DISSERTATION

SOLVING THE RUBIK'S CUBE: UNDERSTANDING THE MANY SIDES OF THE MUNICIPAL STORMWATER PROGRAM

Submitted by

Megan M. DeMasters

Department of Political Science

In partial fulfillment of the requirements

For the Degree of Doctor of Philosophy

Colorado State University

Fort Collins, Colorado

Summer 2017

Doctoral Committee:

Advisor: Susan Opp

Kyle L. Saunders
Sandra Davis
Martin Carcasson

ABSTRACT

SOLVING THE RUBIK'S CUBE: UNDERSTANDING THE MANY SIDES OF THE MUNICIPAL STORMWATER PROGRAM

The importance of water to support all aspects of human and non-human life has led to debates over the quality of water in the United States and continues to be a salient political issue. Stormwater runoff specifically continues to be a primary source of water pollution in the United States posing risks to human health and ecosystems which is further exacerbated by the impacts of climate change. Growing concerns over water quality due to stormwater runoff as well as mixed results on the effectiveness of the stormwater permitting program is the basis for this research and the questions this dissertation seeks to answer. The purpose of this dissertation is to gain a better understanding of how the municipal stormwater program operates by examining phase II of the program. To accomplish the goals for this dissertation, three separate research articles are presented that each utilize and draw from distinct theories but are, at the same time, connected to each other.

The first chapter of this dissertation seeks to understand how states develop and implement their municipal stormwater programs. The second chapter of this dissertation is focused on second-order federalism questions pertaining to stormwater management. The final chapter of this dissertation provides an assessment of public participation in the stormwater program.

Through these three separate, yet interrelated chapters this dissertation has several key findings. First, the way in which federal stormwater regulations are written provides great

discretion to the states in developing and implementing their stormwater permits; ultimately resulting in variation across states in what is required for stormwater permittees to meet standards. Second, local governments required to obtain coverage for their stormwater discharges vary greatly in the ways in which they meet permit requirements and if they are able exceed the minimum required by state-wide general permits. Third, despite public participation efforts ranging from informing the public of the actions local governments are taking to reduce stormwater pollution, to the citizens being directly involved in decision-making processes; these forms of participation are primarily considered to be conventional methods of citizen participation. Finally, across the cases, determining effectiveness of the municipal stormwater program is based on perceptions of effectiveness, rather than how effective the program actually is in reducing polluted stormwater runoff.

The combined findings from these chapters add to scholarship and provide useful information for practitioners involved in this program in several ways. First, each chapter fills gaps and extends our knowledge of the existing literature, contributing to theory building and theory expansion for the respective literature being utilized. Next, by providing information about how phase II of the municipal stormwater program works across various states and different levels of government, this dissertation provides important insights to practitioners tasked with managing stormwater for both environmental and emergency management needs. In sum, this project has both theoretical and practical significance important to the study of environmental management as well as the field of Public Administration.

ACNOWLEDGEMENTS

First, I would like to thank all the interviewees that participated in this study, without them this work would not have been possible. I also wish to thank my advisor Dr. Susan Opp for helping me complete the requirements of my degree and this dissertation. Susan's guidance both professionally and personally made it possible to finish the dissertation and degree requirements on time, while also offering me the flexibility to teach courses and balance other aspects of life. I would also like to thank Dr. Kyle Saunders for the numerous discussions and humoring me when I needed to talk things through. I would also like to thank Drs. Sandra Davis, and Martin Carcasson for their helpful and thorough comments.

Second, I am forever indebted to the Political Science Department and Colorado State University which provided me with the resources to succeed. The department's excellent professors and expertise in environmental politics and policy significantly expanded my knowledge base and skills which was vital to writing a more comprehensive dissertation. Additionally, the many educational and research resources available at the University allowed me to transform my research ideas into a finished and polished product.

Third, I would like to thank my undergraduate advisor Dr. Donna Lybecker. Donna was the first person who suggested I apply to graduate school and provided me with the confidence I needed to pursue a doctorate degree. Throughout the years, Donna continued to be a huge support, often providing advice over phone or e-mail Without Donna I would not be where I am today.

Fourth, I would like to thank my department spouse, Jeff Cook, for his unrelenting support and encouragement for the past five years. His friendship and "Pizza Tuesdays" made

this entire process more bearable. I would also like to thank Megan Ruxton, for her encouragement and support as well as the entire fall 2012 cohort.

Finally, I would like to thank my best friend, Nikolae Ewald. I cannot put into words how grateful I am for his support this past year. Niko's support and encouragement not only kept me motivated to finish, but reminded me that it was okay to have a life outside of school, keeping me laughing and living life throughout the process. More broadly, I would like to thank my friends and family for their constant support. The many phone calls, texts and other conversations asking about what I was working on and when I would finish continued to motivate me. Without each of you, I would not have made it this far.

TABLE OF CONTENTS

LIST OF ACRONYMS

BMP	Best Management Practices
LID	Low Impact Development
MCM	Minimum Control Measure
MEP	Maximum Extent Practicable
MS4	Municipal Storm Sewer System
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
SMARTS	Stormwater Multiple Application and Report Tracking System
SWMP	Stormwater Management Plan
SWPPP	Stormwater Pollution Prevention Plan
TMDL	Total Maximum Daily Load

INTRODUCTION

While U.S. environmental laws such as the Clean Water Act (CWA), passed by the federal government to address water pollution across the United States have led to some improvement in the nation's water quality, the importance of clean water to support all aspects of human and non-human life and activities means concerns over water quality continue to be a salient issue for practitioners, scholars, citizens, and policymakers. Specifically, stormwater runoff continues to be a primary source of water pollution in the United States (EPA 2014), puzzling those who work towards improving water quality. Moreover, the expansion of urbanized areas[1] has further exacerbated water quality concerns from stormwater runoff due to the increased volumes of pollutants being discharged into larger bodies of water (EPA 2014).

To mitigate pollutants from municipal stormwater runoff, the Environmental Protection Agency (EPA) developed rules addressing stormwater runoff from Municipal Separate Storm Sewer Systems (MS4s)[2]. It is estimated that approximately 10 trillion gallons of untreated stormwater enter waterways each year in the United States posing human health risks, damaging ecosystems, and affecting tourism in coastal areas (NRDC 2013). As pollution from stormwater continues to occur, federal, state and local governments are exploring ways to effectively reduce pollutants. These include experimentation with various best management practices and working with other levels of government to address shared concerns over stormwater pollution.

[1] Urban areas represent more densely populated areas of the United States and include commercial, residential, and other non-residential land use. The Census Bureau delineates urban areas after every decennial census. Urban areas are defined as areas with 50,000 people or more while urban clusters have at least 2,500 people but no more than 50,000 (census.gov 2014).

[2] MS4s are structures such as pipes, ditches, etc., that stormwater runoff flows through. Runoff is ultimately discharged into various bodies of water.

Through a series of separate but related chapters, the purpose of this dissertation is to gain a better understanding of how the municipal stormwater program works by examining phase II of the program. After providing a brief primer on the stormwater program, the goals of each chapter will be discussed, focusing on the literature each chapter is drawing from and the questions each chapter seeks to answer.

Introduction to the Stormwater Program

Stormwater runoff is defined as the water runoff from melted snow, rain and other forms of precipitation that does not percolate surfaces thereby collecting debris, chemicals, sediment and other pollutants which, if discharged into bodies of water without first being treated, adversely affect water quality (EPA 2015, 2014). Moreover, because pollution from stormwater runoff arises from a variety of sources including industrial, commercial, and municipal sources; stormwater pollution is considered "one of the great challenges of modern water pollution control" (National Resource Council 2008, vii). The extreme risk untreated stormwater poses for water quality has resulted in stormwater runoff being regulated under the Clean Water Act (CWA) National Pollutant Discharge Elimination System (NPDES)[3] stormwater program, section 402. Since its inception in 1990, the NPDES stormwater program regulates point-source stormwater pollution from three sources: municipal, construction activities, and industrial activities (EPA 2014).

The NPDES stormwater program for Municipal Separate Storm Sewer Systems (MS4s)[4] was developed in two phases. Phase I issued in 1990 requires MS4s in medium and large cities and in some counties (with a population of 100,000 or more) obtain an NPDES permit for their

[3] Full List of Abbreviations at the end of the dissertation.
[4] MS4s are defined as "a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains)" (EPA 2014a).

stormwater discharges. To date, there are approximately 750 cities and counties across the United States that are required to obtain and to maintain a phase I MS4 permit. Phase II, issued in 1999, requires that regulated small MS4s in urbanized areas and clusters designated by the federal or state permitting agency obtain NPDES permit coverage for their stormwater discharges.[5] There are approximately 6,700 phase II MS4s across the United States (EPA 2014).[6]

Phase II of the NPDES program requires operators of small regulated MS4s, or MS4s where stormwater runoff has a high risk of polluting waterways to develop stormwater management programs (SWMPs) to accomplish three things: decrease the discharge of pollutants to the "maximum extent practicable" (MEP), to protect water quality, and to meet the relevant requirements of the CWA (EPA 2000). While this research will only examine local governments covered under phase II of the stormwater program, it is important to note that operators of small-regulated MS4s who must comply with the program requirements include several different types of local entities including local sewer districts, special service districts, state and federal departments of transportation, public universities, public hospitals, military bases, and correctional facilities (EPA 2000). These entities are included under phase II of the MS4 program because their stormwater discharges have been determined to be a significant threat to water quality in their respective areas (EPA 2000).

[5] An urbanized area has 50,000 or more people while an urban cluster as a population of at least 2,500 but less than 50,000 (census.gov).

[6] Phase II designation: 1) requires nationwide coverage of all operators of small MS4s in census defined urbanized areas. Cannot be removed once designated. 2) permitting authority can designate city or town as needed to be regulated if it is determined to potentially adversely affect water quality—minimum criteria include population of at least 10,000 and population density of approximately 1,000 per square mile. 3) if MS4 is physically interconnected with another MS4 that allows for direct discharges into the second system.

In meeting requirements of the municipal stormwater program, operators of small MS4s are required to do five things: apply for an NPDES permit with the appropriate permitting authority (in most cases this is a state-agency), develop a SWMP that complies with the state-wide general permit with six minimum control measures (table 0.1), implement the SWMP and develop best management practices (BMPs)[7] for each of the control measures, establish measurable goals to meet the minimum control measures and evaluate the effectiveness of the program (EPA 2014b). Operators of MS4s have discretion in choosing the best management practices they implement to meet the minimum control measures. Additionally, because MS4s may have other goals related to restoration and protection of water systems, they may set goals in their SWMPs that exceed basic permitting requirements that "reflect local understanding of the storm drain system and receiving water conditions" (EPA 2008).

Table 0.1: Phase II Stormwater Minimum Control Measures

Minimum Control Measures	Summary
Public Education and Outreach	Requires operators of small MS4s to implement a public education program that includes outreach activities such as the distribution of educational materials explaining the adverse impacts stormwater discharge may have on bodies of water and include actions citizens may take to reduce pollution (EPA 2000a).
Public Participation and Involvement	Requires operators of small MS4s to comply with all federal, state and other public notice requirements to ensure there are ample opportunities for public participation in the management and development of MS4s (EPA 2000b).
Illicit Discharge Detection and Elimination	Requires operators of small MS4s to maintain a map of where water from their MS4s is discharged and the affected bodies of water. Additionally, operators must prohibit and have an enforcement mechanism for non-stormwater discharges (EPA 2000c).[6]

[7] For a list of National Best Management Practices that operators of MS4s may choose from visit http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm.

Non stormwater discharges include oil leakages from cars, etc. where local government cites and requests owners to get fixed (personal communication 2015) Enforcement mechanisms include citations for violations.

Construction Site Runoff Control	This control measure pertains to polluted stormwater runoff from any given small MS4 from construction activities that disturb one or more acres of land. Operators are required to have a regulatory mechanism in place to control for land erosion, sediment control and the control of other waste. Requires a mechanism to review construction plans that includes assessment of potential water quality issues associated with construction (EPA 2000d).
Post-Construction Runoff Control	Requires operators of small MS4s to establish and implement strategies to minimize pollution from post-construction runoff. This includes best management practices to address structural and nonstructural components (EPA 2000e).
Pollution Prevention/Good Housekeeping	Requires operators of small MS4s to establish and implement a maintenance and operation program with the primary goal of preventing and reducing polluted runoff from municipal operations. This includes training municipal employees on prevention/Good Housekeeping techniques (EPA 2000f).

Primary authority to approve permit applications for both phase I and II of the stormwater program has been awarded to 46 of 50 [8]states. Information provided by the EPA indicates that when states are the primary permitting authority they have discretion to write permits that may exceed federal NPDES requirements, setting more stringent requirements that take into consideration other state priorities related to environmental protection (State Water Board of California 2004). In addition to the list of best management practices the EPA

[8] The EPA continues to be the primary permitting authority for Idaho, Massachusetts, New Hampshire, and New Mexico.

identifies; states serving as the primary permitting authority may develop their own lists of best management practices with consideration of specific environmental and water quality needs.

Another unique characteristic of the phase II MS4 program is the type of NPDES permit small MS4s are covered under. While phase I MS4s are, in general, required to obtain individual permits that are written with consideration of specific facility design and the relevant water quality issues, phase II MS4s are covered under general NPDES permits which allows for various discharges within a geographical area to be covered by one general shared permit (EPA 2014).This can include multiple units of local government, and non-traditional operators of MS4s including military bases, college campuses, school districts and so on (State Water Board of California 2013). While covered under a general permit, local governments are still required to develop individual SWMPS outlining how they intend to meet the state-wide general permit requirements and their chosen best management practices (BMPs) to meet the minimum control measures. A notice of intent (NOI) serves as the permit application for small MS4s regulated under a general permit and documentation submitted to the state includes the NOI, the chosen BMPs and measurable goals to meet the minimum requirements. Local governments have discretion in choosing BMPs and measurable goals that work best for them (EPA 2014). In some instances, local governments may apply to create a joint SWMP, an implementation strategy allowed under some state level rules and regulations aimed at promoting a more regional approach to stormwater management. Strategies that promote a regional approach to stormwater management include shared responsibility among participating municipalities in developing and managing SWMPs, utilizing other local or state programs available, and applying for a permit with another municipality as a co-permittee (EPA 2014c). Where states

are the primary permitting authority state level rules and regulations affect the ability of small MS4s to work with others and apply for the ability to form joint SWMPs.

Goals of the dissertation

Due to the complexities of the municipal stormwater program, the first article of this dissertation seeks to understand how states develop and implement their phase II municipal stormwater programs. In other words, the first article of this project examines how implementation of this program at the state level works. Since the stormwater program is representative of a partial preemption program, where states have discretion in how they meet federal standards, without further understanding how the implementation process of the stormwater program works it is not possible to answer questions about federal-state relations, or answer questions of why some states exceed EPA standards for stormwater while others do not. In other words, understanding how states develop and implement their programs is a crucial first step to understanding the program and answering future research questions. Building from this first article, the second major research goal of this dissertation is directed at exploring second-order federalism questions pertaining to stormwater management. Specifically, article two will examine how state level rules and regulations affect the development of stormwater management plans developed by local level administrators responsible for operating MS4s. To get at this, this article will build from literature concerning second-order federalism as well as some of the sustainable cities literature to gain a better understanding of how state-local relations affect this program.

The final article in this dissertation will provide an assessment of public participation in the stormwater program. As much of the literature within the fields of public administration and policy alludes to, public involvement has become crucial in effective policy adoption,

development, and implementation. Additionally, because the stormwater program requires public involvement as one of the minimum control measures, gaining a better understanding of how the public are involved and who the relevant groups are is imperative for practitioners who are tasked with implementing and managing this aspect of the program. Following a summary of how the stormwater program works, a summary of the literature, proposed methods, research questions and potential contributions for each of the three articles is presented.

CHAPTER ONE:
STORMWATER THE FINAL FRONTIER: EXPLORATORY STUDY OF STATE-LEVEL IMPLEMENTATION OF THE PHASE II MUNICIPAL STORMWATER PROGRAM

Introduction

Defined as changing land use from forest and agricultural land to urban and suburban areas, urbanization in the United States is occurring at an unprecedented pace (EPA 2008). As the pace of urbanization increases, citizens, political actors and other groups are concerned with the affects urbanization has on water quality. One key reason for this concern is because impervious surfaces, such as roads and parking structures, affect the way stormwater runoff moves, increasing both the rate and volume of stormwater runoff. This in turn increases the amount of pollutants collected that would otherwise be removed through natural filtration systems such as dirt and gravel. It is this increase in stormwater runoff pollution that results in water quality concerns in bodies of water across the United States (EPA 2008). It is estimated that each year approximately 10 trillion gallons of untreated stormwater contaminate waterways in the United States posing human health risks, damaging ecosystems, and affecting tourism in coastal areas (NRDC 2013). In addition to these concerns, climate change also complicates the issue by creating more intense storms and floods, thereby increasing the amount of pollutants contaminating stormwater (Zamatkesh et al 2014; NRDC 2011). It is for these reasons that pollution from stormwater runoff is considered "one of the great challenges of modern water pollution control" (National Resource Council 2008, vii). Additionally, while a regulatory permitting program exists for various types of stormwater runoff, the results have been mixed on how effective the permitting program is at improving overall water quality (NRDC 2008).

This growing concern over water quality as well as mixed results on the effectiveness of the national stormwater permitting program informs this research and the question I seek to answer. This initial exploratory research will examine and document how implementation of the phase II municipal stormwater unfolds at the state level. Aside from the risks associated with stormwater pollution discussed above, this program is important to study based on the size of the program as well as significant lack of information on how the program actually works across states. Despite the lack of information on how the program works, there are a few things that are known that help inform this research. First, the concern over the impacts that polluted runoff has on waterways in the United States has resulted in the stormwater permitting program being quite large, where many organizations are required to obtain coverage under a stormwater permit. In 2008, for example, the total number of permits for stormwater management across the United States exceeded half a million while there were fewer than 100,000 permits for non-stormwater discharges into bodies of water (namely wastewater)[9], illustrating the magnitude of this program. Next, it is understood that as a partial preemption program, when states prove to the EPA that they can meet and enforce federal standards, they become the primary entity responsible for the development of stormwater permits. Finally, it is understood that development of state-wide general permits includes determining what is required of permittees to meet federal standards to reduce pollution from stormwater runoff and includes approving stormwater plans developed by permittees to meet the minimum control measures.

What is less clear about this program is how states develop and execute stormwater permits, how effective stormwater programs are within states at improving overall water quality and what the requirements for monitoring water quality are across the United States, to name a

[9] Discharges from industrial and commercial sources including sewage and other pollutants that can affect quality in bodies of water (EPA 2015).

few (NRDC 2008). To begin answering some of these questions and to get at the primary purpose of this study, I draw from the implementation literature with a specific focus on the literature related to the implementation and enforcement of regulatory programs. Following a brief introduction to the relevant literature, the methods for this article will be presented including a discussion of the rationale and justification for an exploratory study on implementation of the states chosen for this study. This will be followed by background information into the municipal stormwater programs for the states chosen, case analysis and discussion of findings. This chapter will conclude with overarching lessons from this study and directions for future research.

Implementation literature

Implementation is broadly defined as "what develops between the establishment of an apparent intention on the part of government to do something…and the ultimate impact in the world of action" (O'Toole Jr 2000, 266). In addition to this broad definition, because implementation studies explore a number of factors and that can influence how implementation occurs, defining what makes implementation successful is somewhat difficult (deLeon and deLeon 2002; Chang 1999). Moreover, different approaches to the study of implementation prioritize different aspects of the implementation process and determining how best to define successful or effective implementation is connected to the approach implementation researchers are utilizing. While the literature on implementation can be discussed in several ways, the most basic way of categorizing implementation studies is separating them into top-down, bottom-up and hybrid approaches to implementation (Goggin 1991). Each will be discussed in turn.

Top-Down Implementation Studies

Starting in the 1970s, the first implementation studies were pursued based upon a belief that not enough attention was being devoted to the study of policy implementation. This was in part, due to the extent to which it seemed that implementation of policies was not occurring the way policy makers intended. Because there was a general belief that failure during implementation resulted in the overall failure of policy, the goal for early implementation scholars was to diagnose the cause of policy failures (Hood 1976).

Utilizing a top-down approach, scholars began with the understanding that implementation relies on hierarchical control and that the administrative units expected to implement policies should have a clear understanding of the policy, as well as the capacity and commitment to execute those policies. From there, scholars focused on whether policy goals were clearly defined through the existence of a specific statute or authoritative statements, if explicit tools were available to implement a policy, and if agencies tasked with implementation had the adequate authority to do so (Birkland 2011; Mazmanian and Sabatier 1989; Horn and Van Meter 1976). Primarily through case-study analysis of federal policies implemented by states, early implementation scholars determined implementation failure was the result of unrealistic or unattainable goals set by the federal government. This declaration highlights the need for a more systematic understanding of implementation and factors accounting for policy failure (Smith and Larimer 2013; Chang 1999). Examples of early implementation studies highlighting the disconnect between what the federal government wants done and how implementation actually occurred include Derthick's (1972) study examining implementation of federal programs aimed at addressing social and economic issues associated with urban sprawl. In her study, Derthick argues that separating policy formulation and design from

implementation results in policy failure. In another seminal implementation study, Pressman and Wildavsky (1973), find that joint action among different actors and levels of government is a major obstacle to implementation because of coordination issues.

The importance of early implementation studies cannot be understated as they serve as the launching point for all other implementation studies and they also contribute to diagnosing policy failure (Chang 1999). Despite their contribution, these studies are largely viewed as incomplete because they do not consider the day-to-day activities and challenges implementers face such as the ambiguous nature of most policy that is left to administrators to interpret. It has been argued that early implementation studies also fail to account for how local actors and contexts affect implementation. To account for these factors, scholars attempted a new approach to the study of implementation often categorized as the bottom-up approach to implementation studies.

Bottom-up Implementation

Bottom-up approaches to implementation focus on understanding the relationships and interactions among street level implementing staff, their environment and other groups that they interact with. These approaches are rooted in the belief that implementation studies should begin with street-level bureaucrats because they deal with the day-to-day issues that may arise, requiring them to deviate at times from stated policy. It is for these reasons that scholars utilizing the bottom-up approach to implementation believe beginning implementation studies with a focus on laws or policies is not enough to ensure successful implementation. These assumptions highlight that policy change is inevitable during implementation due to street level actors adapting to their political and environmental situations (Majone and Wildavsky 1984).

Scholars focusing on bottom-up implementation also contribute to the literature by developing frameworks and models of implementation. Bardach (1977) for example, promulgated the first implementation framework asserting implementation is a game, or that implementation is an extension of politics whereby the behavior of the primary implementer or street-level bureaucrat affects the success of implementation. Building from Bardach's work, Mazmanian and Sabatier (1983) developed the first comprehensive framework of implementation asserting that the goals and priorities of program implementation differ depending on where a person or group of persons stand in the implementation process; the policymaker, the actors directly responsible for implementation or the group implementation affects most. This framework is also groundbreaking because it highlights various factors that affect implementation including complexity of the program, capacity of states to implement polices based on factors such as resources, and other non-statutory factors that can affect implementation. A primary criticism of the bottom-up approach to implementation is that it places too much emphasis on street-level bureaucrats, without adequate recognition of how agency norms, availability of resources and regulations may constrain implementing actions of street-level bureaucrats (Sabatier 1986).

Hybrid Implementation

In an attempt to reconcile the differences and the limitations of both the top-down and bottom-up approaches to implementation, scholars began focusing on ways to synthesize the two approaches to provide a better understanding of the multitude of factors influencing implementation. Specifically, in examining the implementation of federal laws and regulations at the state level, several scholars have argued that intergovernmental working relationships (IGR) coupled with contextual factors and lack of financial or other incentives (among other

factors) for states to effectively implement federal laws contribute to the complexity of implementation of federal policies at the state level (Pressman and Wildavsky 1973; Derthick 1972). This becomes especially important to understand as state and local governments are becoming increasingly responsible for implementation of federal environmental laws through partial preemption (Vig and Kraft 2013; Lowry 1992).

