing in the City is diverted to a treatment facility, rather than being discharged into local waterways and eventually into the Monterey Bay. Once the water is treated, it can be used to help recharge the groundwater, preventing further saltwater intrusion and providing a more reliable and clean groundwater source for irrigation. Additionally, future phases of the project, which were recently funded by a \$10 million Prop 1 grant, will divert very polluted water from the heavily polluted Reclamation Ditch and Blanco Drain, treating it and recycling back into the groundwater. While the integrated, multi-benefit project is laudable, some water managers wonder if it provides yet another free pass to let agriculture pollute into these waterbodies, now knowing they will be cleaned up further downstream.

Another more divisive event playing out in Salinas but one that could eventually lead to more coordinated efforts between water quantity and water quality and possibly between different agencies and stakeholders, is a lawsuit between an environmental organization, Monterey Coastkeeper and the Monterey County Water Resources Agency. In 2011, Monterey Coastkeeper sued the Water Resources Agency, claiming that the Agency was one of the major culprits of water pollution in Salinas but has never been regulated as such. Monterey Coastkeeper defends that the Water Resource Agency should be treated as a “waste discharger” because the Agency actively operates, withdraws and transports polluted waterways, including the Reclamation Ditch and the Blanco Drain and has inadequately managed the water quality under its jurisdiction. The Water Resources Agency, however, argues that even though it might divert or transport water for flood or groundwater recharge purposes (i.e., water quantity), it is not responsible for the pollution of that water (i.e., water quality). Instead water quality should be the responsibility of the individual polluters, most of which are exempt from permitting and under the umbrella of the Conditional Agricultural Waiver. After more than four years of litigation, in March 2015, Monterey County Superior Court Judge Thomas Wills found that the Water Resources Agency should indeed be considered a discharger. Soon after, the Agency filed a notice of intent to appeal, extending the controversy. If, in the final ruling, the court rules again in favor of regulating the County’s Water Resource Agency as a discharger, while there may be unresolved questions of fairness, the decision would inevitably encourage more interagency collaboration since ultimately the County would need to work with agriculture to clean up the water they manage.

An equally important piece of the water law and policy puzzle, especially in diverse landscapes, is the set of laws and disparate agencies governing land use. Most land use activities present significant potential to pollute nearby waterways. According to at least one regional water resource regulator,

land use is a significantly overlooked harm to local waterways and the agencies that control and manage land uses should be held more accountable. One of the most difficult challenges is that land use policy is fragmented among numerous, disparate entities [27]. For example, in the Salinas area, while the primary entity handling land use permits is the County of Monterey's Resource Management Agency, a variety of other entities and levels of government hold authority over planning, zoning and development patterns. Land use policies usually give little consideration to water quality and water quantity impacts.

One project on the horizon for the City of Salinas, which will test the effectiveness of transferring land uses from agriculture to less polluting activities, such as conservation and parks/recreation, is the Carr Lake project. In January 2017, The Big Sur Land Trust, a nonprofit conservation organization, bought 73 acres of seasonally dry lakebed. For decades, three Japanese farming families have owned the land that makes up Carr Lake and two continue to own and farm their parcels. The Big Sur Land Trust has goals of using the land for parks and recreation community programs, environmental initiatives and education. The City has long thought the land would be an ideal location for a "Central Park". In addition to the potential for possible water quality improvements, it also highlights the important role that nongovernmental actors and partners can and have increasingly played in helping solve a wide array of public problems, including water quality. Because public agencies are so preoccupied with budgeting, completing lengthy regulatory paperwork and trapped specializing in crucial operational functions, society becomes increasingly reliant on third party agencies to help pursue public purposes ([29]).

7. Conclusions: From Fragmented to Joint Responsibilities

"It is difficult to imagine a legal and policy regime as fractured as that used to govern water resources in the United States. Connected issues are addressed without coordination and authority is divided among federal, state and local entities that have little incentive to coordinate their interrelated actions."