Literature examining environmental programs implemented at the state level often finds that the level of effectiveness across states in implementation differs depending on a variety of factors. These factors include the behavior of implementing agencies (including level of discretion), intergovernmental relations (how levels of government work together), complexity of the problem being addressed through policy, financial and institutional capacity, political and environmental contexts and number of actors involved (Scheberle 2004). This is supported in the literature from studies examining state implementation of federal programs. In their study of clean air programs, Potoski and Woods (2002) for example, find that stringency of air quality standards is contingent upon problem severity within the state. In a later study on enforcement, Woods (2008) finds that primary responsibility or goals of an administrative agency, legal constraints, and resources provided from federal to state governments affects enforcement of air quality standards.

Scheberle (2004) offers a model integrating elements from bottom-up and top-down approaches to implementation and includes a number of factors outlined as important to implementation in the literature including intergovernmental relations. Scheberle's approach is useful when studying implementation because it provides the most comprehensive framework of factors outlined by the literature that affect how implementation unfolds. Through the incorporation of both extrinsic (factors outside of an implementing agencies' control) and

intrinsic factors (implementing agencies have some control over) into her model, Scheberle acknowledges that unique contextual and intergovernmental settings affect implementation outcomes. Application of Scheberle's model through case studies reveals that extrinsic factors such as the level of political support and complexity of the problem, and intrinsic factors such as agency capacity and culture, play important roles in influencing policy outputs and outcomes (see figure1.1 for a more in depth list of extrinsic and intrinsic factors).

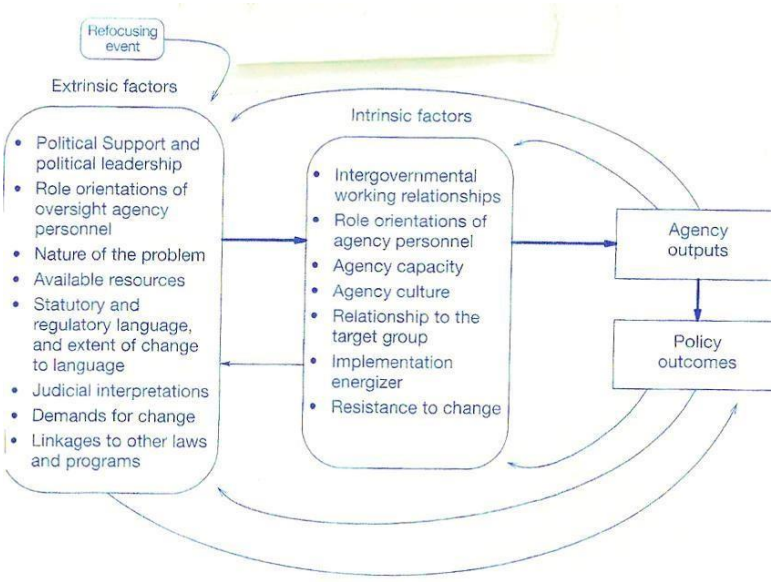


Figure 1.1: Scheberle's model of factors influencing policy implementation outcomes (Scheberle 2004, pp.44)

In addition to identifying intrinsic and extrinsic factors that affect implementation, Scheberle argues that successful or effective implementation of federal regulations at the state level requires both high levels of trust between state and federal actors and high levels of involvement of federal oversight personnel with state implementing agencies (2004, 22). Based

on these characteristics Scheberle develops a typology of federal-state working relationships with four possible types. First, Scheberle argues that relationships that have both high trust and high involvement represent a relationship of "pulling together". This type of relationship is what both groups of actors should be striving for. The relationship can be characterized as symbiotic where "involvement is based on a shared commitment to the policy objectives and a common recognition of the nature of the public problem to be solved" (Scheberle 2004; 22). The second type of relationship is "cooperative but not autonomous" and has high trust but low levels of involvement. Third is "coming apart with avoidance" which has low trust and low involvement and finally relationships characterized by low trust and high levels of involvement are defined as "coming apart and contentious". Through case studies examining a variety of federal programs implemented by states, Scheberle finds that the type of federal-state working relationship is an important factor when determining how effective or successful states are at implementing programs (2004).

Table 1.1: Typology of Federal-State working relationships. Adapted from Scheberle 2004; 22

High trust Cooperative but autonomous	Pulling together and synergistic
Low Trust Coming apart with avoidance Low Involvement	Coming apart and contentious High Involvement

Defining Effective of Successful Implementation

Disagreement in the literature on how to define success in implementation lies primarily in which approach to implementation scholars focus on (Matland 1995). For example, utilizing a top-down perspective, success of implementation is measured based on specific outcomes related to a program's statutes while bottom-up approaches tend to be more broad focusing on "positive affects" (Hoornbeek 2004; Matland 1995; Berman 1980). In choosing a standard by which to measure success, Matland (1995) develops a model based on levels of statutory ambiguity and level of political conflict which, depending on the policy, utilizes a different definition of success (table1.2). Based on his typology, the municipal stormwater program would fall under "experimental implementation" because while overall policy goals are clear (improve water quality), the specific means of achieving this are unclear. In other words, successful or effective implementation is defined as the ability of municipal stormwater programs to make programmatic changes based on what administrators have learned from previous iterations of the program. In this type of scenario, it has been argued that rather than measuring the success of the program, it is more important to learn from the implementation process (Matland 1995; Ingram and Schneider 1990). This is due in large part to the nature of how the stormwater program has been designed at the federal level. Instead of setting specific limits on pollutants that can be measured, the program has minimum control measures and best management practices (BMPs) that local government administrators choose based on contextual factors. Depending on monitoring, and reporting, whether water quality has decreased or increased, administrators learn from this and adapt their stormwater management plans (SWMPs) and the best management practices (BMPs) they choose to address each of the six

minimum control measures[10]. Again, supporting the idea that policies with clear overarching goals, implementation is contingent upon a number of factors and what is most useful for local level actors (Matland 1995).

General factors affecting implementation

While the focus, methods and assumptions vary across the three general approaches to implementation studies, scholars utilizing each approach typically find that the same set of factors influence the success or effectiveness of policy implementation (table 1.2). What is less clear, however, is how these factors affect policy implementation across different policy areas, the relationship between those responsible for implementing policies, how programs are designed and how primary implementers choose policy instruments.

Table 1.2: Approaches to the study of implementation

Approach to the study of Implementation	**Primary Focus**	**Primary Contribution**	**Weakness**	**How Success of Implementation on is defined**	**When approach should be used**
Top-Down	How well state and local government meet policy goals of statutes/regulations	Diagnosis of what leads to policy failure	Does not consider local actors or contexts	Measure of specific outcomes related to program statutes	When complexity is low, clear statutes (Berman 1980)
Bottom-up	Challenges that local implementers face, and how they address challenges.	Recognizes local implementers have discretion, meaning policy change can occur	Does not consider role resources play or how legislation and regulations affect implementer s' behavior	"Positive effects" of program contingent on who you ask	High levels of conflict Ambiguous statutes (Berman 1980; Matland 1995)

[10] Phase II of the NPDES program requires operators of small regulated MS4s, or MS4s where stormwater runoff has a high risk of polluting waterways to develop stormwater management programs (SWMPs) to do three things: decrease the discharge of pollutants to the "maximum extent practicable" (MEP), protect water quality, and meet the relevant requirements of the CWA (EPA 2000). SWMPS are required to address each of the six minimum control measures outlined by the Stormwater management program and provide best management practices specifying the ways in which they will meet each of the minimum control measures.

Hybrid	Utilize both approaches to provide more holistic understanding of factors that affect implementation	Recognizes multiple factors affect implementation	Unclear which factors most important Not easily generalizable	Contingent upon if goals of program are clearly outlined Levels of conflict	Program that is promulgated by one level of government and implemented by another

Contribution

While it is understood that stormwater runoff poses severe risks to public and environmental health, there is no systematic understanding or knowledge of how this program is implemented. Additionally, while it is known that some states do not exceed federal standards for municipal stormwater, and that programs are developed differently (personal communication 2015), it is not understood how or why these choices and decisions are made. Finally, while studies have been completed examining programs promulgated by the federal government and implemented by the states, or programs promulgated by states that require local government to implement, there is little information on how implementation of policies works when the federal government promulgates a law, states develop a program around that law, and then local government implements the program.

Through an exploratory study, this article seeks to understand how implementation of the phase II municipal stormwater program works. While this initial research is more descriptive in nature than the remaining articles of this dissertation, there are several scholarly and practical contributions. First, because no other study exists examining the municipal stormwater program to this extent, this study provides a wealth of substantive information that will be ripe for future research, including the remaining articles of this dissertation.

Next, without understanding how this program is implemented, it is difficult to test theories related to implementation and to determine which factors affect the successful implementation of the program. For example, without understanding how the implementation process works, it is not possible to answer questions about federal-state relations in implementation of the program, questions of why some states go beyond EPA standards, implementing more stringent municipal standards, or just do the bare minimum required. In other words, this is a crucial first step to answering future research questions and applying and testing theory. Also, understanding implementation of the municipal stormwater program can inform theories related to policy instrument choices and policy design because it allows for in depth understanding of how contextual factors, strength of intergovernmental relations and so on affect municipal stormwater program design. An exploratory study of this nature also has value for practitioners at all levels of government responsible for program implementation because it will further elucidate how programs work, which can lead to better understanding of how to accomplish stormwater related goals.

Methods

An exploratory case study approach is utilized for this study because the purpose is to understand how implementation of phase II of the municipal stormwater works, as well as to determine what problems arise in the implementation process (Yin 2004). Also, an exploratory study informs future research, elucidating additional factors important to study and understand from both an academic and an applied perspective. This method also provides for in-depth analysis on cases, which provides a greater understanding of a policy area that there is little knowledge in, allowing for more flexibility to adjust the research design which can be expanded for future research (GAO 1995).

Grounded in the implementation literature, the selection of the specific states to be examined in this research is based on both contextual factors and factors identified as important in the literature. Specifically, cases are chosen first, based on which states have primacy to implement the stormwater program followed by both the rate and the overall level of urbanization—a key contextual issue for stormwater management that influences the policy process (Scheberle 2004; Matland 1995), and political conditions such as citizen and government ideology that can affect the level of government activism and support (Gray and Hanson 2013). These factors are supported in the literature in several studies, including Scheberle's, that find that implementation of federal programs at the state level is contingent on these extrinsic factors. A diverse case selection method is utilized, which is useful when doing exploratory research because it allows the researcher to assess the relationship between X/Y (Seawright and Gerring 2008). In this case, the relationship between states and their respective EPA regions are being examined. This choice is supported in the implementation literature which asserts that the type of relationship states have with their regional EPA counterparts affects how implementation occurs and is a primary factor affecting program success (Scheberle 2004; personal communication 2014). It is also noted that while cases are diverse based on one or more variables, in other categories they should be relatively homogenous in ways that can affect the causal relationship of interest (Seawright and Gerring 2008). In other words, cases are chosen based on similarities on urbanization variables, and differ based on EPA region and state-level political conditions. These factors used to choose cases are described below.

Case Selection based on similar variables

Since the number of impervious surfaces is the largest concern for stormwater runoff pollution, both overall level of urbanization and the rate of urban growth (secondary), as

measured by population density within states and urbanized areas, are used to select cases.[11] Furthermore, urbanization based upon population numbers are used instead of the percent of land mass that is urban because census defined urban areas and clusters (which are determined based on population) are used to determine which entities are required to obtain stormwater permits (census.gov;epa.gov).[12] Level of urbanization defined as the percent of a population that resides in urban areas within a state (census.gov) is the first selection criteria used to select cases for further study. This criterion is used because local governments are required to obtain coverage under stormwater permits based upon population size of their locality, making it the most important factor to start with when selecting cases. Urbanization characterized as the rate of population growth is defined as the rate of population growth in urbanized areas and clusters over a period of time from the decennial census is the second selection criteria used to select cases because the rate of growth exacerbates problems associated with stormwater runoff (EPA.gov).[13] For example, Allison Prost, the Maryland executive director of the Chesapeake Bay Foundation, asserts that "For every existing source [of stormwater pollutants] we're reducing; we have to worry about the impacts of population growth" (cnsmaryland.org). Thus, cases are initially chosen based on these two measures of urbanization; first by the level of urbanization and then by the rate of urbanization.

Based on the level and rate of urbanization, the three states chosen for this study are California, Virginia and Utah. For level of urbanization, states that did not have at least 74% of

[11] The reason urbanization as defined by level of population growth is utilized for this study is because when population levels increase within an urbanized area or cluster, the number of impervious surfaces also increase. This is because construction of homes, businesses and other attractions continue to occur (Spangler et al 2015).

[12] For this study, cases are filtered by level and rate of growth within states rather than urban areas (UAs) or urban clusters (UCs), because UAs and UCs can cross state boundaries, spanning across several states.
Since the purpose of this study is to understand how states develop and implement phase II of the municipal stormwater program, rate and level of urbanization must be measured at the state, rather than the UA or UC level.

[13] Rate of urbanization is defined as the percentage change of a state's overall population that lives in urban versus non-urban areas from decennial census 2000 to 2010 (census.gov).

their population residing in urban areas within their state were excluded. 74% was chosen as the cut-off point because that is the approximate median percentage of overall population residing in urban areas across the United States. Twenty-three states met this criterion with California having the highest level of urbanization at 95% of their population residing in urban areas, making California the first case chosen to evaluate. Choosing California as the first case-study is supported by additional data indicating that California not only has the highest level of urbanization in the United States, but seven of the ten most densely populated urban areas in the United States are in California. In addition to this, California historically has had severe water quantity issues which are further exacerbated by concerns over water quality; this in conjunction with the level of urbanization in the state makes it a vital case for this study.

While level of urbanization is the most important filter, due to the nature of this study, it is impossible to examine all twenty-three states with a level of urbanization above 74%. Of the twenty-two states that meet the level of urbanization criteria, states are further narrowed based on having a median population growth rate in urban areas of 2.5% or higher from 2000-2010. Nine of the twenty-two states meet this justification; Delaware, Georgia, Kansas, Nevada, Oregon, Texas, Utah, Virginia and Washington (table one).[14] To further assess implementation and choose two states from the nine above, cases also need to be chosen based on differences. Case selection of the specific states to study is made based upon important differences and is discussed in the next section.

Case selection based on diversity of variables

Because federal-state relationships affect how implementation unfolds, states are divided into their respective EPA regions. The rationale for looking at EPA region is based on previous

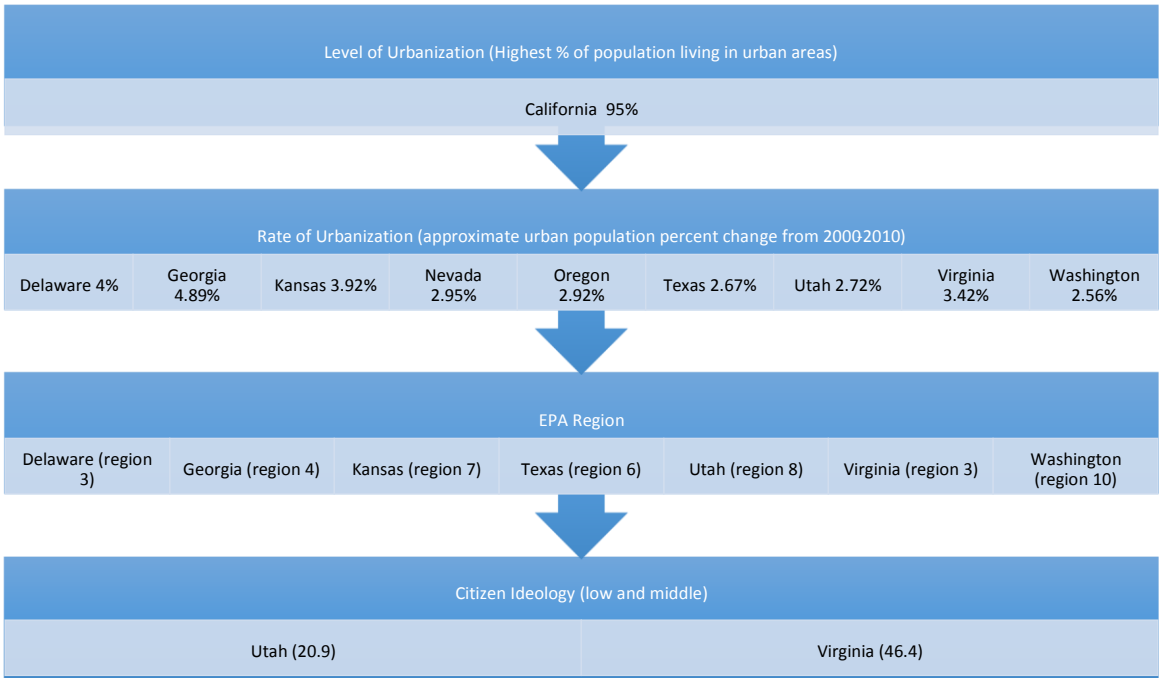
[14] While California only has a rate of growth percentage of .64%, it would be remiss not to include it in this study due to the high levels of urbanization and the fact that of the fastest growing UAs, seven are in California. Indicating that California is a state that should be studied for stormwater management.

studies suggesting that how well states work with the EPA is in part contingent on their region; bureaucratic norms within regional EPA offices and level of problem severity within a region both contribute to important differences in EPA regional offices (personal communication 2014; Scheberle 2004). Because Nevada is in the same EPA region as California, it is not a viable case comparison, leaving eight states to choose from. The final selection criteria used in this study is citizen ideology because the literature suggests that government tends to be more progressive in the implementation of environmental policies when citizens place demands on government and when state government has a more liberal ideology (Matisoff 2008; Dunlap, Chenyang and McRight 2001). In other words, how states develop stormwater programs and whether they exceed EPA standards is expected to be influenced by political ideology (Erikson et al 1993). Utilizing Berry et al's (1998;2009) measure of citizen and government ideology,[15] states are chosen based on which are the most different in terms of ideological leaning. Because California's citizen ideology is more liberal, for the last two cases, one state that is more conservative and one that is more balanced in ideology is selected. Citizen ideology is assessed for case selection instead of government ideology because the literature suggests that citizen ideology is directly linked to how policymaking occurs at the state-level and focuses on the extent to which bureaucrats are responsive to citizens when implementing policies. In other words, citizen ideology can serve as a proxy for how bureaucrats, the primary implementers of

[15] Citizen ideology is developed using several measures. First is the ideological position of members of Congress. Berry et al calculated incumbent ideology score by first using ideology scores provided by AFL-CIO federations (used using how legislators voted on bills), using these scores to calculate the average party delegation scores. These scores were heavily correlated with federal ideology scores, indicating that they are appropriate measures. Next, ideology was measured in each district within a state by measuring the ideological score for district incumbents in relation to the ideological positions of challengers. While there was no information for challenges who lost an election, by calculating the ideological position of challenges who won an election, Berry et al were able to calculate scores by comparing the difference between incumbent ideology scores to the mean absolute difference with new legislators. This was then compared to election results to get a mean score for ideological makeup of citizens. District scores are then used to develop an unweighted average for the entire state, getting at what citizens want both elected and unelected officials to do (Berry et al 2010; Berry et al 1998).

the program, may be expected to act (Crotty and Crotty 2009; Denhardt and Denhardt 2000). Conversely, government ideology is primarily an indicator of state legislatures based mostly on strength of interest groups and partisan leanings.[16] For citizen ideology, the index is scaled with 0 (representing a perfectly conservative state or citizenry) to 100 with (perfectly liberal state or citizenry) (Berry, Ringquist, Fording and Hanson 1998). Once states were divided into EPA region, two states (Utah and Virginia) met the above criteria, representing the most urbanized (on both measures) with diverse ideology rankings (appendix C).

Table 1.3: Case Selection Criteria



While other factors could be utilized for case selection, the case selection criteria are both grounded in the literature, and has data that is accessible for comparison across states. While many factors outlined above are important for implementation and can affect program design along with implementation outcomes, it is also recognized by scholars that factors

[16] The average score for citizen ideology across the country is 49.6 this means that California represents a state with a higher than average score, Utah has a lower than average score and Virginia is close to the average, providing the best overall comparison.

intertwine with one another, exerting influence on other factors. For example, level of political support from elected officials can affect resources made available for stormwater programs (Scheberle 2004). In addition to this, there are several factors outlined in the implementation literature that are believed to affect the development and the implementation of federal environmental programs. These factors, outlined by Scheberle (2004), include agency capacity, availability of resources, statutory and regulatory language, if state stormwater programs are linked to other laws and programs, and finally intergovernmental relationships. It is expected that these variables will affect development and implementation of the municipal stormwater program in each of the states studied (table 1.4). In sum, because factors can be intertwined and because they have the potential to affect implementation outcomes, after the initial case selection, these other factors are assessed and expectations affecting implementation based on these factors are discussed below.

Agency capacity and availability of resources

As identified in the implementation literature, development and implementation of programs and the perceived effectiveness of these programs is contingent upon having adequate resources. These resources include technical and financial assistance as well as adequate number of trained personnel. Based on this, it is believed that adequate resources will affect overall implementation of stormwater programs.

Statutory and regulatory language

Scholars have argued when statutory and regulatory language is vague, there is greater variation in the quality of programs implemented, increased confusion on the intent of programs and greater variation across programs. While the municipal phase II stormwater program outlines minimum control measures (MCMs) and provides a list of best management practices

for each, there is some latitude in how individual states can develop their stormwater permit requirements. Additionally, because the phase II program requires municipal storm sewer systems (MS4s), or sewer systems that are separate from waste water (MS4s) covered under the general permit to reduce stormwater runoff pollution to the maximum extent practicable (MEP), states will vary greatly in what they consider to be the maximum extent that stormwater runoff pollution can be reduced; affecting how permit requirements are written.

Intergovernmental relations

The municipal stormwater program requires action of each level of government making it intergovernmental by nature. Under the NPDES permitting system, the federal government promulgates the rules and requirements of the stormwater program, states with primary permitting authority develop and enforce phase II municipal permits, while local governments and other regulated organizations are required to obtain coverage under the state-wide general permits. Because of this, it is expected that working relationships among levels of government at the local, state, EPA region and federal EPA will affect perceptions of how well the municipal stormwater program works.

Linkage to other laws and programs

The implementation literature has also found that when regulations are tied to other laws and regulations, there is a greater likelihood that those programs will be successful (Scheberle 2004). Therefore, it is expected that states which have connected stormwater concerns to other laws and programs will adopt more prescriptive permits.

Table 1.4: Factors affecting IGR implementation

Factor affecting IGR Implementation	Expected effect on permit development and implementation
Agency capacity and availability of resources	Effective permit development and implementation requires

	states' and permittees to have adequate number of trained personnel, financial, and technical resources
Statutory and Regulatory language	Maximum Extent Practicable" language of stormwater program results in variation in the levels states determine they are able reduce pollution from stormwater runoff
Intergovernmental Relations	The quality of working relationships across local government, states, regional EPA and federal EPA affect perceptions on the overall effectiveness of the stormwater program
Linkage to other laws and programs	Stormwater programs connected to other laws will result in states developing more prescriptive permits

Data Sources

Data sources for this study come primarily from in-depth phone interviews with administrative personnel involved with the municipal stormwater program. A semi-structured interview format with six semi- open questions was utilized to gain a better understanding of how implementation occurs.[17] For each state and their respective EPA regions, e-mails were sent to the phase II municipal stormwater staff asking if they were willing to participate in phone interviews discussing the role of the states in the development and implementation of the phase II municipal stormwater program. Names of state and EPA stormwater staff were determined by finding information on state and EPA websites as well as through a snowball sampling method to determine who else should be interviewed to gain a more in depth understanding of this program. This resulted in a total of seventeen phone interviews each lasting between 20 and 45 minutes across the states and EPA regions; ten from California, two from Utah, one in Virginia, two from

[17] For list of interview questions see appendix A.

EPA region eight, one in EPA region nine and one member of the stormwater staff from EPA headquarters in Washington DC.

The primary reason there are more interviewees from California compared to Utah and Virginia is because of California's water governing structure. Along with their central office, California is organized into regional water boards with dedicated employees to the phase II municipal stormwater program. This is different from both Utah and Virginia where Utah has two dedicated employees for the state and Virginia has approximately three dedicated state-level employees for the municipal stormwater program. In Virginia's case, e-mails were sent to several employees asking for interviews and unfortunately there was only one response. Additionally, while stormwater personnel for EPA region three were contacted, they referred me directly to the Federal EPA Headquarters staff to participate in this research. It is recognized that this is a limitation since Virginia and its' respective region are not as well-represented in this research. However, even with this limitation, given the consistency in interviewee responses across the major themes, the information gleaned from this research is still useful and relevant.

Phone interview transcripts from state and EPA municipal stormwater staff were coded and analyzed using Qualitative Solutions and Research International's NVivo data analysis program. This program was selected because it allows for the systematic evaluation of cases, elucidating common themes and trends across interviews (Crowley, Harre and Tagg 2002). Responses from those interviewed were first coded and divided into themes based upon the factors outlined in the implementation literature believed to affect how programs and policies are developed and implemented. Namely, intergovernmental working relations including the role of state and EPA administrators in the development and implementation of the phase II municipal stormwater program, challenges posed to implementation including inadequate

financial resources and staff, if in the interviewees' opinions the states they work for exceed the standards set by the federal government for the program and how the regional/contextual factors affect development and implementation of the phase II municipal stormwater program across the three states examined.

Additionally, because the stormwater program exemplifies a partial preemption program, I also developed codes or themes for development and implementation to capture information about how these programs are structured. With the primary goal of this study aimed at increasing the understanding of how phase II of this program works, I also included codes for "stormwater program" (as described below) and other factors that the interviews highlighted were important when looking at this study (see appendix B for a full list of codes).

Once the process of grouping text from the interviews into themes was completed I ran an analysis of word frequency available to determine if there were any important words or phrases that were not captured in the themes that were established. I did not find any words or phrases that were not already captured in the themes established so I continued with these themes when further analyzing the data gathered from the interviews. Data was assessed in two ways; a state by state analysis to determine differences across the states and EPA and then by analyzing all interviews together.

To corroborate the information provided in phone interviews, data was triangulated by examining primary documentation such as the existing policies and regulations and any secondary documentation available. Other sources of information used in this research include state-wide general phase II municipal stormwater permits across the states, fact sheets provided by the EPA on the various aspects of the program, and other forms of secondary documentation and archival records. Since this program is complex with little written on its management and

implementation, I rely on these qualitative methods, particularly the phone interviews with implementing personnel because information cannot be captured by mere numbers or readily assessed using quantitative methods. This method is supported in the literature by scholars such as Hacker (1997) who argues the best way to fully understand the strategies and actions agency personnel take is through speaking directly to personnel. After providing a brief background and presentation of case findings on each of the cases, analysis will proceed by discussing the five primary themes across all interviewees that relate specifically to how these programs are developed and implemented,[18] noting specific differences across states where applicable.

Case Presentation

Both the EPA and states have specific roles and responsibilities in regards to management and development of the phase II municipals stormwater program. Prior to a discussion of case findings and analysis, it is important to understand these roles and responsibilities. A brief background of the EPA and states' roles for phase II of stormwater program will be presented here.

The Role of the Environmental Protection Agency

Where states have achieved primacy for the municipal stormwater program, the primary role of both federal and regional EPA staff are to support and to provide oversight (EPA stormwater staff members 2016). Specifically, this means that EPA staff members assigned to the municipal stormwater program are responsible for reviewing state-wide general permits, providing comments when necessary on how states can write permits to be more clear, specific and measurable (EPA stormwater staff four). In sum, the EPA plays a support role to the states that have achieved primacy.

[18] See appendix B for full list of qualitative analysis codes.

The California Case

California achieved primacy to implement the NPDES program in 1973 and was authorized to regulate stormwater discharges when the NPDES program was amended in 1987, providing a framework to regulate stormwater discharges (EPA.gov 2016; SWRCB 2013). Not only is California an interesting case to study because it has the highest levels of urbanization in the United States which contributes significantly to stormwater runoff pollution in the state, but its unique organizational structure for water programs affects the development and the implementation of the phase II municipal stormwater permit. Created in 1967 by the state legislature, California has a state water resources board and nine regional water quality control boards (regional boards) that are responsible for the day-to-day activities related to water quality issues in their respective regions (SWRCB 2016a).

Administrators for the state water board are primarily responsible for writing the state-wide general permit that phase II permittees are required to obtain coverage under, while the regional boards are responsible for ensuring that MS4 operators covered under the state-wide general permit are meeting permit requirements. According to all stormwater specialists interviewed for this study, the structure of the water control board affects how the municipal stormwater program is developed, where the state board is "basically like a hub for the rest of the stormwater program and then the regional boards implement those programs" (Stormwater staff four 2016). After the 1999 phase II stormwater rule affecting small to medium MS4s, California's first state-wide general permit was adopted in 2003, with the most recent iteration of the permit adopted in 2013 (SWRCB 2016b).[19]

[19] State-wide general permit orders are typically in effect for five years for the municipal stormwater program. However, due to permit writing, and other contextual issues, it may take longer than five years for later permits to take effect (EPA specialist four 2016; SWRCB 2012).

California is currently in its second iteration of the state-wide general permit (adopted in 2013), those interviewed described this permit as having more prescriptive requirements, or requirements that are more clearly defined leaving little room for broad interpretations. The result of this is less discretion for regional water board staff in enforcing permit requirements and to permittees on which minimum control measures are used to meet requirements of the state permit (Stormwater staff two 2016). Major changes to this permit include breaking from EPA guidelines for each locality to write SWMPs, instead outlining specific BMPs that permittees can choose from for each of the minimum control measures. Which means "not leaving details to SWMPs, rather, specifies what activities need to be done for each minimum control measure.[20] Permittees are then required to fill out a notice of intent (NOI) and upload further documentation to the Stormwater Multiple Application and Report Tracking System (SMARTS). Other major changes include requiring specific reporting conditions including an annual report review, highlighting the most important areas or priorities in the state with respect to the permit, an addendum addressing different requirements for non-traditional permittees, requiring site-specific or Low Impact Development (LID) for new development and redevelopment with respect to the post construction minimum control measure and specific requirements for permittees that have Total Maximum Daily Load (TMDL)[21] requirements just to name a few (SWRCB 2013).[22] The unique way that California has organized its water regulatory system along with the prescriptive nature of the newest permit is expected to play a role in how interviewees responded to questions related to permit adoption and implementation.

[20] One argument for more prescriptive permits in lieu of SWMPs for individual permittees is that public review on the state-wide permit "satisfies" the public involvement requirement of the phase II rule for stormwater.

[21] Defined by the EPA as a "pollution budget and includes a calculation of the maximum amount of a pollutant that can occur in a water body" (2016a).

[22] For the complete 2013 permit visit http://www.waterboards.ca.gov/board_decisions/adopted_orders/water_quality/2013/wqo2013_0001dwq.pdf.

The Utah Case

Utah achieved primacy for the NPDES program in 1987 when the framework for regulating stormwater runoff pollution was established. Following guidelines set by the EPA, Utah's state-wide permit requires permittees of the program to develop and implement SWMPs, leaving it to the discretion of the permittees which BMPs they choose to implement. Like California, Utah is in its second permit cycle for the program which, like California, is also considered to be more prescriptive. The current permit differs from the previous permit in three primary ways. First, due to the increased risk of nitrogen and phosphorous to bodies of water, the permit requires permittees to incorporate specific measurable goals to reduce the amount of nutrients in stormwater runoff. Second, definitions related to "target audiences" were changed to be more specific, clarifying what is required under the public education and participation minimum control measure. Finally, the most recent permit requires permittees to include an evaluation of low impact development (LID) approaches and BMPs to support low impact development in the post-construction minimum control measure. In addition to this, if permittees are not using LID strategies, they are required to document the reasons why when reporting to the state (deq.utah.gov 2016).[23]

The Virginia Case

Different from the other two states, Virginia was not authorized to issue state-wide permits under the NPDES program until 1991. Despite this, the state of Virginia has many overlapping laws and regulations that affect the phase II municipal stormwater program. A primary reason for this is Virginia's proximity to the Chesapeake Bay which means that many of its stormwater permittees have specific TMDL requirements related to the Chesapeake Bay

[23] For the complete 2010 permit for the state of Utah visit http://www.deq.utah.gov/Permits/water/updes/docs/2010/07Jul/2010SmallMS4GPfinal7-26-2010.pdf.

(Virginia Stormwater specialist 2016). This is significant because the Chesapeake Bay is the largest TMDL cleanup mandated by the EPA due to the extreme risk of pollution in the area (EPA 2010). Aside from strict TMDL requirements, Virginia's permit leaves much discretion up to permittees when they develop their SWMPs and choose their BMPs.[24]

In each of the states above, background information and interviews highlight that while municipal stormwater programs have been influenced differently, each of the states are in at least their second permit cycle and have increased prescriptiveness of their permits due to lessons learned in the previous permit cycle. Utilizing this information, it is possible to analyze case findings.

Case Analysis

Based on information provided by interviewees, lessons can be broken into five general themes: permit development, permit implementation (including enforcement), working relations, challenges to the stormwater program and perceptions on whether states go beyond federal requirements.[25]

Permit Development

In each case, the state is primarily responsible for developing or writing the guidelines for the general permit that designated permittees are required to meet. Common trends related to permit development highlighted through analysis include the push towards writing permits to have more specific language, and in some cases, prescribing specific BMPs that permittees must include when developing their management programs. Changes to the most recent permit in California, for example, reflect challenges with implementing the first permit and takes into

[24] For the complete 2013 general permit for the state of Virginia visit http://lis.virginia.gov/cgibin/legp604.exe?000+reg+9VAC25-890-40.
[25] For a full list of codes see appendix B.

consideration the lessons learned during that permit cycle. More specifically, through continued research and audits of existing stormwater permits, state and EPA stormwater personnel found limitations to the 2003 permit including a lack of baseline to measure the effectiveness of permittees' SWMPs, absence of specific deadlines for complying with the permit, lack of clear performance standards and lack of measurable goals (SWRCB 2013). In sum, these limitations resulted in problems for Regional Board staff in enforcing and determining compliance with the state-wide permit. Explaining this more, California Stormwater (2016) says:

> This new permit is prescriptive in the sense that it outlines the BMPs that the municipalities are going to use, thus, eliminating the flexibility of how to implement a minimum control measure. So now it is outlined specifically in the program, you're going to meet the illicit discharge and detection elimination minimum control measure by implementing the following BMPs as opposed to letting them figure out which BMPs to implement. That is the case for all the minimum control measures. And sometimes, depending [for example] for the public education and outreach, it's not so specific [the BMPs], here's the brochure you're going to use. But it does give some specific requirements of what type of education and outreach needs to be conducted. But I would say there is more flexibility developed into that minimum control measure as opposed to the other minimum control measures that are very specific.

Interviews with Utah stormwater staff highlight Utah has also incorporated more prescriptive requirements based upon lessons learned from the previous permit cycle and due to changes in water quality: "I would say that there are areas of their permit that is more prescriptive than ours, kind of just this back and forth. But we too, just keep adding more and more prescription. We've just had the prescriptions since 2010 renewal. And the 2016 [permit] is just now ready to be signed and put into effect and that's even more prescriptive than the 2010 version" (Utah Stormwater staff two 2016).

While interviews with Utah and California stormwater staff highlight that both states have adopted more prescriptive requirements in their most recent state-wide permits, Virginia maintains they have incorporated a "hybrid approach" providing some specifications but also

providing permittees flexibility when developing their SWMPs. Staff in Virginia explains: "So in Virginia's permit we've got a hybrid approach in which we have provisions of the permit, specifically the minimum control measures that include pretty specific targets that permittees have to meet. For example, they are required to meet public outreach and education opportunities, three per year. And reach 20% of their audience and so on and so forth. But while the permit prescribes those things, we rely on the permittee to use their MS4 program plans to specify how they're going to demonstrate compliance" (Virginia Stormwater staff 2016). Virginia stormwater staff also explained that the hybrid approach allows for the level of prescription and specificity in terms of what is necessary to meet minimum control measure to vary; allowing Virginia to set standards that they feel are best for each of the minimum control measures. Virginia staff continue: "So we really rely on them to specify what they're going to do to demonstrate compliance for specific minimum control measures, 1 2 and 6 (see table 0.1 for the list of the six minimum control measures and descriptions). 6 has some specific provisions in it such as create stormwater pollution prevention plans for municipal sites that are high priority sites which means they have a high potential of interaction of polluted stormwater and then we designate what those sites are and what those slips are" (Virginia Stormwater staff 2016).

The findings from interviews conducted with state implementing staff are also supported by interviews with EPA staff who agree that while minimum standards are set by the federal government, there is still great variation across states regarding how specific the state-wide general permits are written. Despite the variation across states in terms of specificity, EPA staff emphasize because the stormwater program is an iterative process, they would expect that as

time goes on and as states learn more about what is best to reduce pollution from stormwater pollution that more prescriptive permits will continue. EPA staff one (2016) says:

> In the early days of the audit program the enforcement division was always complaining that these permits are vague and we can't determine whether they are meeting the requirements or not. So one thing we like to see are prescriptive permits that lays out how much they have to do. And so that's one thing that makes it possible to determine whether or not they are meeting the requirements. If there are quantitative measurable requirements of the permit and we look at those measurable requirements and do they do those things or not. States are writing permits to be more specific and prescriptive.

Further supporting the trend that permits are becoming increasingly prescriptive, EPA staff three (2016), discusses the process of reviewing state-wide general permits explaining that they are looking for permits that are more specific and therefore, more implementable. Taken together, these interviews illustrate that even though effluent discharge standards are not set for stormwater runoff like they are for other programs such as wastewater discharge, the EPA encourages states to develop more prescriptive permits to better measure compliance of permit standards and measure overall effectiveness of the stormwater program to decrease pollution from stormwater runoff. It is important to note that while the level of prescriptiveness does vary, interviews highlight that there is a general trend of states shifting towards increasingly prescriptive requirements in their permits which directly affects enforcement and implementation of the permit.

Interviews also highlight that states are including several additional requirements that permittees are responsible for complying with. Primarily, states are including specific requirements pertaining to LID and TMDLs (where applicable), but also, in some instances, developing separate requirements for traditional (local governments such as cities and counties) and non-traditional permittees (typically organizations that do not have the same legal authority to adopt ordinances to regulate stormwater but poses a risk to stormwater). This includes

military bases, universities, hospitals and so forth. In both Utah and California, the most recent state-wide permits have included specific language in the post-construction minimum control measure[26] requiring site-specific and LID requirements. Additionally, stormwater staff in both California and Virginia discussed how permittees in areas with TMDL requirements must include specific plans of action when applying for coverage under the state-wide permit specifying how they plan on meeting effluent limits set by TMDL standards. Indicating that other laws and regulations pertaining to water quality can influence requirements states establish for stormwater. Finally, in its most recent iteration of the permit, because non-traditional permittees do not have the same legal authority to enforce actions that other local governments have, California has developed separate requirements for non-traditional permittees that take their legal status and authority into consideration.

Implementation

In terms of implementation, permittees are primarily responsible for putting together SWMPs, or, in the case of California, fulfilling the annual reporting requirements put together in the SMARTs system, the database where all phase II permittees upload documentation indicating they are meeting the permit requirements. For the state-level then, implementation primarily takes the form of permit enforcement and permit compliance assistance to the permittees. Implementation defined as permit compliance and assistance is supported in the interviews, for example, one interviewee states: "we are a regulatory agency, so we provide compliance assistance, we audit the program elements and we take enforcement actions when necessary" (California Stormwater staff eight and nine 2016).

[26] The post-construction minimum control measure requires operators of small MS4s to establish and implement strategies to minimize pollution from runoff that occurs post-construction. This includes best management practices to address structural and non-structural components (EPA 2000).

Interviewees explained enforcement of the permit includes several types of action which include performing audits of municipal stormwater programs, reviewing reports and documentation, and if necessary, taking specific enforcement actions against the permittee. When it is necessary to take specific enforcement actions on the permittees, there is some variation in how extensive enforcement actions are and in some instances, when certain minimum control measures are required to be met. For example, because California's permit specifies that the minimum control measures begin to be implemented in different years over the five-year life of the permit, enforcement means that stormwater staff auditing and inspecting programs look to a specific minimum control measure for the respective year:

> For example, the first year was education and outreach, the second year, public participation and involvement….the third year they are going to look at is illicit discharge detection and elimination….the next thing we look at is pollution prevention and good housekeeping…the post-construction for new and redevelopment so those are some of the areas we will look at and see and hopefully we can focus an audit to that area" (California Stormwater staff five 2016).

While Utah and Virginia do not stagger when permittees must meet each of the six MCMs, enforcement in these states is slightly different. Per Utah's stormwater staff two, when determining compliance, "it's pretty much nearly line by line by the permit". They further explain:

> It's for them [permittees] to show us and [we] look at adequate proof…that they're meeting all the permit requirements... So, we have in office interviews, we get appropriate personnel to tell us what they do and show us what they do whether its reduction forms or written procedures. And then we go out in the field in the afternoon and we either inspect their facilities or we oversight them conducting their inspection and we oversight them conducting construction inspections. And then we also record our audits and we write a very comprehensive report and that's in a nutshell—2-3 day audits.

Across all three states, interviewees describe the process of taking enforcement actions against permittees as "progressive", meaning that actions become more punitive if permittees do not remedy problems found during inspections of their programs. Regional boards in California, for example, utilize the state's enforcement policy that moves from informal to formal enforcement depending on how severe the violation is considered, and if the permittee comes into compliance. California Stormwater staff one explains; "We can have informal enforcement in just an e-mail, a notice of violations for violations or we can actually do formal enforcement…and actually put in an abatement order fee it it's worse or actually penalties in administrative civil liabilities" (2016). Similarly, a Utah stormwater staff member explained that if necessary, the state will "enter into a punitive decree to track and hold them [permittees] accountable for everything they've said in writing that they are going to do and if they fail to do that by the timeframe that's been stipulated, there's a penalty associated with it" (2016).

While enforcement actions across the states include determining compliance through actions such as auditing programs, in some instances, state administrators rely on the EPA or independent contractors to perform audits and inspections of phase II permittees. In California, specifically, three of the ten interviewees discussed a primary reason they have the EPA or independent contractors perform audits is because of the close working relationship between permittees and regional board staff, the regional board would rather be able to aid permittees with compliance efforts, work cooperatively with them, and there is a sentiment enforcement will harm those relations in terms of compliance assistance (California Stormwater staff two, six and ten 2016). As such it will be discussed further below.

Working relations

As a program requiring actions by all levels of government, working relations include relations between state-level personnel and the EPA (region), EPA with the permittees, state level with permittees and the in the case of California, regional board with state-level personnel as well as regional board with permittees. Across all cases there is at least some interaction between state-level personnel and permittees and is in general described as a positive relationship. At this level, the working relationship between state personnel (including California's regional water board employees) is comprised of talking with permittees when developing permit requirements and then compliance assistance. In Virginia, the working relationship involves working closely with permittees during permit writing as well as after the permit is in place. While developing permits the state puts together an advisory panel requesting permittees to submit requests to participate on the panels and share their opinions on the permit allowing the state to "work with the permittees pretty closely in that sense to try to come up with general permit requirements, again that meet federal requirements that still make sense" (Virginia stormwater staff one 2016).

In terms of the working relationship between the state and the EPA (both federal and regional components), the role of the EPA is to provide support and guidance to state-level administrators when writing the general permits. This includes the EPA providing comments and objecting to portions of the states' permit if necessary. This is supported by EPA staff, one of which explains: "we work cooperatively—that's how I would characterize it. Yes, we oversee the program and we can object to a permit and take it over if we think there's something that's not consistent with the Clean Water Act in the permit, we can object to a permit, take it over, and do it ourselves but that's very rare. That doesn't happen very often. So, I'd say that

the relationship is a positive one" (EPA stormwater staff one 2016). In terms of the relationship between the EPA and permittees, both state-level personnel and EPA personnel discussed how they have little to no involvement with permittees. Instances where the EPA and permittees work together include when the EPA has contracted with the state to aid in performing inspections and audits or when permittees have received funding from the EPA for other programs related to stormwater management (EPA stormwater staff one 2016).

Because California is unique in its structure, the state board's primary interaction with permittees is when permits are being written, whereas regional boards interact with permittees on a day-to-day basis. The working relationship between the regional board and permittees involves a number of activities including compliance assistance, technical assistance, "meet and greets", answering phone calls, e-mails, etc., pertaining to the permit and involvement in working groups (California Stormwater staff 2016). Utah had similar responses in that they work with permittees in various ways, including education. As one of Utah's stormwater staff explained:

> We have a gal here that's devoted to just the pollution prevention aspect of their municipal facilities. And she's not compliance at all…..She works in best management practices and takes a look at their practices and makes suggestions for improvement and she's familiar with that aspect of the permit. To let them know if they're out of compliance. So proactive reach out. So that they get their act together before we show up for an audit. It has been very well received, we thought at first, because we're all in the same office that they wouldn't trust that and that some would think that we were checking up on them for compliance purposes and but they're really embracing it and we've kept it very separate from what we do in terms of compliance which works very well (Utah Stormwater staff two 2016).

Exceeding Minimum Federal Regulations

In terms of states exceeding federal standards for the municipal stormwater program the results are varied not only across the states, but also in the case of California, within the state.

Stormwater staff members from Utah would say they do not exceed federal standards because "with our interpretation of what we need to do to meet the intent [of federal regulations] there's really no reason to go above and beyond" (Utah stormwater staff two 2016). This sentiment seems to be shared with all EPA stormwater staff interviewees who argue that due to the nature of the program, states do not necessarily go "beyond" standards set by the EPA: "Well, I think…because of the maximum extent practicable language that's just always being reevaluated and I think that our states have made a lot of progress in reevaluating that standard and changing conditions in their permit" (EPA staff three 2016). This sentiment is shared by other EPA staff who say "I wouldn't say they [states] go beyond the regulations, I would say that they, some states define what is the maximum extent practicable for their permittees. That can be different for different states" (EPA staff four 2016).

Unlike Utah and the EPA, Virginia has staff members who believe that their state has exceeded standards set by the EPA for stormwater. In Virginia, this is based on state-wide regulations and law in addition to what is required by the EPA. Reasons given for this are because of the TMDL requirements for the Chesapeake Bay:

> In Virginia we have state-wide post construction standards, so in other words the things that the national permit requirements are just that each ms4 permittees create construction requirements for their localities. And in Virginia we actually have state-wide standards that are separate for our ms4 program. So as long as ms4 permittees are meeting the state-wide standards then they're meeting the requirements for the ms4 permit. That's mcm 4 and 5. And we have a few other reporting requirements in the permit but the overall construction requirements and development requirements are definitely more stringent.

California has mixed responses when asked whether they exceed federal standards with four staff members who discussed this asserting that the state does, in fact, exceed the federal standards, two staff members saying the state does not go beyond federal standards, and four

staff members choosing not to answer. One staff member that believes that the state has gone beyond federal standards asserts that the state has gone beyond federal standards by requiring LID in the state permit arguing that "I mean it is something EPA wishes but it's not a part of their regulations as far as I understand" (California Stormwater staff three 2016). On the contrary, another staff member asserts that due to the MEP standard, the state has not gone beyond federal standards. They say: "No, not at all. Every state permit that has been adopted has some findings in it that basically states we are following the federal EPA permit guidelines and we are consistent and no court, or anything has ever challenged that. I don't think so. The EPA's regulations provide a fair amount of latitude and we've exercised that" (California Stormwater staff two 2016).

Challenges to the program

There are five primary challenges that state-level and EPA stormwater administrators interviewed believe permittees have when implementing the program; adequate financial resources, number and expertise of staff, regional or contextual differences, the nature of the stormwater program and increased prescriptiveness of the permit. Having adequate financial resources was cited by nine of the seventeen administrators across the cases. In California for example, some permittees are disadvantaged communities where funds are lacking to provide basic government services, which in the opinion of some make it difficult for them to put money towards stormwater runoff pollution (California Stormwater staff four 2016). As one interviewee explains that it is "hard for them [permittees] to justify spending money on the stormwater program when they are firing police men" (California Stormwater staff seven) while an interviewee from the EPA asserts that "Financing is the single biggest issue" (EPA one, 2016).

In addition to having adequate financial resources, having enough staff that also has expertise is a challenge at both the state and local levels of government. In Utah for example, one of the stormwater staff notes how small staff size has affected the ability of the state to do inspections and follow-up with compliance: "it was just myself running the program, doing the inspections and follow-up and so the follow-up was lacking" (Utah stormwater staff two 2016). They also discuss that having enough dedicated staff is also an issue for permittees saying "they [permittees] need a better, a dedicated person who understands the permit and they just kind of have too many chefs in the kitchen who tend to know just a little bit but not the full picture of the permit.