—Robert W. Adler, Professor of Law

As the Salinas case study illustrates, the compartmentalized laws separating water pollution control policies in agricultural lands versus those in urban areas, as well as policies dividing water quality, water quantity and land use, do not lend themselves to coordinated and collaborative efforts—although the waterways themselves are inextricably connected. As Dr. Adler's quote eludes to, this is not an unusual case; rather it is a common phenomenon occurring throughout the United States. Managers that administer municipal separate storm sewer systems (MS4s) are using the limited resources available to them to narrowly focus on complying with their own set of permits, while other dischargers (e.g., growers) are each individually concerned with separate mandates.

While current water laws and policies tend to facilitate more divisive rather than cooperative approaches, what do seem to be driving progress are issue-based mandates and local watershed projects that occur as a result of dire circumstances. Unfortunately, these forced-collaborations are the exception to the rule and are implemented as a result of devastating events—a historic drought (SGMA), a lack of clean drinking water (Human Right to Water) and seawater intrusion (Pure Water Monterey)—rather than as a preventative measure and as standard practice. However, because of the legislative mandates' strong directives, especially the "right to consider" clause in the Human Right to Water and the SGMA landmark decision to finally regulate groundwater, each could likely set a new precedence of more interagency cooperation within California's water management network. While the SGMA and Human Right to Water are not strong enough on their own to overhaul disparate federal and state policy regimes, combined and with other local efforts, they may begin to elicit incremental and vital change.

Addressing the root cause of the pollution problem—a political system that largely exempts agriculture's pollution—would be a logic place to begin in solving this water quality conundrum.

The inadequacies of the current approach to agricultural nonpoint source pollution control in the U.S. have been widely studied and discussed (see [30] for a review of the literature). Transitioning from voluntary mechanisms to more effective and enforceable regulatory instruments based on measurable water quality performance is paramount to cleaning U.S. waters.

In California, a shift to numeric performance standards for agriculture necessitates a major overhaul of the state's Conditional Agricultural Waiver program. The most effective, yet dramatic change would be to remove the waste discharge exemption status for agriculture altogether and transition the industry from a Waiver program to a permit system. This major reform could either occur at the state or federal level. Two other nonpoint pollution sources that have successfully undergone such a transition include: (1) Confined Animal Feeding Operations (CAFOs) and (2) urban storm water.

If the California State Water Board and Regional Boards continue to work within the confines of the Conditional Agricultural Waiver program, several glaring issues need to be addressed. First, the Agricultural Waivers need to work as intended: Agricultural Waivers need to become more rigorous with every 5-year-update if water quality improvements are not being achieved and the State Board needs to hold Regional Boards accountable to making progress. While Regional Boards may have attached more provisions to their Waivers, in most regions water quality continues to decline or remains in a dismal condition with only limited success stories (e.g., water column toxicity decrease in the Central Coast region). Second, as the Superior Court Judge advised, Waivers need to have "adequate performance standards and feedback mechanisms to assess the effectiveness of implemented management practices in reducing pollution and preventing further degradation of water quality" [20]. Even if Agricultural Waivers have added modest monitoring requirements to subsequent iterations of their region's Waiver program, many still fall short of verifying the effectiveness of on-farm water quality management practices. Additionally, most programs, if not all, have insufficient monitoring data to identify individual operations that cause impairments. This issue points to a third and perhaps the most important problem within the Agricultural Waiver program: public disclosure and information. The most effective means of identifying a polluter is to conduct individual discharge monitoring at the edge of a discharger's field where pollutants enter the water. Growers and the California agricultural lobby have fought hard to keep monitoring as far away from their fields as possible and to ensure that their names are not associated with monitoring data. Growers do not want to be identified as a point source polluter and subsequently regulated under the NPDES permit system. As one Regional Board staff member put it, growers "don't want to deal with a government agency managing their land and water and they don't want to be called part of the problem". This final piece unveils the underlying impediment to agricultural water quality—as it currently functions, the Waiver program allows the most egregious agricultural polluters to hide in the shadows of collective monitoring and pollute into state waterways. Whether we transition to a permit system where more rigorous monitoring is mandated and public disclosure is law (e.g., NPDES), or whether we demand similar provisions in Agricultural Waivers, the public and policymakers must have access to transparent, sound and ongoing water quality data at the edge-of-field in order to make decisions on behalf of public health and the environment.