Interviewees identified regional and contextual factors as a third challenge to implementation. Some of these factors include economic conditions, support from local government and climate. This is especially true in California where the state varies so much in terms of climate, making it difficult for some permittees across the state to implement uniform standards. In discussing the post-construction requirements in the recent iteration of the California permit for example, one interviewee states: "I've heard a lot of concern from phase IIs that are trying to implement the state-wide permit where our priorities are different throughout the state has been very challenging and they have been specifically concerned with the post-construction requirements that they don't have any flexibility to regionally adapt the post-construction requirements to their given area and that seems to be a challenge" (California Stormwater staff four 2016). Another type of contextual difference relates to the type of permittee; traditional or non-traditional. In discussing this challenge EPA staff says:

> I think one challenge is the fact that the phase II program encompasses a lot of different types of entities—it can encompass the non-traditional ms4s like say, an air force base. It can also encompass a county government….And I think each one has different perspectives on how to implement parts of their phase II program and questions about it

with different challenges. So I think that's a challenge states have to address when they implement and develop their permits.

Another challenge is the nature of the stormwater program, namely the maximum extent practicable requirement. Based on interviews, while the flexible nature of the MEP standard allows for states to be innovative when writing their permits, it can also result in states writing permits that do the bare minimum because there is not a clear guideline that states should be innovative. EPA staff explains: "I think the MEP standards makes it difficult because it's a flexible iterative program, it makes it difficult for the states who want to write clear permits, but at the same time they may be pushed to not make a stronger permit- because where's the clear requirement that you need to change the permit?" (Staff four 2016). Related to the idea of the nature of the program being an iterative process, some interviewees acknowledge that while increased prescriptiveness of the permit makes it easier for state and regional boards to assess permit compliance and take necessary enforcement actions, it poses a greater challenge for permittees who may not have the resources to execute all aspects of a permit prescribing specific action.

Discussion

The analysis above reveals that the phase II municipal stormwater program is most representative of implementation literature that illustrates where various levels of government are involved, there are multiple perceptions and ways to think about a program. This discussion will proceed by discussing each of the major themes elucidated in the analysis.

Permit Development

In each of the states chosen for this project, it is made clear that while it does vary, there is a push towards more prescriptive permits to not only include specific requirements, but to also streamline the process. The push for permits that are increasingly prescriptive is illustrative

of findings in the implementation literature that regulatory language affects implementation. As this research highlights, reasons given for why permits have become more prescriptive include that it is a natural progression of the program, that it reflects what is needed in the states studied and occurs due to "lessons learned" as the program is in place for longer periods of time. Additionally, specific requirements in the permit highlight on some level, the state's priorities. For example, California's push for LID and hydro-modification requirements is an indication that the state as a whole's push towards increasing environmental sustainability efforts. Finally, interviews make clear that more prescriptive permits make it easier for those responsible for ensuring permit compliance because there is a baseline across the board. This suggests that while there may not be specific effluent standards set, more prescriptive permits requiring certain actions such as use of LID technology, or specific BMPs used for the various MCMs, are a way to ensure compliance and set clearer standards to measure permittee's effectiveness in reducing pollution from stormwater runoff.

Permit Implementation:

Across all cases and interviewees, implementation includes compliance assistance which state and EPA administrators do through collaborating with permittees. This includes answering questions so that permittees understand what is required of them when implementing BMPs for each minimum control measure and participating in various stakeholder groups as well as enforcing the permit. In the interviews, it was made clear that compliance assistance is a major part of the states' role because they would rather educate, collaborate and in general work with permittees rather than be punitive because in the long run that is best for stormwater runoff quality improvement. Compliance assistance is a major aspect of working relations between permittees, the state as the permitting authority and/or the EPA. Interviewees agree that the

increasingly prescriptive nature of the permit not only makes it easier to assist in compliance, but also in enforcing the permits. The greatest concern in this area is that not all permittees are "equal", meaning that state or regional boards responsible for ensuring permittees are complying with the state-wide general permit may need to take this into account. Across the three states, this seems to be the case more so in California than the other two states.

Working Relations

The implementation literature highlights that the state of working relations among levels of government is crucial to effective implementation. While there is some discrepancy, overall all state-level, region (CA) and EPA staff interviewed would agree that working relations are positive among various levels of government. Due to analysis indicating that the EPA region is not as involved with the phase II program as they may be with other programs, using Scheberle's model, this could be described as a working relationship that is cooperative but autonomous. While states do work with the EPA, the EPA plays more of a support role and offers guidance if they determine there are issues with how permits are written. Indicating once again, that the EPA is not overly involved with the stormwater program when states have primacy. Part of the reason for this is again, nature of the law. The MEP standard means that often if states have written the phase II permits in such a way to address all the minimum control measures, the EPA will not object to a state-wide general permit. Contrary to findings by Scheberle and other who have utilized her model who suggest that the best type of working relationship between states and the federal government for intergovernmental implementation is "pulling together and synergistic", findings from this study suggest that for programs such as the municipal stormwater program that do not have clear and measurable goals, the best type of relationship is one that is characterized as cooperative but autonomous. A potential reason for

this is because the variable nature of stormwater and differences among states requires states to have greater discretion in determining how best to reduce pollution from stormwater in their states. In sum, these findings indicate that the best types of working relations for intergovernmental implementation are somewhat contingent on the type of policy being discussed.

Exceeding Minimums:

This theme is the most representative of the implementation literature because perceptions vary based on where interviewees are located, the positions they hold, how they interpret the law to define the MEP which affects their perceptions on whether they are going beyond what the federal government requires. In determining what the MEP is, analysis indicates that administrators at the state-level have discretion in determining what ways the state will meet minimum control measures, including if they choose to go beyond what they perceive is required of them. In making this determination, MEP is contingent on several factors including technical and financial resources, regional concerns and political factors such as which groups are involved, leaving discretion to states in what is considered "the maximum extent practicable". In addition to the MEP language, as permits become more prescriptive in nature, it could make it clearer when permittees are exceeding permit requirements, and reasons why they exceed those requirements. The findings here suggest reasons can include linking stormwater management to other environmental programs and issues as well as overall commitment to environmental protection.

Challenges:

Like many programs, adequate resources including financial and adequate number of staff are the biggest problems facing permittees when implementing the phase II requirements.

Additional challenges include regional and contextual differences which are seen within and across states. This is especially the case in California where regional differences in terms of socio-economics across local governments and extreme climate difference across the state make it challenging for some permittees when complying with the state-wide general permit.

Conclusion and Lessons Learned:

While this study is exploratory in nature, there as several important lessons that are gleaned from this study including a greater understanding of how the phase II program of the municipal program works. The first lesson learned pertains to the Maximum Extent Practicable language associated with stormwater regulations. The MEP language allows for discretion, where permit writers determine what is best for their state based on contextual factors and what is necessary for their state. MEP is determined based upon several factors including water quality, financial and staff resources, etc. Additionally, based on the MEP language, we have learned that there is great variation across states and within states. The second lesson learned in this research is that based on how prescriptive recent permits have become, policy learning is occurring. This means that the states studied meet our definition of successful implementation because they exhibit learning and improvement as the program operates. Finally, through the analysis done it is understood that there are still challenges both across and within states that affect how well permittees are able to meet permit requirements.

While there are several important lessons learned, the information presented in this study opens the door for many opportunities for future research. This includes, first, attempting to better understand the relationship between MEP language and discretion; testing how much various factors including political climate play a role in permit writing and examining which groups attempt to influence the permit writing process. There is also an opportunity to

understand perceptions from permittees who are primarily responsible for implementation of the program. This includes challenges that they may face when implementing their stormwater pans, how they perceive working relations among the state and EPA, and why some permittees may exceed state-wide general permit requirements. Additionally, interviews made clear that permittees vary in implementation of the permit, further substantiating the need for further research pertaining to permittees. In California, for example, analysis indicates that there is variation within the state in terms of what permittees are doing with the state-wide general permit. This lends itself to questions pertaining to second-order federalism: or why some permittees choose to do more than what is required of the state-wide general permit. Another direction for future research is to further test Scheberle's model of Intergovernmental working relations and determine if programs which are similar to the stormwater program are most indicative of working relations that are cooperative and autonomous. This would aid in understanding if the type of program determines which type of working relationship is best. The final area of future research is to gain a greater understanding of what the relationship between the EPA and states entails, which would include examination of a relationship where states are not the primary permitting authority.

CHAPTER TWO:
WHOSE STORMSEWER SYSTEM IS IT? INTERGOVERNMENTAL RELATIONS AND MUNCIPAL STORMWATER

Introduction

In a federalist system like the United States, where power and authority to pass and implement policy is shared at the federal and state levels of government, it becomes imperative to understand the relationship between levels of government. Intergovernmental relations (IGR) can be defined as the interactions and interrelationships between units of government and continues to be an important area of study within the fields of Political Science and Public Administration (Stephens and Wikstrom 2007). Scholars such as Walker (1981) assert that studying intergovernmental relations is important because it has been "etched in stone" that federal, state and local governments not only should work together, but often need to do so to execute policies. IGR studies are also prompted by the notion that relationships in the United States are not neat, nor do they have clearly drawn jurisdictions among levels of government. Rather, the responsibility to develop and execute policies occurs across levels of government (Wright and Cho 2000; Elazar 1987; Grodzin 1966, 1960).

Devolution of federal policies to states for implementation and administration is one such instance that requires cooperation among levels of government. Beginning in the 1970s, a significant number of federal programs have been devolved from the federal government to states, placing the primary responsibility for day-to day execution of these programs on the states (Stephen and Wikstrom 2000; Stephens 1974). As is illustrated by numerous studies, there are many federal programs which have been devolved to state government across policy areas ranging from environmental programs such as the Clean Water and Clean Air Acts (Wood

and Potoski 2010) to welfare reform (Cho et al 2005). Once devolved to the states, many of these programs also require local governments' participation to execute or to administer (McGuire 2006).

While the literature on implementation and IGR has emphasized the importance of federal-state relationships for the development and execution of federal environmental programs, less is understood about the relationships between states and localities when local governments also play a role in the development and execution of environmental programs. By integrating the IGR literature and the literature focusing on local environmental policy and sustainability, this research seeks to better understand the intergovernmental relationship among states as the primary permitting authority for stormwater and local governments required to develop and implement municipal stormwater programs. Specifically, the question being addressed in this chapter is: which factors at both the state and local levels of government affect the ability of local governments to exceed what is required of them in the state-wide general municipal stormwater permit when they administer their municipal stormwater program? To answer this question, this article will proceed with a brief primer on phase II of the municipal stormwater program followed by a discussion of the relevant literature beginning the relevant IGR literature and then moving on to the literature on sustainable cities. Next, there will be a discussion of the survey instrument and methods employed for this study. Following methods, there will be a discussion of the results from the bivariate and multivariate analysis. From here, there will be a summary of the results, framing them in terms of the stories they tell about how municipal stormwater management works. This research concludes with a summary of major findings and directions for future research.

Short Primer on Phase II of the Municipal Stormwater Program

Because of the risk untreated stormwater creates for water quality, stormwater is regulated under the Clean Water Act (CWA) National Pollutant Discharge Elimination System (NPDES). The NPDES stormwater program for Municipal Separate Storm Sewer Systems (MS4s)[27] has been developed in two phases, and phase II will be the focus of this primer since it is the program that this study is addressing[28]. Established in 1999, Phase II requires regulated small MS4s as designated by the federal or state permitting agency, to obtain NPDES permit coverage for their stormwater discharges. To obtain coverage under the state-wide general permit, operators of small regulated MS4s must develop a stormwater management plan (SWMP) (or something similar) that do three things. First, management plans must outline how permittees hope to decrease the amount of pollutants from stormwater runoff to the "maximum extent practicable" (MEP). Second, management plans are required to outline how permittees aim to protect water quality and third, meet the relevant requirements of the CWA (EPA 2000). Operators of small-regulated MS4s who must comply with the program requirements include several different types of local entities including municipalities, local sewer districts, special service districts, state and federal departments of transportation, public universities, public hospitals, military bases, and correctional facilities (EPA 2000). In meeting requirements, operators of small MS4s are required to do five things: apply for a NPDES permit with the appropriate permitting authority, develop a SWMP with six minimum control measures

[27] MS4s are defined as "a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains)" (EPA 2014a).

[28] Phase I issued in 1990 requires MS4s in medium and large cities and some counties with populations of 100,000 or more, to obtain a NPDES permit for their stormwater discharges.

implement the SWMP and develop best management practices (BMPs)[29] for each of the control measures, establish measurable goals to meet the minimum control measures and evaluate the effectiveness of the program (EPA 2014b).

The municipal stormwater program is best characterized as a partial preemption program whereby state level agencies that are able to meet or to exceed federal requirements gain primacy in implementing and enforcing the federal mandates (Daley et al 2013). States that have achieved primacy for this program are responsible for issuing individual or general NPDES permits[30] for stormwater runoff and auditing various stormwater programs in their states. The states have discretion when writing permits allowing them to include requirements that may be more stringent than EPA's minimum standards. As operators of municipal storm sewer systems (MS4s) that are covered under the stormwater permitting program, local government administrators are responsible for the development of stormwater management plans (SWMPs) requiring them to develop best management practices for each of the program components and to also implement and to enforce the SWMP (EPA 2000). In sum, stormwater regulations exemplify some of the many complexities of IGR because federal, state and local governments all play an integral and interdependent role in the development, implementation and enforcement of this program (figure 2.1). Additionally, the various roles and responsibilities at each level of government make this program extremely complex and ultimately a program ripe for study. Furthermore, given the significant and increasing risks that polluted runoff from stormwater poses to human health and the environment studying this program and understanding the intergovernmental working relations is timely (EPA 2015).

[29] For a list of National Best Management Practices that operators of MS4s may choose from visit http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm.

[30] Individual permits cover a single source of pollution or runoff while general permits can cover multiple entities (EPA 2000).

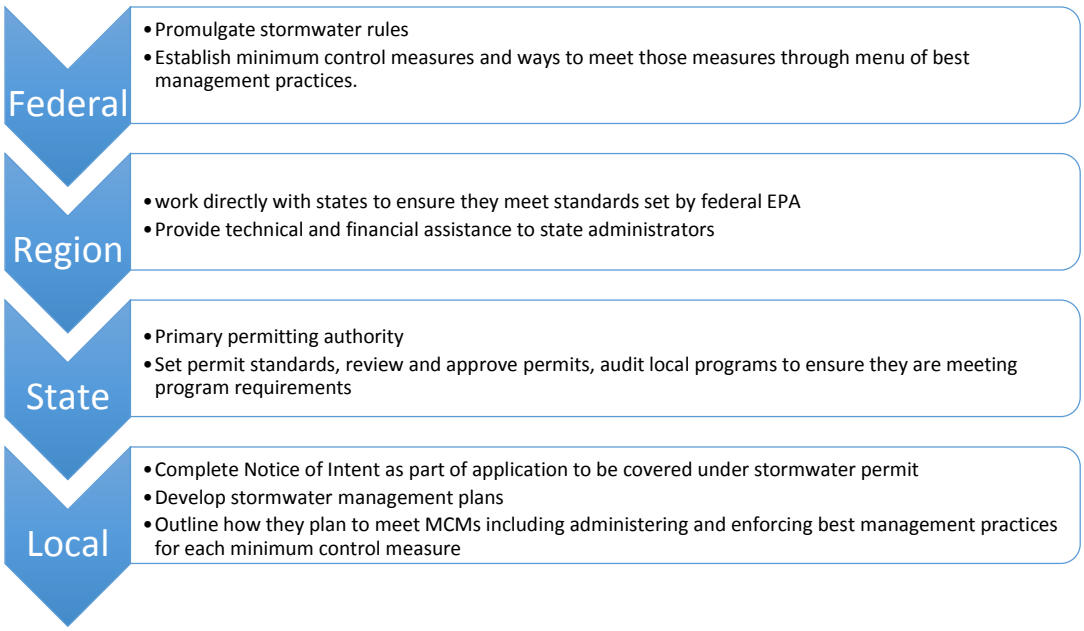


Figure 2.1: Federal-State-Local responsibilities of the municipal stormwater program

Review of the Existing Literature

Factors affecting IGR policy implementation

There are several factors which affect intergovernmental relations and the implementation of policies among levels of government, one of which is the availability of sufficient fiscal resources for state and local governments to adequately administer federal programs (O'Toole Jr. 2007). In general, it has been argued that the federal government has not kept pace with the rate at which states have taken on primary authority for many programs. Specifically, it has been shown that where states are the primary authority for many federal programs, including those that are considered unfunded mandates, a primary concern is shared that states do not have the adequate financial resources to effectively manage and implement federal programs. Additionally, for programs devolved by states to local governments, there is also concern about adequate financial resources. In sum, there is a general belief in devolution studies that money provided through direct federal assistance to local governments for

administering federal programs as well as money from state funds have not been able to keep up with the increased pressure placed on local government, thereby making it more difficult for local governments to administer programs effectively (Berman 1998).

As states devolve authority to local governments to administer and implement programs, the amount of discretion provided to local governments also affects implementation and interactions among levels of government (Bowman and Kearney 2010). For example, programs that are illustrative of substantive devolution (where the responsibility for making specific policies is shifted to another level of government) can expand local discretion and foster innovation and flexibility (Fording et al 2007), but can also place a strain on local governments responsible for implementing these programs.

An additional factor emerging from the literature as affecting IGR policy implementation is the quality of working relationships among program administrators at different levels of government (Scheberle 2004). In the context of state and local relations, the quality of working relations varies based upon the amount of discretion and autonomy granted to localities by state government (Wolman et al 2010). Wood (2011) for example, finds municipalities that are given more discretion when administering policies results in better quality relationships between state and municipal program administrators. Additionally, it has been found the level of autonomy local governments are provided is related to whether local governments are charted as Home rule or Dillon's rule municipalities. For example, Bowman and Kearney (2012) find that states with higher levels of local government autonomy have at least some Home Rule municipalities[31], suggesting local governments in states that employ

[31] Dillon's rule holds a narrow interpretation of municipal authority and governance where municipalities may only engage in activities they are specifically sanctioned by the state to engage in. Home rule in comparison is delegation of power from the state to local government units, providing local government units with greater local autonomy and less interference from the state (NRC 2013).

Dillon's rule across all local government entities have less autonomy. This is important for IGR studies because it helps explain how local governments where Dillon's Rule applies may have less discretion and are less likely to be policy innovators. In sum, when local governments have more autonomy, the literature suggests that there are better working relations across levels of government and local governments have more discretion when developing and implementing policies.

Another set of factors affecting IGR include contextual factors such as how severe a perceived problem is within a state and number of groups involved that play a role in intergovernmental relationships. Because contextual factors vary so much by state, Cho et al (2005) argue that to understand IGR and how implementation occurs at the local level, it is best to focus on a group of contextual, institutional, intergovernmental and professional variables to explain how local government administers programs. In general, Cho and his colleagues find that the strength and quality of intergovernmental relationships as well as the perceived effectiveness of IGR policy implementation depends on the level of professionalization within state and local agencies and the amount of authority local governments are granted to develop and to administer programs (2005).

Local Government characteristics related to IGR policy implementation

While external factors such as availability of resources and level of autonomy granted to local government affect how programs are administered at the local level, internal characteristics of local governments also affect how programs function (Krause 2011). Literature that focuses on why local governments may exceed state level requirements for certain programs argue that it is a mix of economic conditions within the locality, demographic factors, and governing structure (council-mayor, council-manager). Building from Peterson's seminal work *City Limits* (1981), other scholars such as O'Connell (2008) and Steel and

Lovrich (2000) use economic indicators such as general city revenues and per capita income to determine if this plays a role in the adoption of environmental policies. They find that economically prosperous governments are more likely to adopt policies that exceed state or federal environmental standards. Lubell and his colleagues (2009) research assessing cities in California further supports this and they find that the adoption of sustainability policies are more likely to occur in cities with that are fiscally healthy with a higher socioeconomic status of residents.

While these studies do not pertain specifically to IGR policies, they shed light on factors influencing program management and adoption at the local level which is useful to our understanding of why some local governments may develop more comprehensive stormwater management plans than what is required by the state permitting program. In sum, the literature highlights that the ability of local governments to execute programs devolved to them by the state are contingent upon levels of local level discretion (home rule versus Dillon's rule), economic conditions, demographic factors and government structure. However, what is less clear is how various local governments, based on these differences, perceive how state level rules affect their ability to implement these policies. This purpose of this research is to explore those relationships.

Contributions

It has been said that intergovernmental cooperation is "at the heart of the implementation process" (Scheberle 2004, 2). This is especially the case as federal programs have been devolved to states to administer. Additionally, because of the role local governments play in the execution of policies, there is need for continuing study of state to local government relations (McGuire 2006). While a significant number of studies are focused on federal-state

intergovernmental relations (Scheberle 2004), or devolution from federal to state, or state to local government,[32] less research has been done on IGR relationships and policy implementation in a program that transcends all levels of government. Through the study of the municipal stormwater program, this research extends existing understanding of second-order federalism pertaining to IGR policy implementation with respect to complex programs requiring cooperation across all levels of government. In addition to this, the municipal stormwater program is important to study because of the significant implications pollution from stormwater runoff has for environmental and public health. This is an important contribution to the current literature on IGR implementation as well as the knowledge of practitioners and scholars alike because this research is integrating theories of IGR and the literature focusing on local government sustainability, both of which are crucial to our understanding of environmental policy development and implementation. While most studies focused on why local governments exceed state or federal government requirements examine sustainability policies (or something similar), it is possible to develop a greater understanding about local government decisions to exceed standards set forth in state and federal policies if the relationships between preemption and IGR are better understood.

Data and Methods

In answering the primary research question of whether and how rules and regulations at the state level affect how local governments manage their stormwater programs, this research begins with two assumptions. First, state level rules and regulations affect the decision of local governments to exceed the state-level requirements for stormwater. Second, where state level rules provide incentives for local governments to develop programs exceeding minimum

[32] Studies of this type often fall under second-order federalism studies, with IGR being a part of second-order federalism but not necessarily studied on its own.

standards, it is argued that internal factors such as form of government (council-manager or council-mayor) affect the willingness or the ability of local government to incorporate additional measures into their stormwater program other than what is required by state or federal regulations. To test these arguments three models are developed and tested; the first model based on the IGR literature, second, sustainable cities literature and a third model that combines the two. The unit of analysis for this study are general purpose local governments, such as counties, cities and towns that provide a wide array of services (Dye and MacManus 2015)[33] and are required to obtain coverage under the state-wide general permit for their stormwater runoff discharges.

Data Collection

Data for this project were collected in two ways: first through survey results from an original survey that was distributed to all phase II permittees within the states of interest (California, Utah and Virginia), and second, data were collected from the American Community Survey (ACS) 2014 5-year estimates. Contact information for organizations required to obtain coverage under the phase II stormwater general permit was provided by state-level stormwater administrators in each state.[34] Combined, there were 444 organizations that were sent the survey to be completed. Using Qualtrics survey software, the initial web survey (included in appendix D) was e-mailed April 05, 2016, with follow-up e-mails sent April 12, 19 and 26 of 2016. Of the 444 e-mails sent there were 143 surveys started with a total of 139 completed for a response rate of approximately 29%.

[33] While local government units also include special-purpose government such as special service districts, they are not included in this analysis because this study is only examining traditional ms4 permittees, whereas, special service districts are considered non-traditional ms4 permittees.

[34] While California and Virginia stormwater administrators provided an excel spreadsheet with contact information for each of the organizations required to obtain coverage under the phase II general permit, Utah required a GRAMA request form submitted prior to releasing any information.

Of the 139 completed, 88 of the survey respondents are employed by organizations that are traditional phase II permittees characterized as general purpose local governments making those the only responses eligible to be analyzed for this study. [35] The remaining surveys were stored and kept as part of a larger data set for future research. The dependent variable is based on a question in the survey asking if local governments exceed the minimum control measures outlined in the state-wide general phase II permit. Of the 88 respondents, 69 answered the question that the dependent variable was derived from. The limitations of this response rate include a large standard error making the results of the analysis less robust and generalizable across cases. However, despite these limitations, because this is the first study of its kind, this exploratory analysis is a critical first step to engage in future research. Additional demographic and economic indicators were gathered using American Community Survey's 2014, 5 year estimates. Combined, these data sources provide the necessary control variables and independent variables to test the three models.

Measures of the Independent Variables

The dependent variable; whether local governments exceed the minimum requirements set forth by the state is a dichotomous variable where respondents answers were coded as "0" if they do not exceed minimum requirements and "1" if they do. Because the dependent variable is dichotomous, independent variables are assessed based on a change in probability. In other words, independent variables are evaluated based on if they increase the probability of local governments exceeding state-level requirements at the $p < .05$ significance level. There are three general categories that variables fall under; government characteristics, variables expected to impact programs based on the literature discussed above and other characteristics. While table

[35] For a full list of survey questions, and survey methodology see appendix E.

2.1 provides a brief description of each variable and its relationship to the dependent variable, they are also described below.

Government Characteristics

The first variable, *govtype* is a dichotomous variable where survey respondents answered "1" if the local government structure in their locality is a council-manager form of government and "0" if it is not. The notion behind including this variable is because previous literature, particularly literature pertaining to sustainable cities, suggests legal form of government affects the ability and willingness to exceed minimum requirements (Krause 2011). Next, the variable *generalrule* which is also dichotomous, is a measure of which local governments are home-rule municipalities and which are Dillon's rule. The rationale for providing this is because it is believed that Home rule municipalities have more discretion than Dillon's rule municipalities. *municipalitytype* is included to differentiate between cities/towns and counties.

Specific variables influencing programs

This group of variables are expected to have some impact on whether local programs exceed state requirements and are included for one of two reasons; either they are flagged in the literature as important, or were included as survey questions for this study based on findings from a previous study.[36] There are two independent variables to determine if local governments have adequate human resources to manage their programs. The first is *dedicatedstaff*, a dichotomous variable where survey respondents were asked if they had at least one employee who works with stormwater only. The second, *staffsize*, is a count variable determining the number of employees who work on stormwater related issues. The next variable,

[36]Based on in depth qualitative interviews and the findings from chapter one of this dissertation there are several factors that can influence how stormwater programs are developed. These factors were included in this study.

numberofenvironmentalsustissues, is a count of the number of environmental sustainability policies or programs that are connected to the goals of the municipal stormwater program. This variable is included because the sustainable cities literature suggests when local governments connect other environmental programs, or sustainability issues to other environmental concerns, the result is more environmental protection (Krause 2011).

Also, a count variable, *yearsprogram* measures how long a local government has been required to obtain coverage under the state-wide general permit for their stormwater discharges. *Mgmtplan* is a dichotomous variable where survey respondents answered "1" if they are required to write a formal management plan to obtain coverage under the state-wide general permit and "0" of they do not. The rationale for including this variable is based on findings from a previous study which indicated that in some instances local governments do not have to submit a formal plan for approval. Based on a question from the survey asking respondents how much latitude they are provided by state government when managing their stormwater programs, *discretion* (table 2.1), is a measure of the perceptions of the respondents about how much latitude they feel they are provided by the state. This measure is ordinal, ranking from one where local administrators have no discretion at all to five, where local administrators have complete discretion.

The variable, *govsupport*, also deals with perceptions, measuring how much support local governments perceive they have from other levels of government. This variable has four categories (one for each level of government) and is based on a 5point Likert scale (one being the least support and five being the most) political support local government perceive to have from each level of government (local, state, regional EPA and federal EPA). This variable is necessary because literature focused on intergovernmental implementation suggests that

perceptions on the level of positive working relations are can affect overall perceived effectiveness of programs (Scheberle 2004).

The variable *TMDL* is a dichotomous variable where respondents answered "1" if they have TMDL requirements and *TMDL_swprogram*, also a dichotomous variable asks respondents if TMDL issues in their jurisdiction are incorporated into stormwater management. Total Maximum Daily Loads (TMDLs)[37]are included because of the risk TMDLs pose for water quality it is suggested that TMDL requirements will influence stormwater programs. Finally *work_ms4*, is a dichotomous variable and is based on a question from the original survey asking respondents if they work cooperatively with other MS4s. This variable is included because the IGR literature suggests that working cooperatively to achieve similar goals can impact how programs are developed and implemented.

Other Variables

Six other variables are included as control variables to be tested in the full models. First is the percentage of the population over 25 years old with a college degree. This is based upon the 2014 American Community Survey estimates. This is included as a proxy for affluence within communities (Lubell et al 2009). Other control variables include population size, (table 2.1), the percent of landmass within a local governments' jurisdiction, diversity, median household income and median home value. These are common control variables used to measure socio-economic status which is why they are included (Lubell et al 2009).

[37] TMDL is a regulatory term in the Clean Water Act, which describes the maximum amount of pollution a body of water can have and maintain water quality.

Table 2.1: Variable descriptions

Variable	Description	Relationship to DV
DV: Goesbeyond	Dichotomous variable: 1 if local governments go beyond the MCMs in the state-wide general permit and 0 if not	N/A
Government type	Dichotomous variable: 1 if they have a council-manager form of government and 0 if not	It is expected that local governments that have Council-manager form of governments are more likely to exceed what is required of them
Dedicated Staff	Dichotomous variable: 1 if they have dedicated staff to the SW program and 0 if not	Rationale for this variable is that having staff specifically dedicated to the stormwater program suggests that resources are available. With more resources, local governments can more easily exceed state requirements
Staff size	Count of number of staff working on SW program	The larger the staff, the more resources they have available to exceed state requirements
Number of environmental sustainability issues	Count of the number environmentally sustainable policies SW program is associated with	When local governments link other sustainability issues to their stormwater program, it is expected that they will exceed what is required of them by the state
General rule	Dichotomous variable: 1 if local government is considered a general rule municipality and 0 if not	Other literature suggests that home-rule municipalities have more discretion, which affects their ability to exceed what the state requires of them
Years program	Count of how many years local government has been required to obtain coverage under the phase II permit	Proxy for resources available; longer amount of time in program, more likely they have resources and will exceed what is minimally required of them
Management plan	Dichotomous variable: 1 if municipalities are required to write a formal management plan and 0 if not	Included to determine if having to write a formal management plan affects whether local government units will exceed what is expected of them
Discretion	Based on a 5-point Likert scale (from 1 = no discretion at all to 5= complete discretion)	It is expected that the more discretion a local government has, the more likely they are to exceed what is required of them

TMDL	Dichotomous variable: 1 if municipality has TMDL requirements and 0 if not	Included because in interviews completed in a previous study suggested that TMDL requirements influence stormwater programs. Those with TMDL requirements are expected to exceed state requirements
TMDL_swprogram	Dichotomous variable: 1: TMDL requirements affect how SW program is executed and 0 if not	It is expected that when Stormwater programs include TMDL requirements, local governments are more likely to exceed minimums
Work_MS4	Dichotomous variable: 1:work cooperatively with other organizations and 0 if not	When local governments work cooperatively with other ms4s, they are likely to exceed what is required of them
Government support	5-point Liker scale (from 1= very little support to 5= very supportive)	The more support that local governments have, the more likely they are to exceed state minimums
Municipality type	Dichotomous variable: 1 for city or town and 0 for county	N/A This variable is included as an indicator of the types of localities in this study
Percent of population over 25 with a degree	ACS 2014 5-year estimates	N/A Control variable and a measure of affluence in communities
Population	Total population 2014	Larger the population, the more likely local government is to exceed what is required of them
Percent area land	Percent of total area that is land	Larger the amount of land, the more impervious surfaces and more likely local government is to exceed what is required of them
Diversity	Calculation of total racial diversity based upon percentages of nonhispanic white, black and hispanic	N/A Control variable

Examination of the variables included in this research highlight the differences between what the IGR literature and the Sustainable Cities literature focuses on. While the nature of IGR relationships affects the ability or willingness of local government units to exceed what the state requires, the sustainable cities literature focuses primarily on internal characteristics of local government including government type, level of citizen education attainment, level of

unemployment, median household income, property value and so forth to explain the adoption of certain policies.

Hypotheses:

Of the 69 cases, 25 indicate they "go beyond" or exceed what is required of them by the states to meet permitting requirements, which equates to approximately 36% of the respondents. Based on the literature presented in this chapter, several hypotheses are laid out to test the increase in probability of a local government going beyond what the state requires. These hypotheses are based on findings from both the IGR and Sustainable Cities literature. Each will be discussed in turn.

Intergovernmental Relations

IGR scholars point to the availability of resources as a primary contributor to the ability of government to effectively execute programs that are delegated to them from other levels of government (Scheberle 2004). Resources include having adequate number of staff and monetary resources available to fully execute the programs. To test this, there are three hypotheses dealing with local government units having adequate resources in this research:

Hypothesis one: Local governments that have at least one employee dedicated to the municipal stormwater program are more likely to exceed standards set by the state.

Hypothesis two: The more staff members that a local government has working on the municipal stormwater program, even if these employees work on other programs, the more likely they are to exceed the minimum standards set by the state.

Hypothesis three: The longer a local government has been participating in the municipal stormwater program, the more likely they are to exceed what the state requires they do.

Quality of working relations, as measured by levels of discretion and autonomy, are also expected to affect whether a local government is able to exceed what is expected of them.

There are two sets of variables that examine this. First, is how a locality is chartered under state law. When a locality is home-rule, it will have more discretion and more authority than those that are chartered as general or Dillon's rule localities. Next, it is believed that when local governments perceive that they have more discretion when executing their programs that they are more likely to go beyond what is required of them. The next two hypotheses test these issues:

Hypothesis four: Local governments that are chartered as home-rule municipalities are more likely to go beyond standards set by the state-wide general stormwater permit.

Hypothesis five: Local governments with higher levels of discretion are more likely to exceed standards set by the state-wide general permit.

Sustainable Cities

It has long been recognized in the sustainable cities literature that a number of internal factors result in local governments being leaders in terms of adopting sustainability policies. Because the municipal stormwater program is an environmental program aimed at improving water quality, like other environmental programs which local governments take the lead on adopting, it is believed that the same factors which result in local governments being leaders in adopting sustainability policies may affect the likelihood or ability of local governments to exceed state-wide general municipal stormwater requirements.

Hypothesis six: Local governments that have their stormwater management plans linked to other sustainability issues are more likely to exceed what is required by the state.

Hypothesis seven: Local governments with one or more sustainability issues that they are working towards achieving are likely to exceed what is required of them.

In addition to being linked to other sustainability issues, because TMDLs are a major source of pollution, it is believed that if a local government has TMDL requirements that they

must meet, this will have an impact how they address stormwater. The following hypotheses test this:

Hypothesis eight: Local governments with TMDL requirements are more likely to exceed what the state requires of them.

Hypothesis nine: Local governments that have incorporated their TMDL requirements into their stormwater management program are likely to exceed what the state requires of them.

Grounded in the sustainable cities literature, it has been found that more affluent communities are more likely to adopt policies related to sustainability (Lubell et al 2009; Steel and Lovrich 2000). Based on this, three hypotheses are outlined:

Hypothesis ten: Local governments with median household incomes above state levels are more likely to go beyond standards set by the state-wide general permit.

Hypothesis eleven: The greater the percentage of the population over 25 years old with a college education, the more likely a state is to go beyond standards set by the general permit.

Hypothesis twelve: The higher above the median home value for the state, the more likely a local government is to exceed standards set by the state-wide general permit.

Other hypotheses:
While there are hypotheses that are specific to findings in each of the literature discussed, there are two hypotheses that relate to both models. The first relates to government structure. Based on findings from the sustainable cities literature, it has been found that cities having council-manager form of government are more likely to adopt and implement sustainability policies (Lubell et al 2009). In addition to this, other literature focusing on local governments suggests that the council-manager form of government is more progressive in policy choices and tends to be less politically motivated which can result in the adoption of more sustainability programs (Kearney et al 2001). This is believed to be the case for exceeding standards set by the state for stormwater as well:

Hypothesis thirteen: Local governments with a council-manager form of government are more likely to exceed standards set by the state-wide general permit.

Next, both the IGR literature and sustainable cities literature suggest that having good working relations and high levels of support from various levels of government are important.

The following hypothesis tests this:

Hypothesis fourteen: Local governments who perceive strong levels of government support at the local, state, regional EPA and Federal EPA levels of government are more likely to go beyond what is minimally required of them.

Because the dependent variable is dichotomous, when determining the relationship between the dependent variable and the independent variables, Kendall's tau tests were run to determine the bivariate relationships; taub for square independent variables and tauc for nonsquared independent variables. Bivariate tests were done for all the variables to determine significance, and then when running the IGR, Sustainable Cities and combined logit models, only variables that were significant at the .05 and 0.10 level were included.

Table 2.2 Hypotheses

IGR specific hypotheses	**Sustainable Cities specific hypotheses**	**Other hypotheses**
Local governments that have at least one employee dedicated to the municipal stormwater program are more likely to exceed standards set by the state.	Local governments that have their stormwater management plans linked to other sustainability issues are more likely to exceed what is required by the state.	Local governments who perceive strong levels of government support at the local, state, regional EPA and Federal EPA levels of government are more likely to go beyond what is required of them.
The more staff members that a local government has working on the municipal stormwater program even if these employees work on other programs, the more likely they are to exceed standards set by the state.	Local governments with one or more sustainability issues that they are working towards achieving are likely to exceed what is required of them.	Local governments with more land per square mile are more likely to go beyond standards in the state-wide general permit.
The longer a local government has been in the municipal stormwater program, the more likely they are to exceed what the state requires they do.	Local governments with TMDL requirements are more likely to exceed what the state requires of them.	

Local governments that are chartered as home-rule municipalities are more likely to exceed standards set by the state-wide general stormwater permit.	Local governments that have incorporated their TMDL requirements into their stormwater management program are likely to exceed what the state requires of them.	
Local governments with higher levels of discretion are more likely to go beyond standards set by the state-wide general permit.	Local governments above the median household income for the state are more likely to exceed standards set by the state-wide general permit	
	The greater the percentage of the population over 25 years old with a college education, the more likely a state is to exceed standards set by the general permit.	
	The higher above the median home value for the state, the more likely a local governments is to exceed standards set by the state-wide general permit.	

Results and Analysis

Bivariate results

Because the dependent variable is dichotomous, Kendall's tau tests were done to measure the relationship between the dependent variable and independent variables. Kendall's Tau correlations return coefficients of 0 to 1, where 0 indicates there is no relationship between variables and 1 is a perfect relationship. In other words, the closer to 1 the measure of association is between the independent and dependent variable, the stronger the relationship between the two. Measurements of association using Kendall's Tau-b and Tau-c (depending on whether the comparison was being done with the same number of rows and columns or not) was done when examining independent variables and the dependent variable. This exercise yielded six significant independent variables out of the eighteen tested (Table 2.2). In other words, when running bivariate tests, I examined whether the probability of a local government "going

beyond" what is required of them in terms of the state permit increased when the dependent variable interacted with each of the values of the independent variables.

The first significant bivariate result of importance was the number of years a local government has been in a program. Table 2.3 presents the crosstab between the number of years a local government has been part of the municipal stormwater program and the dependent variable. The measure of association for this relationship is Kendall's Tau-c and is .06, indicating that while the measure of association is not strong[38], there is still relationship between the dependent variable and number of years a local government has been in the stormwater program. This is significant at the $p<.05$ level.

Table 2.3 Measures of association by count and percentages of the relationship between going beyond state level regulations and the number of years' local government unit has been in the phase II municipal stormwater program

GOESBEYOND		LESS THAN 5 YEARS	5-9 YEARS	10 PLUS YEARS	TOTAL
NO	Count Percentage	16 80.00	3 27.27	23 65.71	42 63.64
YES	Count Percentage	4 20	8 72.73	12 34.29	24 36.36
TOTAL	Count Percentage	20 100	11 100	35 100	66 100

Pearson chi2 (2) = 8.6653 Pr= 0.013 tau_c = 0.0624

For each category of years (less than five, five to nine, and ten or more) a local government is required to obtain coverage under the stormwater permit, we see the probability of a local government going beyond what is required of them increase from a probability of 20 percent for local governments which have been required to obtain coverage for less than five years, to a probability of over 72 percent when a local government has been in a program between five and nine years.

[38] When measuring the strength of the relationship for Kendall's Tau-b and Tau-c, Tau-tests where the measure of association between the variables is less than .1 are considered relatively weak, where .1 to .3 are moderately strong and anything above .3 is strong.

What this illustrates is over time, the ability for local governments to learn what works in managing their stormwater, and an ability to adapt and adopt practices that are more innovative, as supported by the intergovernmental implementation literature. However, when moving to local governments involved in the program for nine years or more, the likelihood of them going beyond what is required drops back down to approximately 34 percent. While still a higher percentage than when programs are in their infancy, this major decline in the probability of exceeding the minimal requirements could suggest that over an extended period, local governments are less likely to innovate, or are not capable of innovating further based on other factors such as availability of resources, support, etc.

Also of both statistical and substantive significance, the crosstab presented in table 2.4 indicates that the state in which a local government is located also affects whether they exceed state standards, with the measure of association being Kendall's Tau-b and is 0.23, indicating the association between the two variables is moderately strong.

Table 2.4. Measures of association by count and percentages of the relationship between going beyond state level regulations and state phase II permittee is in

GOESBEYOND		UTAH OR VIRGINIA	CALIFORNIA	TOTAL
NO	Count	25	19	44
	Percentage	75.76	52.78	63.77
YES	Count	8	17	25
	Percentage	24.24	47.22	36.23
TOTAL	Count	33	36	69
	Percentage	100	100	100

Pearson chi2 (1) = 3.9352 Pr= 0.047 tau_b= 0.2388

With the probability of a local government exceeding state requirements increasing from approximately 24% to 47% if the local government is in California, this suggests a "California effect", which has been well-documented in past research. California tends to be more

innovative and exceed federal environmental standards and this shows that local governments also tend to be more innovative when state laws allow them to be.

The role of sustainability linkages, as supported by the sustainable cities literature, also receives support through two of the significant variables. Table 2.5 presents the crosstab for local government's management plan is connected to other sustainability issues and the dependent variable. This measure of association is Kendall's Tau-b and is .33 indicating a strong relationship among these variables. This is also significant at the $p<.05$ level. In addition to this, Table 2.6 highlights that the number of sustainability issues a management plan is connected to affects the dependent variable with the measure of association being Kendall's Tau-b at .29.

Table 2.5. Measures of association by count and percentages of the relationship between going beyond state level regulations and if stormwater management plan is linked to other sustainability issues (mgmtplan_sustissues)

GOESBEYOND		NO	YES	TOTAL
NO	Count	38	6	44
	Percentage	73.08	35.29	63.77
YES	Count	14	11	25
	Percentage	26.92	64.71	36.23
TOTAL	Count	52	17	69
	Percentage	100	100	100

Pearson chi2 (1) = 7.9158 Pr= 0.005 tau_b= 0.3387

Table 2.6. Measures of association by count and percentages of the relationship between going beyond state level regulations and if stormwater management plans are linked to more than one sustainability issue

GOESBEYOND		LINKED TO ONE OR LESS SUSTAINABILITY ISSUES	LINKED TO MORE THAN ONE SUSTAINABILITY ISSUE	TOTAL

NO	Count Percentage	39 70.91	5 35.71	44 63.77
YES	Count Percentage	16 29.09	9 64.29	25 36.23
TOTAL	Count Percentage	55 100	14 100	69 100

Pearson chi2 (1) = 5.9828 Pr= 0.014 tau_b= 0.2945

The chi-square results in table 2.5 indicate that when stormwater plans are linked to other sustainability issues, it increases the probability of local government units exceeding state minimums from approximately 29% to 64%. Additionally, the number of sustainability issues that local governments link their programs to is positive and statistically significant at the .01 level, suggesting that local governments more focused on increasing their level of sustainability practices are also more likely to exceed the minimum expectations required of them by the state-wide general stormwater permit.

The final two significant bivariate results include the link between TMDL requirements and stormwater programs, and the presence of high levels of support from local government officials. Table 2.7 presents the crosstab between whether local governments who have TMDL requirements connect them to their stormwater plans and the dependent variable. The measure of association for this relationship is Kendall's Tau-b and is .25 indicating a relatively strong relationship between the dependent variable and if local governments have TMDL requirements. This is significant at the $p<.05$ level. Finally, table 2.8 presents the relationship between the level of local government support and the dependent variable. The measure of association is Kendall's Tau-c and is .33 which is also a strong measure of association. This is also significant at the $p<.05$ level.

Table 2.7. Measures of association by count and percentages of the relationship between going beyond state level regulations and if stormwater program plan incorporates TMDLs

GOESBEYOND		NO	YES	TOTAL
NO	Count Percentage	18 70.91	14 46.67	32 58.18
YES	Count Percentage	7 28	16 53.33	23 41.82
TOTAL	Count Percentage	25 100	30 100	55 100

Pearson chi2 (1) = 3.5969 Pr= 0.058 tau_b= 0.2557

Table 2.8. Measures of association by count and percentages between going beyond state level regulations and level of support from local government

GOESBEYOND		VERY UNSUPPORTIVE	SOMEWHAT UNSUPPORTIVE	NEITHER SUPPORTIVE OR UNSUPPORTIVE	SOMEWHAT SUPPORTIVE	VERY SUPPORTIVE	TOTAL
NO	Count Percentage	2 50	9 90	6 85.71	14 66.67	8 40.	39 62.9
YES	Count Percentage	2 50	1 10	1 14.29	7 33.33	12 60	23 37.10
TOTAL	Count Percentage	4 100	10 100	7 100	21 100	20 100	62 100

Pearson chi2 (4) = 9.6161 Pr= 0.047 tau_c= 0.3371

When local governments that have TMDL requirements include TMDLs in their stormwater program it increases the likelihood of exceeding state minimums from 28% to 53%. This suggests that, in some instances, polluted runoff could affect TMDL levels in some areas resulting in more stringent programs to reduce pollution from stormwater runoff. This provides further evidence that when stormwater management is paired with other local environmental concerns local governments are more likely to exceed minimum requirements set by the state. In terms of government support at the local, state, regional EPA and federal EPA level, only local government support was significant with a p-value of 0.047. As the sustainable cities literature indicates, having local government officials that are supportive of sustainable

environmental policies, and who take an interest in reducing stormwater pollution, increases the likelihood of local governments exceeding requirements at the state-level. While the sustainability literature does suggest that support from government at the local level is important for the adoption of environmental sustainability policies, it also suggests that support at the state level also can have an impact (Krause 2011). These results do not support that part of the sustainable cities literature.

Table 2.9: Measures of Association for going beyond state level regulations and independent variables

Independent Variable	***Pearson Chi-Square***	***Kendall's TauB***	***Kendall's TauC***	***Pr***
Municipality type	0.6825	-0.0995	--	0.409
Government Type	1.573	0.01511	--	0.209
Dedicated Staff	0.1217	0.0426	--	0.727
Staff size	1.0921	--	0.1038	0.579
Years in program	8.6653	--	0.0624	0.013**
Population size				
California Effect	3.9352	0.2388	--	0.047**
Formal Management Plan	1.6727	-0.1557	--	0.196
GENERALRULE	0.7434	0.1152	--	0.389
SW Management plan is connected to other Sustainability issues	7.9158	0.3387	--	0.005***
Number of sustainability issues SW plan connected with	5.9828	0.2945	--	0.014**
TMDL Requirements	0.7917	0.1200	--	0.374
TMDLs connected to SW PROGRAM	3.5969	0.2557	--	0.058*
Works cooperatively with other MS4s	1.2261	0.1384	--	0.268
Level of Local government support	9.6161	--	0.3371	0.047**

+p<0.1, **p<.05 ***p<.01

Logit models without controls

To test for the isolated effects of the independent variables proved significant in the chi-square tests, these variables were tested in three separate models. The first looked solely at the variables supported by the intergovernmental relations literature (IGR Model), shown in the

first column of Table 2.10, followed by those supported by the sustainable cities literature (Sustainable Cities Model) in the second column, with the Combined Model in the third column. For the IGR logit model, only staff size remains significant, and only at the 0.10 level. The same trend is seen with the sustainable cities model, with only one of the independent variables remaining significant; the number of environmental sustainability programs the stormwater program was linked to. Interestingly, when the models are combined, both staff size and the number of environmental sustainability programs in the community lose significance, while the state that a local government is housed in gains significance in a positive direction (meaning governments located in California), and where TMDL requirements are linked to a stormwater program. This ultimately suggests that state culture and when local stormwater programs are linked to other environmental concerns, this has a greater effect on local governments exceeding requirements for stormwater management. To further parse this out, control variables are included in the model to determine if these variables continue to hold significance when traditional controls are included.