Another, separate agricultural-specific mandate would be to introduce a piece of legislation that addresses groundwater pollution, especially nitrate contamination. As one staff member working closely with the Salinas Valley SGMA reported, what is trying to be done with the SGMA is so colossal that the water quality piece will likely take a back seat to the focus on water quantity. A policy that would directly address nitrate contamination would be profound in many ways but perhaps one of the most important impacts it could have is in bridging water quality (especially nitrate contamination), water quantity (since water quality in groundwater is inextricably connected to groundwater levels) and land use (the biggest culprit in California being agriculture). As one groundwater expert explained, "there is no use in putting all the effort into balancing groundwater levels, if all the water is polluted and unusable" (Personal Communication, 13 November 2017). One problem cannot be solved without

addressing the other, necessitating what he called a “One Water” perspective. Additionally, due to the nature of nitrogen transport pathways into groundwater, the simple process of initiating a groundwater quality regulatory program could provoke a different way of thinking about environmental regulation. This is due to the fact that regulators would need to begin monitoring and controlling the source of nitrate pollution—fertilizers—if improvements were actually to be achieved. While reducing pollutants at the point of entry might not sound revolutionary, such a policy tool has a lot of potential but is rarely been employed. Most environmental policy tools employed in the U.S. occur at the end-of-pipe, after the pollutant has already entered the environment.

The other key missing element to solving the water quality conundrum is sufficient funding. Many of the public water pollution control systems are so poorly funded that even if there were intentions to reach across jurisdictional boundaries to other dischargers, they may not have the time nor resources for undertaking such an endeavor. California’s State Water Board and the Federal EPA seem to be aware of the funding problem and do offer some financial support. The State Revolving Fund, administered by the State Water Board, is one of the most common ways storm water managers secure funds for capital improvement projects. The Fund is a loan program intended to assist the following projects: nonpoint source pollution control programs, implementation of estuary conservation programs and construction of wastewater treatment facilities. Other State related funding mechanisms include Proposition 13: Safe Drinking Water Bond Act, Proposition 40: Water, Habitat, Air and Park Projects, Proposition 50: Water Security, Drinking Water, Coastal and Beach Protection Act, Federal Urban Creek Restoration Grants and State/Tribal Wetlands Program (see Salinas Stormwater Management Plan for more details). Federal grants include Nonpoint Source Implementation Grant and the Stream Restoration Mitigation Bank.

While the City of Salinas has the above grant and loan options at their disposal for special projects, their year-to-year budget for the entire storm water and urban water quality program is reliant on its portion from the General Fund. In a city plagued by high crime rates, the majority of the Salinas’ General Fund budget (usually over 70%) is dedicated to funding police, fire and other public safety services, leaving the municipal storm water programs with limited staff and funding. The Public Policy Institute of California estimates an annual funding gap of \$500–\$800 million for storm water programs in cities throughout the state [1]. Because the State now mandates that cities comply with more rigorous NPDES permits, not only for their wastewater treatment but also for urban storm water, increased funding must follow.

Fortunately, despite the financial obstacles, Salinas has successfully complied with the most rigorous municipal discharge permit in the Central Coast region and even found creative ways to implement multi-benefit, integrated water quality and quantity projects, such as Pure Water Monterey. Nongovernmental agencies have stepped in to play a role, such as the Big Sur Land Trusts endeavors at Carr Lake, as well as third party monitoring groups aiding in assessing the regional water quality problem (e.g., Coastal Watershed Council’s First Flush). Clearly, however, water quality efforts would benefit most not from disparate efforts but from larger institutional change. Currently, different levels of government are deemed as competing power structures [27]. As the urban-agricultural interface so vividly illustrates, agencies charged with regulating urban water discharges are pitted against those regulating agricultural pollution because they do not want to be responsible for each other’s waste and similarly those managing water transport, flooding and recharge (e.g., Monterey County Water Resource Agency) do not want any part of water pollution management. Perhaps if the agricultural industry was held to the same high pollution standards with similar regulatory mechanisms as their urban counterparts, not only would there be a better chance of improving water quality but water resource management might have a chance of becoming integrated.

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