Table 2.10: Logit models without control variables

Variables	**IGR Model**		**Sustainable Cities Model**		**Combined Model**	
	Coefficient	*SE*	*Coefficient*	*SE*	*Coefficient*	*SE*
Staff Size	0.833	0.45*			0.882	0.754
Years in Program	0.36	0.32			0.608	0.428
California Effect	1.73	0.65			2.42	1.09**
SW Management plan is connected to other Sustainability issues			1.64	1.45	1.78	1.69
Number of sustainability issues SW plan connected with TMDLs			0.11	1.688	-0.941	1.91
			1.12	0.69	2.06	0.981**

connected to SW Program				
Level of Local government support	0.287	0.27	0.442	0.285

Reported logit coefficients are unstandardized. *p<0.10, **p<0.05

Logit models with controls

Before incorporating the control variables into the above models, bivariate tests were completed on each of the control variables to determine if the measures of association between the control variables and the dependent variable were significant and whether they had an effect on the probability of local governments exceeding what is required of them. Results of the bivariate tests indicate that the only significant variables are the percent of the population over 25 with a college degree and median household income. Because population over 25 with a college degree is used as a proxy to measure how affluent various communities are, this suggests that the affluence of a community affects their ability or likeliness to exceed state-level requirements.

The models were then run again with control variables, the results of which are shown in Table 2.11. When the control variables were included with the IGR model, the only variable which remained significant, and again in the positive direction is the state dummy variable, labeled *California Effect*. Once again these findings indicate that local governments in California are more likely to exceed the minimum requirements for stormwater management. The percent of the population over 25 with a college degree also proved significant and at the higher significance threshold of 0.05. Overall, the IGR model shows that being located in California, and having a higher population of educated adults are the most significant factors for local governments to exceed minimum requirements of this program. Interestingly, when the sustainable cities model was included with the control variables, the previously significant

variable for number of environmental sustainability programs connected with stormwater programs is no longer significant, but instead having a stormwater program linked to TMDLs is positive and significant at the 0.10 level. Also of note is the significance of the variable indicating the percentage of a jurisdiction that is considered land, which is also significant at the 0.10 level, but in a *negative* direction. In other words, the likelihood that a local government will exceed the minimum requirements for stormwater management is increased by the addition of TMDL requirements along with a decrease in land mass. The findings with land mass are interesting because this means less land area within a local governments' jurisdiction increases the likelihood of a local government exceeding state level requirements. One potential reason for this is that there are more impervious surfaces covering the land that is in that jurisdiction, and with more land there would be a greater cost associated with exceeding the minimum state requirements. In addition, we see once again that the percent of the population over 25 with a college degree is significant at the 0.05 level.

When viewing local government actions in this sample through the lens of sustainable cities, it appears that higher levels of educated adults are the most significant factor driving local government stormwater efforts. Other important factors include having TMDL requirements associated with stormwater management plans and the amount of land mass within the local governments' jurisdiction with higher levels of TMDL requirements and lower levels of land mass increasing the likelihood of exceeding minimum requirements. What is interesting about the TMDL result is that stormwater management plans that are connected to other environmental sustainability issues outside of TMDL requirements do not have an effect on whether local governments exceed state-level requirements; a result that is contrary to other findings in the sustainable cities literature. One possible explanation for this result pertains to

the perception of the importance of mitigating TMDL concerns and how TMDLs affect pollution from stormwater runoff. More specifically, because TMDLs pose a threat to water quality, when TMDLs are connected to stormwater management plans they may influence a local governments' willingness to go beyond state-level requirements because of the risk (or perceived risk) to water quality TMDLs pose.

Finally, a logit model was run which combined both models. Overall, when combining the two models along with the control variables, the variables reaching significance in the IGR and sustainable cities models also reach significance when combined. In the combined model with the control variables included, the state a local government is in, having stormwater programs linked to TMDL requirements, and the percent of the population over 25 with a college degree are all positive and statistically significant, while the percent of land area within their jurisdiction that is land is negative and significant, suggesting that the more land within a local government's jurisdiction, the less likely they are to exceed what the state requires. A summary of these results will be discussed further below.

Testing for Marginal Effects

Since the dependent variable in this research is dichotomous and tests are measuring whether each of the independent variables increase the probability of a local government exceeding what is required of them in this program, marginal effects were run to determine how much each of the significant variables affect local governments exceeding state-level requirements. To test the marginal effect, different values were set to illustrate the changes in probability (with a "0 "1" effect). Testing for marginal effects indicates that local governments which are not located in California and do not have a TMDL program connected to their stormwater management plan have a probability of exceeding state-level requirements of 0.

These are conditional meaning that local governments outside of California with TMDLs have approximately a 30% chance of increasing the likelihood of exceeding minimums. Whereas, local governments in California with TMDLs have approximately a 75% chance of going beyond state-level requirements. These results further support the idea that there is a California effect which influences local governments and that their perceptions of risk to water quality also influence local governments' actions in this program.

Table 2.11: Logit models with control variables

Variables	**IGR Model**		**Sustainable Cities Model**		**Combined Model**	
	Coefficient	*SE*	*Coefficient*	*SE*	*Coefficient*	*SE*
Staff Size	0.712	0.534			1.010	1.066
Years in Program	0.400	0.403			0.903	0.623
California Effect	2.220	1.100*			3.250	1.730*
SW Management plan is connected to other Sustainability issues			1.750	2.380	2.370	3.280
Number of sustainability issues SW plan connected with			-0.831	2.540	-1.400	3.42
TMDLs connected to SW Program			2.190	1.140*	2.030	1.190*
Level of Local government support			0.161	0.409	0359	0.416
Diversity	-0.337	1.470	0.222	2.320	-0.169	2.390
Population over 25 with a college degree	3.420	1.490**	5.020	2.370**	4.770	0.0310**
Median Home Value	-0.025	-0.635	-1.190	0.950	-1.28	0.963
Median Household Income	-0.722	0.515	0.129	0.784	0.107	0.923

Percent Area Land	-1.220	2.470	-0.678	4.010*	-7.110	3.950*

Reported logit coefficients are unstandardized. *p<0.10, **p<0.05

Summary of Results

While most of the significant results from the bivariate analysis become statistically insignificant when placed in a combined model, they still point to interesting stories that help account for why local governments will go beyond what is required of them. The first story is a resource story, one which both the IGR and Sustainable Cities literature point to as being important. Having enough human and fiscal resources available to the program affects the ability of local government to not only effectively execute programs, but also their capability to do more than what is minimally required of them. When examining the results of the bivariate tests, having an adequate number of employees to ensure that best management practices are being executed to meet the minimum control measures is crucial. In addition to this, increasing the amount of time that a local government is enrolled in the stormwater program also increases the probability they are likely to exceed requirements, suggesting that the more time a local government is part of the program, the more likely they are to have human, technical and fiscal resources available to successfully execute their program. The one caveat to this is that we do see a drop-off in local governments exceeding minimum requirements after being part of the stormwater program for nine or more years, suggesting that over time, the ability to innovate plateaus. Another important aspect of the resource story is the wealth within localities. More affluent communities as measured by population with a college degree and higher levels of household income indicates that these communities likely have more resources available to them and are therefore able to put more towards their stormwater programs.

The second story deals with the relationship that localities have with other levels of government, specifically the state they reside in. In every model, the "California effect" continues to be significant. This is interesting because while state matters, the level of support local governments' felt was not significant in any of the models. This suggests that state political culture matters in the sense that local governments are an extension of the state, and that they also have similar cultures resulting in their ability or desire to go beyond what is required of them.

Along with the significant bivariate results and those in the combined models, it is surprising that some of the variables outlined in both sets of literature are not significant for the stormwater program. Specifically, type of government structure a local government has, and the level of discretion a local government has in place. This is interesting because previous studies examining why local governments adopt sustainability programs suggest that having a council-manager form of government increases the likelihood of local governments adopting environmental sustainability programs. One possible explanation why this trend is not seen when looking at stormwater programs is because local governments are required to obtain coverage under a state-wide general permit, meaning the program is not voluntary like other environmental sustainability programs are, government structure may then be expected to have less influence on whether local governments exceed what is required of them. This assumption is supported in the sustainable cities model because while support at the local level of government does increase the probability that a local government unit will exceed what is required of them, it does not remain significant in the combined model suggesting that overarching concerns at the state-level are more important than the level of support at the local

level. This could also be the case for why local level autonomy and discretion are not significant in any of the models.

A final interesting result is that TMDLs connected to stormwater management plans continue to be significant. This contributes to the understanding that TMDLs pose a threat to water quality and therefore, are more likely to influence stormwater management decisions at the local level.

Conclusion

There are several important conclusions that can be drawn from this article that can direct and influence future research. First and foremost, local governments do vary in their ability or willingness to go beyond what the state requires of them. This suggests that like federal-state intergovernmental working relations local governments also face challenges when executing programs that are handed down to them by another level of government and that based on both external and internal characteristics of these working relations, some local governments are more successful than others in reaching these goals. Second, state political culture clearly affects local governments. More specifically, local governments in California are more likely to exceed what is required of them in this program. This is in line with other environmental policy research indicating that California is often a leader and innovator in environmental policy, suggesting that state culture also matters when looking at various approaches to stormwater management and federal regulatory policies and programs.

Along with these interesting findings, it is important to note that this study has some significant limitations. The primary limitation to this study is the small n. There is a total of 69 cases and for some independent variables this goes down to 55 because some questions were simply not answered on the survey. In addition to the small number of cases in this study,

availability of data is also a limitation. Because this is a program that has not been studied to this extent, and because of the MEP language, data is not readily available indicating if stormwater programs across states are decreasing pollutants. As such, the survey developed relied heavily on information from survey answers, which serves as proxies for various questions and analysis. These limitations make this survey difficult to generalize across local governments and the results must be taken with caution.

Despite the small n, and limited amount of data available, this continues to be an important study and a critical first step to future research on stormwater management. Future research can expand the existing data set across more states and local government units to test hypotheses further. Additionally, future research should attempt to determine what the reasons are for local government units going beyond what is expected of them. For example, do local governments go beyond what is required of them because of regional water concerns, concerns with climate change, etc.? As research continues in this area, local governments can learn from what others are doing, understand better how state culture and rules affects them and improve their stormwater programs to meet not only the requirements of the state-wide permit but also, eventually exceed what is required of them**.**

CHAPTER THREE:
CITIZEN PARTICIPATION AND MUNICIPAL STORMWATER

Introduction

It is widely accepted in the field of public administration that civil servants should engage the public when making policy decisions. Because citizen participation is a foundational aspect of democracy it is viewed as being integral to the development and maintenance of an accountable public service (Nabatchi 2012; Denhardt and Denhardt 2000). In addition to this, when developing and implementing policies across levels of government scholars have found that there is more support for programs when there is an engaged citizenry rather than one that is passive (Irvin and Stansbury 2004; King, Feltey and Susel 1998; Putnam 1995). Based on this belief, laws and regulations at all levels of government have been promulgated requiring some form of public participation in political decision-making processes. As part of the National Pollution Discharge Elimination System (NPDES), phase II of the municipal stormwater program is just one example of a federal program that requires stormwater administrators to provide avenues for public participation in program development and implementation. Moreover, given the large amount of discretion provided to local governments when engaging the public, local governments responsible for administering stormwater programs are experimenting with various forms of public participation as part of a larger effort to effectively reduce pollutants from stormwater runoff.

The purpose of this research is to examine how local governments engage and involve the public in their efforts to reduce pollution from stormwater runoff. Specifically, the questions being asked in this article are centered on how public participation occurs across local governments and what types of public participation activities are occurring in this program.

Drawing from the literature on citizen participation, this research examines ways in which public participation occurs across six local governments in Virginia that are enrolled in the municipal stormwater program. In answering these research questions, this paper proceeds with a brief primer on phase II of the municipal stormwater program with specific emphasis placed on the public participation component of the program. Following a discussion of the relevant literature, case selection and the methods employed for examining local governments in Virginia will be discussed, including some expected findings. From here, there will be a discussion of the findings from the case studies and an analysis of the important factors related to public participation. This research will conclude with a summary of the major findings and implications for future research and by offering suggestions to administrators to improve public participation efforts.

Short Primer on Phase II of the Municipal Stormwater Program

Adopted in 1999, phase II of the municipal stormwater program seeks to reduce polluted runoff in urbanized areas and clusters[39] across the United States. To accomplish this goal, the EPA has established six minimum control measures addressing various aspects of stormwater pollution and it is believed that this combination of efforts is the most effective way to reduce stormwater pollution. In doing this, the Environmental Protection Agency (EPA) requires operators of municipal separate storm sewer systems (MS4s[40]) to obtain coverage under a state-wide general permit for their runoff. In applying for coverage under the permit, local governments are required to develop, implement and enforce a stormwater management plan

[39] An urbanized area has 50,000 or more people while an urban cluster as a population of at least 2,500 but less than 50,000 (census.gov).

[40] MS4s are defined as "a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains)" (EPA 2014a).

(SWMP) outlining how they plan on meeting each of the minimum control measures (EPA 2016b). Moreover, as one of the six minimum control measures, public participation and involvement is viewed as critical to reducing pollution from stormwater runoff. The EPA provides several reasons for this.

First, the EPA suggests that by involving the public in the stormwater program, support from the public will also increase. The justification provided is that when the public is involved in various aspects of the program, they feel a sense of "ownership" and are more likely to take part in efforts to reduce pollution from stormwater runoff. In addition to this, the likelihood of individuals participating by providing resources, such as their time to volunteer and engagement in activities such as stream cleanup, also increases. Second, greater public support can result in shorter timelines to implement the program because members of the public are less likely to object to proposed actions. Finally, through involving the public, localities are able to increase the base of expertise on stormwater related issues, an economic benefit which can also serve as a conduit to other programs. In other words, when citizens choose to be involved in the development of the stormwater program, it increases the likelihood that those citizens make connections between the goals of the stormwater program to other environmental programs. This results in citizens being more receptive to other environmental programs which results in greater overall positive effects for the environment (EPA 2015).

As alluded to earlier, local governments are required to outline best management practices (BMPs) and measurable goals as part of their stormwater management plan to ensure that they are satisfying each of the minimum control measures. Possible BMPs to satisfy the public participation minimum control (table 3.1) measure include the creation of citizen panels or advisory committees, volunteer water quality monitoring groups, storm drain stenciling and

volunteer educators or speakers at schools, or other community events to educate people on the harms of stormwater pollution and methods to reduce it (EPA 2015).

Table 3.1: Public Participation Minimum Control Measure Best Management Practices

Best Management Practice	**Description**
Public Meetings/Citizen Panels	Provides citizens with the opportunity to discuss views on stormwater and provide input for stormwater management plans and best management practices for the various minimum control measures
Volunteer Water Quality Monitoring	Cost effective way to monitor water quality and educate citizens on the quality of local water bodies
Volunteer Educators/Speakers	Individuals who hold workshops, attend various events to encourage public participation
Storm drain Stenciling	Drawing pictures around a storm drain to bring awareness to runoff
Community Clean ups	Clean up projects around beaches, bodies of water in the community and storm drains
Citizen Watch Groups	Group of citizens who aid with identifying individuals who are adding to stormwater pollution
"Adopt a Storm Drain" Programs	Programs which encourage citizens to maintain storm drains that are free of debris and monitor what goes into water ways

The EPA intentionally leaves discretion to operators of MS4s in choosing their BMPs to meet each minimum control measure because they want to provide the operator of the MS4 with the flexibility to determine which management practices best meet the needs of their unique community. While there is considerable flexibility, the EPA does require that operators of MS4s complete at least two goals to meet the public participation minimum control measure: first, the operator must follow state and local requirements for public notice and second, the operator must determine which BMPs are most appropriate for their jurisdiction and develop measurable goals for each BMP selected (EPA 2015). The wide variety of BMPs and the various level of public participation required for each coupled with the latitude local governments have in choosing their BMPs results in varying levels of public participation across local governments.

Review of relevant literature

Noted by many scholars, defining public participation is challenging because it includes many processes and activities. This diversity in definitions makes it especially difficult for public administrators responsible for including stakeholders in the decision-making process to determine the best forms of participation and which stakeholders need to be included. Following Nabatchi and Leighninger (2015), public participation can be broadly defined as "an umbrella term that describes the activities, which peoples' concerns, needs, interests and values are incorporated into decisions and actions on public matters and issues" (p.14). Public participation can be understood as either indirect (such as voting) or direct (such as involvement in task forces, working groups, etc.). This chapter assesses public participation as it relates to the municipal stormwater program as a form of direct participation. Thus, the literature on direct participation will be utilized to examine how the public participates in the development and execution of the municipal stormwater program.

Direct Public Participation

As more pressure is placed on all levels of government to include citizens in decision-making processes, scholars are highlighting the various advantages of participation as a way to inform practitioners of the value of citizen participation (Nabatchi 2012). Some of these advantages include: education; empowering citizens; persuading citizens of the direction government is taking; and providing opportunities for groups that may oppose each other to talk, which can break gridlock and be less costly than other means such as going to court (Irvin and Stansbury 2004). While many benefits of engaging the public are widely recognized, there are still questions and disagreement surrounding citizen participation in the literature, including: 1) what it means to engage the public in decision-making processes (this often differs across policy

areas); 2) which groups need to be involved in the process; and 3) to what extent the public *should* be involved in certain decisions. Similarly, public administrators responsible for engaging the public often have discretion in determining how much to include citizens in the process and what form that citizen participation will take (Handley and Howell-Maroney 2010; Yang and Callahan 2007; Feldman and Khademian 2002). The level and type of participation government engages citizens in most often depends on the goals of public administrators for the participation which ranges from simply informing the public about an issue to involving the public in the decision-making processes (Nabatchi 2012).

Other research has pointed to the importance of administrative ethics and culture for understanding variation in levels of community engagement. In their study examining local administrators of the community development block grant program, Handley et al (2010) find higher levels of citizen participation occurred where local administrators felt more accountable to the public in their communities rather than other groups or actors. Similarly, Yang et al (2004) find that bureaucrats are more likely to facilitate participation when an issue is salient, when the agency culture reflects value in citizen participation, and when it is practical for civil servants to facilitate participation. These studies further highlight variation in what accounts for citizen participation, the form it takes and how extensive it is.

Forms of Public Participation

In discerning between types of citizen engagement, various models, typologies and frameworks have been developed (Nabatchi 2012; Creighton 2005). One of the most widely accepted and utilized model is the International Association for Public Participation (IAP2 2007). The IAP2 is a continuum with five forms of public participation, each of which reflects a different purpose and level of citizen participation (figure 3.1).

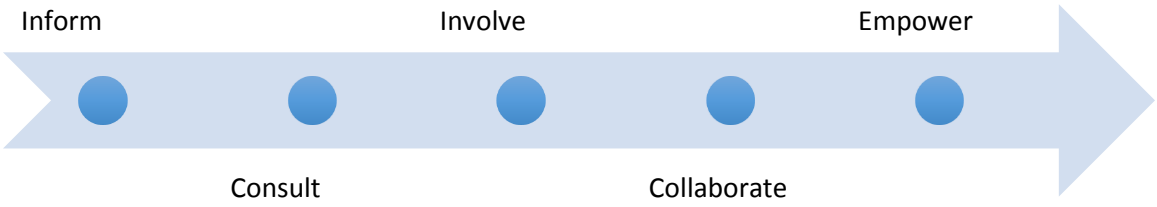


Figure 3.1: Types of participation. Adapted from http://c.ymcdn.com/sites/www.iap2.org/resource/resmgr/imported/IAP2%20Spectrum_vertical.pdf

The IAP2 continuum depicts how public participation can occur; moving from minimal participation to participation where the public has actual decision-making authority. The first point on the continuum is to *inform* the public, which involves simply providing the public with information rather than allowing the public to share in the decision-making process. Second on the continuum is to *consult* with the public. At this level, government asks the public for their opinions pertaining to policy decisions, allowing for, at best, the ability for those opinions to be incorporated into decisions made. Third is to *involve* the public, wherein the public is consulted and included in the decision-making process to ensure policy alternatives directly reflect citizen concerns and desires; making this the first place in the continuum where the public has at least a minimal role in decision-making. Fourth is to *collaborate* with citizens, which provides the public with higher levels of shared decision-making authority. The final level on the continuum is to *empower* the public, or "place final decision-making in the hands of the public," the highest level of shared decision-making (Nabatchi 2012). More recently, the continuum has been consolidated and participation has been consolidated into three categories: thick participation which encompasses empowerment on the continuum, thin participation including collaboration and involvement, and conventional participation which includes informing and consulting the public (Nabatchi and Leighninger 2015).

Under these collapsed categories of participation, conventional approaches to participation include efforts to inform and consult the public such as public notice and comment periods, town hall meetings and public hearings as well as basic efforts to involve the public such as appointing community members to advisory committees. Research has found that due to low levels of required public involvement these types of efforts have not resulted in high levels of satisfaction from the public (Kettering Foundation 2015). Both thick and thin participation are attempts to move away from conventional approaches to actual citizen participation seeking to *empower* the public, rather than simply *inform* the public. Thick participation such as Portsmouth Listens or Chicago's 49th war participatory budgeting process involves empowering small groups of people and using tools such as deliberation, dialogue and meaningful discussions to learn, to decide and to act by bringing members of the public to spaces where they can deliberate on important issues affecting their community and develop solutions because of this dialogue (Leighninger 2014). Compared to thick participation, thin participation is less time consuming with the aim of bringing together a large number of people to express their ideas, affiliate with a cause or identify public problems (Kettering Foundation 2015). Examples of thin participation include signing petitions, joining or sharing a cause on social media and donating money to a cause (Amirehsani 2015). Both thick and thin participation are responses to conventional forms of public participation and are attempts to increase opportunities for citizens to engage in more meaningful ways (Leighninger 2014).

Public Participation in the Municipal Stormwater Program

This research seeks to understand how public participation occurs in the municipal stormwater program and whether these participation efforts can be characterized as conventional, thick, or thin efforts. This study also seeks to add more in depth analysis to the

public participation literature through assessing how the public participates and how it is engaged in the municipal stormwater program. Understanding how local governments involve the public in the municipal stormwater program is important because of the significant public health risks associated with stormwater runoff pollution. Specifically, the adverse effects health risks polluted water can have on citizens means that they should be aware of these risks, as well as have the opportunity to deliberate on the best ways to address these risks. Additionally, because stormwater runoff pollution comes from a variety of sources including oil leaks from vehicles, contaminants from restaurants, etc., understanding how the public is involved in the process can shed light on if programs providing greater opportunities for public participation are also perceived by public administrators in the program to be more effective in their efforts to reduce polluted runoff. This adds to the existing literature because while current literature discusses how local decisions are made at state and federal agencies (Nabatchi and Leighninger 2015), it does not currently address how local government acts or facilitates participation when federal mandates provide discretion to local entities. For example, while it is understood that for many programs government agencies are required to hold a notice and comment period, this is oftentimes the extent of citizen participation. As noted earlier, there are several BMPs that government may choose from when engaging citizens making this an interesting and useful program to study. Understanding the ways that local government actors engage the public when they are *given a choice* on how to facilitate that participation, is both a significant contribution to the literature on public participation and to local government officials working to improve public participation processes in environmental programs.

Moreover, this research contributes to the theoretical and applied understandings of how public participation unfolds in two primary ways. First, this research examines the capacity for

local government to engage with the public in a meaningful way. In other words, through comparison of local governments, it is possible to see if participation differs and if it does differ, how some local governments can more directly involve the public than others within the same program under the same state-level rules. Through discussion with local practitioners it is possible to uncover who the local administrators of the municipal stormwater program consider relevant stakeholders in terms of participation, which also has the potential to highlight which stakeholder groups local government is ultimately responsive to. Additionally, while this program requires operators of MS4s to include public participation to comply with standards set by the federal government, the level and type of participation varies across local governments depending on how their stormwater management programs are developed locally and which BMPs are chosen (personal communication 2015). Highlighting the various ways that local government engages the public can help civil servants responsible for creating avenues for stakeholder involvement to come up with better ways to involve the public or to allow them to create more meaningful dialogue and shared decision-making authority.

Methods

To answer the research questions posed above, I utilize qualitative research methods using a comparative case study approach. A case study approach is appropriate for this project because in-depth case studies create context-specific knowledge which helps to understand various phenomena and is necessary to allow for researchers to draw conclusions and generalizable observations (Yin 2009; Flyvbjerg 2006). Because the purpose of this article is to understand how local government involves the public in their stormwater program, I use a "more similar" case approach to compare how similar municipal governments in one state engage the public in this program. Additionally, because this is a first attempt at understanding how the public is involved in the creation and implementation of stormwater programs,

determining if there is variation among similar local governments is a critical first step. Moreover, this strategy is best due to the exploratory nature of this study and because most similar cases which are "broadly representative of the population will provide the strongest basis for generalization" (Seawright and Gerring 2008, 298).

Case Selection

The unit of analysis for this study is local governments in Virginia required to obtain coverage under phase II MS4 permits. Cases were selected based upon the results from the survey sent to local governments for article two of this dissertation project. Questions from the survey used to select cases asked specifically about how local governments engage citizens for the public participation minimum control measure requirement (see appendix H).

Virginia is chosen for this study because of its unique position along the Chesapeake Bay. Virginia is part of the Chesapeake Bay Total Maximum Daily Load (TMDL) cleanup, the largest TMDL cleanup the EPA has mandated to date (EPA 2010). As the largest TMDL program, a majority of local governments across the state that are enrolled in the stormwater program also have significant TMDL requirements they are required to include in their stormwater programs to reduce TMDL pollutants in the Bay. Consistent with preliminary results from a prior survey indicating that TMDL requirements play a significant role in how stormwater programs are developed, local governments with TMDL requirements tend to have more requirements in their stormwater management based on meeting those TMDL requirements (personal communication 2016). In sum, while it is understood that TMDLs affect stormwater management, it is less clear if TMDL requirements affect specific aspects of the stormwater program such as how local governments develop goals to meet the public participation requirement.

Of the total sixty-nine survey respondents across the three states studied, thirty-five local governments that responded are in the state of Virginia. Because this project is also interested in how local governments differ in their public participation processes, cases were narrowed in two ways. First, cases were chosen by whether they answered the question on the survey pertaining to how effective they believe they are in meeting the public participation minimum control measure. Responses ranged across all possible options, from those that believe they are effective, to those that view their programs as somewhat effective, to those who do not view themselves as effective at all in meeting the public participation minimum control measure. Because this study is concerned with understanding the various ways in which local governments engage the public and if the types of engagement are related to perceptions of effectiveness related to the municipal stormwater program, cases were narrowed to responses by local governments that viewed themselves as both effective and not effective. Next cases were narrowed by two variables that they are most similar on; local governments which have a Chesapeake Bay TMDL requirement, and type of government structure (council-manager for cities and towns and commission for county government). Narrowing cases by these criteria reduced the number of potential cases from 35 to 16. E-mails were sent to the 16 local governments asking them to participate in the study, 6 responded for a response rate of approximately 37% and are the cases examined for this study[41]. The six local government for this study are two counties (Hanover and James City), two cities (Harrisonburg and Fredericksburg), and two towns (Vinton and Blacksburg). The cases are similar with respect to the form of government (council-manager for cities and towns or commission for county

[41] To increase the response rate, follow-up e-mails were sent to the 10 local governments who did not respond. One responded and indicated they were too busy, and the other 9 did not respond.

government) and the presence of TMDL requirements which plays a role in how they manage their municipal stormwater program (personal communication 2016).

While each of these local governments has some similarities, they differ in some of the public participation activities they engage in and when they entered the stormwater program. Three of the local governments included in this study have both stormwater utility fees and stormwater advisory committees (Blacksburg, Harrisonburg and James City County). Each of the local governments except for Blacksburg and James City County entered the phase II program in 2003, while these two local governments entered in 2008.

Data Sources:

Data for this study comes primarily from in-depth phone interviews conducted with administrative personnel involved with the municipal stormwater program; specifically, program officials with an intimate understanding of the public participation minimum control measure. For each local government that answered the survey question related to how effective they believe they are in meeting the public participation minimum control measure, an e-mail was sent asking if they would be willing to participate in over the phone interviews asking specific questions discussing activities related to meeting the public participation minimum control measure. Contact information for this program was gathered from the list of phase II MS4 permittees provided by the state of Virginia. In some instances, I was provided with a different point of contact to answer questions related to the public participation minimum control measure upon reaching out to the local governments with the state provided list. Six in-depth phone interviews were conducted lasting between twenty and thirty minutes each with stormwater administrators in the six local governments studied. Despite the small sample size these cases are valid to examine for several reasons. First, cases are representative of the municipal governments in Virginia, with two cases per local government type. Second, each of

the cases has Chesapeake Bay TMDL requirements and third, the cases have been in the stormwater program since at least 2008.

Due to the small sample size, information from the phone interviews was further supported using primary documentation such as municipal stormwater management plans and any secondary documentation that was made available by the interviewees, EPA website and websites for local governments' stormwater programs. These additional sources include an examination of federal guidelines related to the public participation minimum control measure, the state of Virginia's state-wide general phase II municipal stormwater permit and its public participation requirements, stormwater management plans provided by interviewees or found on their websites, and other forms of secondary documentation and archival records available for the cases. This method is supported in the literature where scholars such as Hacker (1997) argue the best way to fully understand the strategies and actions agency personnel take is through speaking directly to personnel. Before moving to findings based upon interviews conducted, the next section introduces pertinent case information which sheds light on Virginia's laws and requirements influencing how local governments develop stormwater plans.

Case Background

Virginia

Virginia was authorized to issue state-wide permits under the National Pollution Discharge Elimination System (NPDES) permitting program in 1991. Aside from strict TMDL requirements due to overlapping rules and regulations related to pollution in the Chesapeake Bay, Virginia's permit leaves much discretion up to the individual permittees when they

develop their SWMPs and choose their BMPs. [42] For the public participation and involvement minimum control measure, the state of Virginia requires several things. First, operators of MS4s must comply with public notification requirements when adopting their stormwater management plan. This is to ensure the public is given ample notice of requirements that may affect them and provide them with time to comment on the proposed plans. Next, the state-level permit requires operators of MS4s to maintain an updated MS4 program (annually) and along with annual reports on progress, the MS4 program document must be made available on their webpage for at least a year. As part of the permit application/reapplication process, the operator of the MS4 must notify the public, solicit comments and discuss how comments are addressed when obtaining permit coverage.

Virginia also requires that the public be involved through "promotion, sponsorship, or other involvement," which means that operators of MS4s are required to have at least four annual local activities drawing attention to the adverse effects of polluted stormwater runoff in the community. These activities include river/stream cleanup days, creation of advisory committees, and hazardous waste cleanup days. Per the state-level permit, "the activities should be aimed at increasing public participation to reduce stormwater pollutant loads; improve water quality; and support local restoration and cleanup projects, programs, groups, meetings or other opportunities for public involvement" (Virginia.gov 2016).

In addition to state laws and regulations pertaining to water quality in the state, Virginia is unique in the fact that counties in the state only operate MS4s when they own their road systems. In other words, while cities own roads crossing their jurisdiction, in many instances the

[42] For the complete 2013 general permit for the state of Virginia visit http://lis.virginia.gov/cgibin/legp604.exe?000+reg+9VAC25-890-40 .

state, rather than counties own roads in county jurisdictions, meaning that counties which do not own their road systems only operate MS4s from schools, office complexes and so forth.

Discussion of Findings

Findings of this research will be discussed in two ways. First, case specific findings will be discussed, examining how public participation unfolds in each of the local governments. Specifically, there will be a discussion of types of public participation activities the local governments are engaged in, how effective the interviewees believe their public participation program is and ways in which they believe they can improve the effectiveness. After a presentation of these case specific findings, there will be a discussion of general findings across the six cases. Following the case-specific and general findings, the analysis section will proceed by outlining the general themes from the public participation literature that are highlighted in interviews and provide insight to how public participation occurs for municipal stormwater. Table 3.2 summarizes the key characteristics of each of the cases, the BMPs, if BMPs are geared towards informing or involving the public, and other important characteristics.

Table 3.2 Case Information for Local Governments

Local Government	Government Structure	Year entered Program	Best Management Practices	Inform v. Involve the Public	SW Utility Fee	Presence of a Stormwater Advisory Committee
Hanover County	Commission	2003	➢ promote the availability of the SW plan ➢ Annual reports made available ➢ be involved in reducing pollutants	➢ Inform ➢ Inform ➢ Inform		
James City County	Commission	2008	➢ public notice of plans available ➢ program plan made available ➢ promote and sponsor activities	➢ Inform ➢ Inform ➢ Involve	x	x

Harrisonburg	Council-Manager	2003	➢ program plan and reports made available ➢ participate in at least 4 local activities	➢ Inform ➢ Inform/Involve (contingent upon which activity is occurring)	x	x
Fredericksburg	Council-Manager	2003	➢ program plan made available to the public ➢ annual reports made available ➢ promote storm-drain stenciling/marking ➢ participate in and sponsor local activities to engage the public	➢ Inform ➢ Inform ➢ Involve ➢ Involve		
Vinton	Council-Manager	2003	➢ promote storm-drain stenciling/marking program ➢ sponsor clean-up events ➢ creation of staff and citizen representatives in regional organizations ➢ post program plans and annual reports online	➢ Involve/Inform ➢ Involve ➢ Involve ➢ Involve		
Blacksburg	Council-Manager	2008	➢ hold stakeholder meetings for stormwater improvement ➢ TMDL implementation planning meetings ➢ participate in stream clean-up efforts ➢ program plan and annual reports online ➢ participate in additional outreach events	➢ Inform ➢ Inform and support efforts of other groups ➢ Involve ➢ Inform ➢ Inform	x	x

Hanover County

Hanover County was required to obtain phase II municipal stormwater permit coverage in 2003 and Hanover County has developed three measurable goals (table 3.3) for their public

participation minimum control measure and subsequent best management practices to achieve each of them. The first measurable goal is to make the stormwater management plan available on the county's website. Second, the county provides forums and other opportunities for public comment on the stormwater management plan every permit cycle. Finally, Hanover County provides support to the Hanover-Caroline Soil and Water Conservation District; a citizen board of elected and appointed individuals, which through a memorandum of agreement with Hanover County, provides education on watersheds and stormwater to students throughout the county (Hanover county.gov).[43]

When asked about which groups are targeted for public participation, it was described as the public at large, and from there, county employees can determine who is interested and would like to be more involved with stormwater pollution reduction. For example, it was noted that Hanover County has some individuals from the Chesapeake Bay foundation who are interested and are active in providing comments to them. The interviewee also discussed how during the formal public participation process citizens can provide comments on changes to the stormwater plan and that the county works to address those comments. However, the interviewee also discussed that this is limited because very few people actually comment. The interviewee says: "we write a program, the public then comments on it and I find that the public is generally asking questions [when they comment]. I guess if anybody was to have a comment we would try our best to reflect on the plan and address it. But it is kind of limited the people who really comment on it [the stormwater plan] (Virginia Stormwater administrator 4).

[43] For a full list of measurable goals, BMPs and how to evaluate effectiveness of the public participation minimum control measure see http://www.hanovercounty.gov/PW/Municipal_Separate_Storm_Sewer_System_MS4_Stormwater_Program_Plan.pdf.

For each of the measurable goals described and their respective BMPs, effectiveness is primarily measured by the number of people that the county reaches with their public participation efforts. For example, when Hanover County holds community development meetings, the effectiveness of BMPs is measured by counting the number of people who attend the meetings. In other words, the BMP is reported as effective when there are higher levels of attendance from previous years, or more people at the activities put on by Hanover County. When asked about their perception on the effectiveness of the various BMPs used to meet the public participation minimum control measure, the interviewee explained that they think the current BMPs are good because residents do not complain, they meet state-level requirements and the intent of the federal regulations. When asked, what could be done to improve public participation efforts in the county, the interviewee discussed taking more of a regional approach to stormwater management, arguing that cooperation across jurisdictions could improve efforts to reduce overall stormwater pollution. In other words, the county considers itself effective in meeting the public participation MCM, not because actual pollution from stormwater has decreased, but because they are accomplishing the bare minimum required by state and federal standards to engage the public.

Table 3.3. Case Information for Hanover County

Local Government	Government Structure	Year entered Program	Best Management Practices	Inform v. Involve the Public	SW Utility Fee	Presence of a Stormwater Advisory Committee
Hanover County	Commission	2003	➢ promote the availability of the SW plan ➢ Annual reports made available ➢ be involved in reducing pollutants	➢ Inform ➢ Inform ➢ Inform	no	no

James City County

James City County differs from Hanover County in several ways. First, the county's MS4 is largely comprised of parks, school buildings, and office complexes rather than residential areas. In James City County, the roadways are owned primarily by the Virginia Department of Transportation which means the MS4s they own and operate are primarily office complexes, schools and parks within their urbanized area. These comprise approximately 5% of the county's total land area, which means the county does not have large amounts of land/ms4s to manage as part of their stormwater program (personal communication 2016). Also, different from Hanover County is that James City County has a Stormwater Program Advisory Committee; comprised of up to 15 members at a time appointed for four years. The role of the committee is to assist and to advise the board of supervisors and county staff "in the development, implementation, and promotion of the County's stormwater program to meet the needs of the citizens of James City County by fulfilling the goals of the stormwater program" (jamescitycountyva.gov 2016).[44]

Even though very few residential areas of James City County are covered by their MS4 permit, their public participation efforts are offered county-wide and target the public at large through traditional processes such as holding various educational events such as workshops to educate the public on the risks of polluted stormwater runoff (table 3.4). The County also presents opportunities for citizens to be more involved through participation in volunteer water quality monitoring and annual river clean-up efforts (personal communication 2016).

When asked how they would describe their public participation program, the interviewee said that through the SWAC, they believe that the public is consulted and that public opinions

[44] For a full list of measurable goals and BMPs visit http://jamescitycountyva.gov/DocumentCenter/View/8893.

are reflected in decisions made by the county. They further explain that there have been times when the SWAC directs the county to take actions that are beyond the scope of the MS4 permit, but are considered beneficial for stormwater quality in the county, suggesting that the "MS4 is a minimum of what our citizens expect" (Virginia Stormwater Administrator three). The interviewee also explained that activities such as the annual river-clean-ups and volunteer water quality monitoring are attempts to involve the public more in stormwater management.

When asked about the effectiveness of their public participation efforts, the interviewee discussed that while the County puts information out there, cooperates in annual clean-ups and so on, they do not necessarily believe their efforts are effective in reaching the public. Reasons provided for this include the volume of information provided; too many messages make it difficult for people to continue to be engaged, and, stormwater is not a topic that catches people's attention.

Table 3.4. Case Information for James City County

Local Government	Government Structure	Year entered Program	Best Management Practices	Inform v. Involve the Public	SW Utility Fee	Presence of a Stormwater Advisory Committee
James City County	Commission	2008	➢ public notice of plans available ➢ program plan made available ➢ promote and sponsor activities	➢ Inform ➢ Inform ➢ Involve	x	x

The City of Harrisonburg

The City of Harrisonburg has been a part of the stormwater program since 2003 and adopted a stormwater utility fee in 2006 to support the "operation, maintenance and regulation" of the city's storm sewer systems and stormwater program. Owners of "developed property" are responsible for paying the fee which is based on "the amount of impervious area on developed

property because properties with higher amounts of impervious area contribute greater amounts of stormwater runoff and pollutants to the stormwater management system" (Harrisonburgva.gov 2017). Like James City County, Harrisonburg also has a stormwater advisory committee (SWAC). The SWAC is comprised of five members appointed by the city council who provide oversight and recommendations to the city council on the stormwater program (Harrisonburgva.gov 2017). In addition to this, the SWAC was instrumental when the city was developing the stormwater fee, "taking part in a very long process to work with the public and ensure the public's concerns and interests were represented". In addition to this, "the SWAC meets every four months…. to talk about what we're doing [the city] in the stormwater program and what's happening with the stormwater utility fee." Indicating that the SWAC is instrumental in decisions made about the fee and where funds are spent (Virginia Stormwater Administrator six).

Aside from the SWAC and their involvement in the management of stormwater, public participation efforts were described as ranging from involving the public directly, to programs that are designed to simply provide information (table 3.5). The city also is involved with many partnerships with organizations and groups to put on events such as the Black-run river clean-up efforts twice a year. In addition to this, Harrisonburg has an online portal (Be Heard Harrisonburg) where citizens may comment, ask questions and so forth.[45]

When asked how effective these various participation efforts are in engaging the public, the interviewee said that they believe the events they hold such as the river clean-up day is very effective, with effectiveness being measured by the number of people who attend. One way in which they believe their program can be improved is to make it less reactive and more

[45] For more information on the Public Participation BMPs visit https://www.harrisonburgva.gov/sites/default/files/PublicWorks/files/stormwater/2013-2018%20Program/MS4%20Program%20Plan%202014.pdf .

proactive. In other words, rather than educating the public about stormwater when an issue arises, they believe more efforts could be taken to educate the public before an issue arises.

Table 3.5. Case Information for Harrisonburg

Local Government	Government Structure	Year entered Program	Best Management Practices	Inform v. Involve the Public	SW Utility Fee	Presence of a Stormwater Advisory Committee
Harrisonburg	Council-Manager	2003	➢ program plan and reports made available ➢ participate in at least 4 local activities	➢ Inform ➢ Inform/Involve (contingent upon which activity is occurring)	x	x

The City of Fredericksburg

Fredericksburg differs from Harrisonburg in the fact that it does not have a stormwater utility fee or an advisory committee through which citizens may become involved. (table 3.6) They meet the basic state and federal requirements and encourage public participation through formal comments on drafts of stormwater program and through Wetland board[46] meetings held periodically throughout the year where water quality issues are addressed. The city has also partnered with an organization focused on cleaning the area's waterways, Friends of the Rappahannock,[47] and works with them to hold two annual river clean-ups. Fredericksburg also works with the Clean and Green Commission, an appointed commission comprised of 13 members with the purpose of creating a "cleaner and greener" environment (Fredericksburgva.gov 2017). The city of Fredericksburg works with the commission on two

[46] The Wetlands Board is comprised of seven appointed members who are residents of the community with the purpose of conducting studies and providing recommendations to the city council on ways in which the city can protect wetlands within its jurisdiction. More information can be found at http://www.fredericksburgva.gov/index.aspx?NID=257.

[47] Established in 1985, Friends of the Rappahannock is a nonprofit, grassroots conservation organization which aims to protect the Rappahannock river. More information can be found at: http://riverfriends.org/ .

campaigns aimed at reducing pet waste and cigarette butts thrown away in the community (personal communication 2016).

When asked about how the public is engaged with these various programs, the interviewee described their public participation efforts as most characteristic of providing information about the stormwater program, rather than involving the public. This is primarily due to their cigarette butt campaign, river clean-up campaign and pet waste campaign which were described as engaging the public, but not necessarily providing them with a role in making decisions (personal communication 2016).

The public participation BMPs were described as effective by the interviewee who asserts that providing residents with the opportunity to participate in local activities such as the river clean up raises awareness about water quality issues, while providing information through flyers and other public announcements allows citizens to appropriately dispose of materials such as pet waste or cigarette butts that could adversely affect water quality (personal communication 2016). The interviewee also indicated that they did not believe their program needed much improvement because "if the public is provided with the opportunity to take actions, then they have done their job" (Virginia Stormwater Administrator two). The interviewee further indicated that while the city is doing their part to engage the public, changing social behavior is a challenge, especially with environmental issues.

Table 3.6. Case Information for Fredericksburg

Local Government	Government Structure	Year entered Program	Best Management Practices	Inform v. Involve the Public	SW Utility Fee	Presence of a Stormwater Advisory Committee

Fredericksburg	Council-Manager	2003	➢ program plan made available to the public ➢ annual reports made available ➢ promote storm-drain stenciling/marking ➢ participate in and sponsor local activities to engage the public	➢ Inform ➢ Inform ➢ Involve ➢ Involve	no	no

Town of Vinton

The town of Vinton also entered the stormwater program in 2003 and describes their chosen BMPs for public participation as efforts to target the public in general (table 3.7). Examples of ways to engage the public include an annual river clean-up, placing the MS4 permit on the town's website for public comment and working with a group called the Clean Valley Council to educate students in schools on the adverse effects of polluted stormwater runoff. In addition to these broad efforts, Vinton also has programs in place which target specific groups such as pet owners since pet waste has an adverse impact on stormwater and the TMDL requirements for their town (personal communication 2016).

In terms of effectiveness of their chosen BMPs, the interviewee discussed that they are effective in reaching citizens who already are concerned about stormwater pollution, but are not as effective in reaching those who are not already aware. They suggest the development of programs which better connect residents to stormwater issues through visual effects, i.e. people fishing or enjoying various bodies of water. In addition to this, the most reach iteration of Vinton's MS4 program plan includes an opportunity for staff members and citizens of Vinton to serve as members of regional organizations focused on water quality. It is interesting to note, that this replaces the use of an advisory committee because of the belief that the advisory committee was ineffective in reaching goals related to public participation (Vinton.gov 2015).

Table 3.7. Case Information for Vinton

Local Government	Government Structure	Year entered Program	Best Management Practices	Inform v. Involve the Public	SW Utility Fee	Presence of a Stormwater Advisory Committee
Vinton	Council-Manager	2003	➢ promote storm-drain stenciling/marking program ➢ sponsor clean-up events ➢ creation of staff and citizen representatives in regional organizations ➢ post program plans and annual reports online	➢ Involve/Inform ➢ Involve ➢ Involve ➢ Involve	No	no

Town of Blacksburg

Blacksburg entered the stormwater program in 2008 (table 3.8) and in 2015, based upon the recommendations of a stormwater task force, implemented a $6.00 a year stormwater utility fee. In addition to the fee, the town of Blacksburg has a Stormwater Advisory group comprised of community members, business owners and nonprofits that are responsible for adding in the implementation of the utility fee, engaging the public and making the town council aware of spending priorities for stormwater (Blacksburg.gov 2017). In Blacksburg, some efforts are geared towards the public at large, while others are targeted at specific groups. Echoing what was found in Vinton, certain programs in Blacksburg are targeted at groups which they feel most impact certain pollutants such as homeowners and pollutants associated with lawn care.

Efforts to engage the public begin with informing the public about the program and while there are systems in place where input can be provided, the interviewee discusses how very little input is provided when it comes to developing the stormwater management plan (personal communication 2016). Also similar to Vinton, the interviewee discussed how their efforts are effective in reaching those citizens who already participate or are paying attention to

stormwater concerns, but argues that they are not effective in reaching those who are not aware of the adverse effects of stormwater pollution. Their argument is that awareness is not being increased. The interviewee suggests one reason for the ineffectiveness of the BMPs is due to the permit requirements of the state-wide stormwater permit. They argue:

> Our permits require more numeric reporting on the outreach we are doing. So for example, if we speak at a class, we have to know the number of people in the class. And the permit has a minimum of 20% of your target audience [reached]….it is a lot of effort to get to that 20% goal, it is a lot of people sometimes. And what I find is there are a lot of methods that I think could be effective like television, and radio and things like that but those are areas we don't have the statistics to back up what kind of effect its getting…. So then we shy away to things we can count like mailers. It is easy to count how many mailers we send out because its how many copies did we print out. But its making the outreach less interesting, its less various, less diverse. It is so focused on the number because the number is pretty hard to get to meet the permit requirements. We aren't getting the big picture of we want to get the word out and so when you're trying to get the biggest bang for your buck you end up doing some of these old tried and boring methods because they are so easy to count (Virginia Stormwater Administrator five).

. In sum, they argue that simply putting a numeric value on who is reached by various participation activities does not measure if those activities raise awareness, or change behaviors that contribute to polluted runoff. Meaning, effectiveness is not determined by changing peoples' behaviors or measured by reducing the amount of pollutants in stormwater.

Table 3.8. Case Information for Blacksburg

Local Government	Government Structure	Year entered Program	Best Management Practices	Inform v. Involve the Public	SW Utility Fee	Presence of a Stormwater Advisory Committee

Blacksburg	Council-Manager	2008	➢ hold stakeholder meetings for stormwater improvement ➢ TMDL implementation planning meetings ➢ participate in stream clean-up efforts ➢ program plan and annual reports online ➢ participate in additional outreach events	➢ Inform ➢ Inform and support efforts of other groups ➢ Involve ➢ Inform ➢ Inform	x	x

General Findings

While there are differences across the cases and their public participation programs, the in-depth phone interviews highlight three general categories when examining public participation and involvement: who the local governments primarily target for public participation and involvement, ways in which participation occurs; and perceived effectiveness of the public participation programs and how they can be improved. Each of these general themes will be discussed.

Targeted Groups

In five of the six cases, the goals of the public participation BMPs are to engage with the public at large. In four of the six cases, both the public at large and specific groups are targeted, depending on which BMP is being implemented. The sixth case targeted primarily restaurant owners and University students, but not the public at large. For example, one administrator noted that their annual clean up days that occur twice a year are aimed at involving the general public, while the local government will also put together brochures and information about how to reduce pet waste to target pet owners specifically (Virginia stormwater administrator one 2016). One reason interviewees provided for targeting specific groups is based on that groups

impact on pollutants related to TMDLs or other pollutants of concern. In explaining how they target specific groups they explain:

> "We targeted those groups that we felt were more closely impacting certain pollutants. For example, we had bacteria as a pollutant of concern and a lot of bacteria stems from pet waste [why they target pet owners]….Another one of the groups we have identified are homeowners, they are the ones that are most impacted by construction sites and sediment….and then third…we have personally found that grease and oil handling from our restaurants has been an issue, for the illicit discharge system. So we have those three kind of target audiences and we try to target our messages accordingly because we think those are the people that would make the most difference" (Virginia stormwater administrator five 2016).

In sum, while interviews highlight that both the public as a whole and specific groups are targeted for the public participation and involvement minimum control measure, the level at which the public versus specific groups are targeted varies depending on the local government, what their major pollution concerns are, and if TMDL requirements play an active role in stormwater public participation and involvement efforts.

Ways in which participation occurs: conventional, thick and thin

Across the cases, efforts to engage the public range from activities aimed at simply informing the public of stormwater concerns to activities that involve the public. Examples of activities with the primary goal of informing the public include the creation of flyers or mailers which explain how to reduce various types of pollutants. Activities that have the primary goal of involving the public include activities such as volunteer water quality monitoring groups and advisory committees where the public is more directly involved with stormwater management. Overall, interviews highlight public participation efforts vary greatly and range from conventional forms of participation (those aimed at simply informing the public), to thin forms of public participation, with no indication that thick participation is occurring in these six local governments.

Overall Effectiveness and Ways to Improve

Across the cases local stormwater administrators believe their BMPs are effective when they meet the state-wide general requirements, but are less certain in how effective they are in informing and getting the public more involved in reducing stormwater pollution. A common sentiment was that the BMPs are effective in reaching those who already are focused on environmental issues and those that care about stormwater. For example, one interviewee noted that the only person they had comment on the most recent iteration of their stormwater program was part of the Chesapeake Bay Foundation (Virginia stormwater administrator four, 2016). Another interviewee mentioned that they thought that their efforts to engage the public were effective, but noted that changing social behavior was difficult (Virginia stormwater administrator two, 2016). In other words, across the cases effectiveness is generally defined as the number of people various public participation efforts reach, not reductions in stormwater pollution.

When asked how the public participation program could be improved, the primary ways given across these cases were for their BMPs to be less reactive. In other words, to provide information prior to an incident occurring or prior to the public calling and asking questions (Virginia stormwater administrator six, 2016). Another suggestion was to focus efforts on creating a regional approach to public participation and involvement to streamline messages and be more efficient with resources (Virginia stormwater administrator four, 2016). A third suggestion for improvement was to simplify messages and convey information in a way that is easier for the public to grasp. The final suggestion for improvement was to utilize different metric to measure effectiveness in place of what the state mandates. While no example was provided for a different metric, there is still a belief that the current permits' metrics do not

necessarily measure the effectiveness of the public participation BMPs in reducing pollutants in stormwater runoff.

Analysis of Findings

When examining public participation and involvement, case specific and general findings highlight several important themes. Each will be discussed.

Targeted Groups

Cases illustrate that while there may be instances where specific groups are the intended target of public participation efforts, typically, local governments target the general public when developing public participation BMPs. The rationale for targeting the general public is because pollutant sources contributing to stormwater runoff pollution vary greatly and include sources such as pet waste, oil from vehicles, restaurant waste, etc., meaning that in most cases, the most effective way to reduce pollution is to target the general public to participate in the stormwater program. However, in some cases, based on the levels of pollution from specific sources, local governments target specific groups because they contribute most to stormwater pollution. For example, the stormwater administrators in both Vinton and Blacksburg explained that they have programs that target specific groups rather than the public at large because those groups have been found to contribute the most to pollutants of concern. This finding is in line with previous scholarship focusing on citizen participation because it highlights that while the goal across local governments is to reduce pollution from stormwater, local governments choose to target certain segments of the population for public participation efforts based on which groups contribute the most to the pollution.

One reason provided in the literature that helps explain why localities may target specific groups for public participation efforts is because different government programs and

policies require different types and levels of participation. For example, in their study on public managers, public participation and the types of relationships built, Feldman and Khademian (2002) find that who public administrators choose to engage in public participation is contingent upon which groups are affected by a given policy and which participation efforts will result in the best policy outcomes. In other words, program goals influence choices governments make when engaging the public.

Ways Local Government Engages the Public: Conventional, Thick and Thin

One interesting finding across these six cases confirms previous literature on public participation. Quite simply stated, this research also shows that programs and activities to engage the public vary greatly, even within the same program. For example, some programs involve the local governments simply putting together information through printed materials such as flyers and brochures to inform the public about the stormwater program and ways to reduce pollution from stormwater runoff. Whereas other types of participation programs in local governments work to engage the public more in the actual management of stormwater including coordinating annual river clean-up efforts and storm-drain marking. This finding is corroborated by literature suggesting that local administrators have discretion in determining the form that public participation efforts will take, and which groups are best to target for public participation. Interviews suggest that the saliency of pollution from stormwater runoff greatly effects participation efforts along with what the primary goals of local administrators are (Nabatchi 2012). In other words, if the primary goal is simply to inform residents of the harms of stormwater, they may choose to inform the public through flyers rather than promote efforts for the public to play more of an active role through activities such as water quality monitoring and cleanup efforts.

While forms of public participation vary in these six cases, these public participation efforts across the cases can be characterized primarily as conventional means of participation, with some of the local government activities moving towards thin participation, or efforts to more directly involve citizens. Following the literature, efforts characterized more as thin participation are those that seek to actively involve the public and provide them with opportunities to participate in activities which reduce pollutants from stormwater runoff (table 3.9).

Table 3.9: Local Governments and Public Participation Efforts

Participation Activity	**Conventional**	**Thin**
Stormwater Advisory Council	x	
Annual River Clean-up		X
Volunteer Water Quality Monitoring		X
Avenue for providing comments	x	
Forum where education is provided	x	
Pamphlets/Flyers providing information	x	

It is interesting to note that local governments which currently have implemented stormwater utility fees are also those with public participation BMPs that are more participatory, including elements such as advisory committees. The interview conducted with the city of Harrisonburg suggests two potentials ways to interpret this finding. First, it supports previous findings in the citizen participation literature that when fiscal resources are involved, the public is more likely to pay attention to policy choices and want to have a role in the decisions made by government officials. And second, that the creation of a stormwater utility fee indicates that the local government has more fiscal resources and can dedicate more funds to programs aimed at increasing public involvement. Based on the interviews conducted in this research as well as the relevant secondary information examined the financial component seems

to support the first interpretation; the financial component results in more participation. Moreover, if effectiveness of public participation BMPs is simply measured by the number of people involved in various activities, then local governments with a stormwater utility fee, which see an increase in involvement by the public, are considered to have more effective public participation programs.

Examination of the ways in which participation occurs supports previous findings that most efforts to engage the public in environmental programs are conventional participation efforts. The information presented in tables 3.2 and 3.9 illustrate the types of participation activities occurring and is also a visual representation that most activities are aimed at informing rather than directly involving the public. While most participation efforts occurring in these local governments inform the public, there are various activities happening such as storm drain marking that can be described as thin participation efforts. Interviews and supporting documentation suggest that while these activities are aimed at engaging the public, those that participate tend to be those that are already concerned with water quality, making it difficult to determine if thin participation efforts are effective at reducing stormwater pollution. In addition to this, while none of the participation activities can be described as thick participation efforts, local governments such as Vinton, are attempting to move towards thick participation with goals to get the public more involved in regional organizations. In sum, findings here support the public participation literature that while there are laws and regulations at all levels of government mandating public participation, there is no consensus on how the public should be involved more than simply providing them with opportunities to comment on proposed government action.

Effectiveness of the Public Participation Minimum Control Measure

When measuring how effective BMPs are in increasing public participation and awareness, this study highlights that there is a difference between perceived and actual effectiveness in engaging the public and how effective these practices are in reducing pollution from stormwater runoff. In addition to this, some interviewees discussed how they believe that the citizens that participate are those that already know and care about the effects of stormwater pollution, meaning that programs may not be as effective as they could be in reaching residents that are less informed on the importance of reducing stormwater pollution. This finding is in line with previous citizen participation literature suggesting that conventional public participation measures are less effective than thick participation. Like other studies, it is believed they are less effective because local governments do not engage the public in meaningful ways that would provide them opportunities for meaningful dialogue and deliberation on stormwater issues. In addition, while advisory groups or councils can be viewed as thin or thick participation efforts, in these cases they fall more in line with conventional forms of participation, with some moving towards thin participation. Interviews and supporting documentation corroborate this finding because they suggest that while stormwater advisory councils are in place, members are typically appointed by city council, and their efforts as a group fall along the lines of making decisions and informing the public of those decisions, rather than directly engaging them. Vinton's move away from a SWAC toward efforts to involve citizens in regional organizations further supports this finding. An argument could be made that moving towards forms of participation aimed at involving and empowering the public could lead to changes in social behavior by encouraging buy-in, however it is unclear if this would be the case.

Conclusions and Lessons Learned

The analysis above reveals that the public participation efforts of these local governments are most representative of conventional participation practices where the role of government in engaging the public is focused more on *informing* the public on what is being done to reduce pollution from stormwater runoff, rather than *empowering* the public to take an active part in decisions to reduce pollution that either thick or think participation strategies would advocate for. This is evident because while there are efforts such as river clean ups and volunteer water quality monitoring groups that are more closely related to thin participation efforts, citizens still do not have an active role in decision-making processes. This suggests that conventional forms of participation continue to be prevalent in the creation and execution of BMPs for public participation in the stormwater program. However, while most participation efforts are considered conventional, one important finding from this study is that the ability of local governments to choose their BMPs means that BMPs chosen by local governments also results in various types of public participation efforts, some of which are more participatory. Examples of this included those aimed at involving the public more directly like volunteer water quality monitoring groups and annual clean up days. In addition to this, the fact that those local governments with stormwater utility fees also have some form of a stormwater advisory committee suggests that when a separate fee is being discussed, the public plays a larger role. In addition to this, there appears to be a pattern in who among the public does *not* get involved; interviews highlight the fact that those who participate are those who already have a vested interest in the effects of stormwater, which leads to further questions about how successful programs are in engaging the public if the public isn't interested.

This research also highlights and confirms a common struggle when examining environmental programs; how to measure effectiveness of programs. Similar to other environmental programs, there are differences between perceived effectiveness, effectiveness in meeting the requirements of the program, and how effective efforts are in actually reducing the amount of pollutants discharged into bodies of water from stormwater runoff. Moreover, interviews highlight the ways of measuring effectiveness simply by counting the number of residents a program reaches, does not do much to determine effectiveness in reducing stormwater pollution, or how engaged the public feels with this program.

Based upon the findings of this research, I offer three recommendations to local administrators: local governments should consider holding focus groups, develop alternative metrics to gauge the effectiveness of these efforts, and finally collaborate with other public administrators to share best practices. Each of these suggestions will be elaborated on in the text below.

The first suggested recommendation for local governments moving forward is a suggestion for them to hold focus groups, or create a forum where the public can get together and discuss concerns over water quality and share their opinion on how to improve it. This suggestion is in line with both the public participation literature and with the findings of it that suggest engaging the public more directly by allowing the public to play a more active role in decision-making processes helps the public feel more empowered. Additionally, this type of engagement will help let the public know that they have a voice in the efforts taken by local government to improve water quality. In addition, using focus groups or forums is a step towards understanding how engaged the public feels with the stormwater program- something that these cases do not currently measure. Therefore, this is a good first step in creating a baseline to

measure how engaged the public feels, and from there, through providing opportunities for the public to engage in decision-making processes for stormwater, metrics can be developed to determine if public engagement has increased through holding forums or focus groups. This work can help better understand and assess the role of public participation in this program.

The second suggestion for local administrators is for them to develop alternative metrics to determine the effectiveness of public participation efforts; metrics that are better able to connect public participation efforts to a reduction in pollution. This recommendation is based upon findings in this study related to the way that effectiveness is currently measured. Interviews highlight current measures of effectiveness in meeting the public participation BMP are not measuring if engaging the public results in a reduction in stormwater pollutants or if the public feels engaged with current public participation efforts. In addition to this, metrics assessing performance can be utilized to help local administrators improve their programs. In a study done by de Lancer Julnes and Holzer (2001) for example, they find that while only a small group of state and local governments go beyond simply reporting numbers associated with programs, measures used are able to improve program design and influence managerial decision-making. Therefore, developing alternative metrics is another way that local administrators can measure effectiveness of their public participation efforts.

The final recommendation for local administrators is a suggestion for them to come together and share best practices in public participation efforts. The goal here is for local governments with similar challenges to be provided the opportunity to share, and innovate to find alternative ways to enhance public participation efforts. Currently, stormwater associations such as Virginia's Municipal Stormwater Association (VAMSA) has had great success in bringing various groups of people together to develop and promote ideas to improve water

quality. Based upon their success, it is believed that local government with similar challenges will have the opportunity to develop stronger public participation programs.

Given the exploratory nature of this study, there are many directions future research can take to learn more about public participation in this program. First, future research could extend this study and include more local governments to determine if the findings from these six cases are generalizable across other governments under the phase II municipal stormwater program. Future research could also further define successful or effective public participation efforts. This would include some sort of program evaluation to determine first, if various activities meet permit requirements. Second, if evaluation efforts include some sort of policy instrument to measure if efforts to engage the public result in a reduction of pollutants and finally include a list of best management practices across local governments that are proven effective in engaging the public. Finally, further research could continue to determine if any best management practices are illustrative of thick or thin public participation, and if so, reasons local government adopted thick or thin participation practices.

CONCLUSION

There are three primary goals that this dissertation set out to accomplish throughout the three chapters presented. First was to gain a better understanding of how states develop and implement stormwater permits affecting how stormwater programs are organized and managed. Building from this, the goal of the second chapter was to understand how state-level rules and regulations affect the development and management of stormwater plans in localities. And the final goal of this project was to provide an assessment of how public participation occurs at the local level in the stormwater program, with particular attention paid to the types of public participation activities occurring. While each chapter has drawn from a distinct set of literature to answer these questions, they also build on each other to provide a more comprehensive picture of how phase II of the municipal stormwater program works. This includes providing examples of how state and local governments are managing stormwater effectively as well as challenges they face. Below I will discuss the key findings from each chapter, their contributions to political science scholarship and practitioner knowledge, as well as directions for future research.

Summary of Key Findings

Chapter one

Grounded in the intergovernmental implementation literature, the first chapter's overall goal was to understand how phase II of the municipal stormwater program unfolds at the state level. This was accomplished by conducting an exploratory qualitative case study across three states (California, Utah and Virginia) where state level administrators were interviewed. This chapter first presented a greater understanding of how the permitting process works for the

phase II municipal program. The primary finding that emerged from this chapter was that the way in which the federal stormwater regulations are written provides discretion to states in developing and implementing the general state-wide permits. This is an important finding because it suggests that discretion in writing and developing stormwater programs at the state level results in variation across states regarding what requirements beyond what the EPA expects are included in state-wide general permits, and whether states are perceived to write permits simply to meet federal requirements, or if they exceed those minimum requirements. In other words, it allows for a more concrete understanding of how discretion affects the decisions for states to adhere to federal minimum requirements, or exceed them with more stringent management plans.

Furthermore, findings from this first chapter suggest there are several reasons why states vary in what they choose to include as part of the state-wide general permit requirements, as well as their ability to enforce them. Idiosyncratic elements within states are the first reason why states vary with stormwater management. For example, while not mandated by federal stormwater requirements, California's state-wide general permit includes requirements for low impact development due to concerns of flooding when the state does receive a large amount of precipitation. Part of this is because California has many urbanized areas and clusters and the number of impervious surfaces increases the flood risk. Another example of how state-specific concerns affect stormwater permits is in Virginia where permittees that have TMDL requirements are required, by the state, to include a plan of action in their stormwater management plans submitted to the state for coverage under the state-wide general permit about how they plan to address TMDL concerns. Both examples suggest that state-specific concerns affect what is included in stormwater permits.

Third, when stormwater programs are connected in some way to other laws and regulations, the result tends to be general permit requirements written in ways that exceed federal requirements. For example, because of the Chesapeake Bay TMDL requirements, the state of Virginia has several laws and regulations mandated by the state that exceed those at the federal level. The final reason for variation across states is the Maximum Extent Practicable (MEP) language of federal stormwater regulation. Interviews highlight that the MEP language means that states vary considerably in what they believe is required to reduce stormwater runoff pollution and is, in large part, due to state-specific concerns related to stormwater. A final finding from this first chapter is that while states vary in what they require of phase II permittees, there is a trend towards writing permits to be more prescriptive. This is due in large part on policy learning that has shown that more prescriptive permits are easier to enforce and make it easier to set baseline standards to measure effectiveness of stormwater programs. Additionally, this study found that funding for localities required to obtain coverage under the state-wide general permit continues to be a challenge which can affect enforcement of the permit.

Chapter two

Building from the first chapter, through the collection and analysis of original survey data, the goal of the second chapter was to understand how state level rules and regulations affect local governments required to obtain coverage under the general permit. Specifically, using the intergovernmental and sustainable cities literature this chapter found that state level rules and regulations affect the ability and/or willingness of local governments to do more than what is required by the state-wide general permit. Results from this chapter indicate that local government units vary in their ability to exceed what the state requires of them, suggesting that

similar to federal-state intergovernmental working relations, local governments also face challenges when executing programs that are handed down to them by another level of government. Specifically, this chapter finds there are both extrinsic and intrinsic factors which affect whether local governments exceed state-wide permit standards.

The primary intrinsic factor affecting the ability or willingness of local governments to exceed minimum requirements is whether they have the resources to do so. This is in line with other studies focusing on why some localities are more likely to adopt environmental sustainability policies, finding that more affluent communities provide more resources for development of more stringent environmental programs. The primary extrinsic factor affecting local governments is state political culture. Specifically, local governments in California are more likely to exceed requirements than local government in either Virginia or Utah. This is in line with other environmental policy research indicating that California is often a leader and innovator in environmental policy, suggesting that state culture also matters when looking at various approaches to stormwater management.

Chapter three

The final chapter of this dissertation sought to understand how various local governments in Virginia engage the public as part of the requirements of the municipal stormwater program. The main finding from this chapter is that a local administrator's perception of how effective localities are at meeting the public participation minimum control measure does not actually measure how effective they are at reducing pollutants and increasing water quality. In addition to this, participation most generally could be considered conventional participation for this program rather than thick or thin. Future research could expand upon this to determine if shifting towards thick and thin participation rather than conventional

participation procedures could increase effectiveness in reducing stormwater runoff pollution. This final chapter concluded with recommendations for practitioners to better connect their public participation efforts with ways to measure effectiveness of pollution reduction and suggestions for moving towards public engagement strategies that are more participatory

In sum, major findings from each chapter are bulleted below:

- Maximum Extent Practicable language results in discretion in how states develop the state-wide general municipal stormwater permit and leads to different perceptions across states and the EPA if states actually exceed what is required by federal standards
- Permits becoming more prescriptive over time indicates that policy learning is occurring which is one way to measure success of implementation
- State-level rules and regulations affect the ability and willingness of local governments to adopt programs exceeding state or federal requirements
- There is a difference between perceived effectiveness and actual effectiveness of public participation practices. Alternative metrics to measure effectiveness should be explored to determine if there is a better way to connect public participation efforts to reduction in pollutants from stormwater runoff.
- Best management practices related to public participation tend to follow conventional forms of participation rather than thick or thin participation

Contributions and Directions for Future Research

Despite the distinct findings across each of these chapters, there is a common thread; results are based on perceptions on challenges and effectiveness of the municipal stormwater program rather than measures of how effective the program is in reducing pollutants from stormwater runoff illustrating two interesting realizations about this program. First, that the variable nature of stormwater across the country makes it exceedingly difficult to develop measures of success in reducing pollution from stormwater runoff across the country. This is once again supported by the fact that the stormwater program uses MEP language rather than setting effluent limit standards. Related to this point is that more work needs to be done to develop metrics which can better connect perceptions of effectiveness of the municipal stormwater program to actual reductions in pollutants. In addition to these realizations, there are

several important theoretical and practical lessons as well as the potential for future research. First, this research project has provided a better understanding of how the phase II municipal program works which is crucial for any future research on this program. Understanding the mechanisms of the program allows for the application of a variety of other theories related to intergovernmental implementation, policy design, and program evaluation, to name just a few, which means this research is critical to the application of additional theories related to policy implementation and design. Second, the practical application of this project is that understanding how this program works across states/permittees can allow for the sharing of ideas across permittees. If other phase II permittees are made aware of specific challenges others are facing, along with what permittees with similar challenges are doing to address those issues, then they may be able to strengthen their program and make it more effective.

Future research can take several directions. The first would be to extend the scope of this research and explore how other states develop and implement the phase II permit. It would be especially interesting to compare states with more urban areas to those with fewer urban areas and determine if the trend seen in this research of states increasing prescriptiveness of the permits over time differs based on the level of urbanization. In other words, it would be instructive to see if states with more rural areas also feel the need to adopt more prescriptive permits. This would also provide a greater scope of how political dynamics within states affect permit development and implementation. Similarly, the survey implemented in Chapter Two could be expanded to other states to gain a greater understanding of the challenges local governments face as well as to determine if findings from the second chapter can be standardized across the United States. In addition, more in depth analysis could be done to gain a better understanding of how the public participation and involvement section of the permit

works. This would include determining if any local governments have adopted BMPs that are considered thick or thin participation efforts. Finally, studying other local governments could illustrate why local governments believe they are effective/ineffective and if lessons learned from Virginia are similar to what is seen across states.

WORKS CITED

Amirehsani, Kevin. 2015. “How “Thick” or “Thin” is your Civic Engagement Project”. UNC School of Government Community Engagement Learning Exchange. http://cele.sog.unc.edu/how-thick-or-thin-is-your-civic-engagement-project/ (accessed January 13, 2017).

Bardach, Eugene. 1977. *The Implementation Game: What Happens after a Bill Becomes a Law* MTT Press Cambridge, Mass.

Berman, David R. 1998. *State and Local Politics*. 8th ed. Armonk, NY: M. E. Sharpe.

_____ 2003. Local Government and the States: Autonomy, Politics, and Policy. Armonk, NY: M. E. Sharpe.

Berman, Paul. 1980. “Thinking About Programmed and Adaptive Implementation: Matching Strategies to Situations.” In Why Policies Succeed or Fail, eds. Helen Ingram and Dean Mann. Beverly Hills, CA: Sage Publications, 205-227.

Berry, William D., Evan J. Ringquist, Richard C. Fording and Russell L. Hanson. 2009. “Updated and Revised Citizen and Government Ideology Measures Through 2008.” Available at http://bama.ua.edu/~rcfording/readme_update2008.pdf.

Berry, William D., Evan J. Ringquist, Richard C. Fording and Russell L. Hanson. 1998. “Measuring Citizen and Government Ideology in the American States, 1960-93.” *American Journal of Political Science* 42(1): 327-348.

Birkland Thomas 2011. *An Introduction to the Policy Process* third edition M.E. Sharpe Inc. Armonk, New York, London, England.

Bowman, Ann, and Richard Kearney. 2010. "Subsidiarity in State-Local Relations." Available at SSRN 1665467.

Bowman, Ann, and Richard Kearney. 2012. “Are U.S. Cities Losing Power and Authority? Perceptions of Local Government Actors.” Urban Affairs Review 48(4): 528-546.

Brewer, Garry D., and deLeon, Peter. 1983 *The Foundations of Policy Analysis*. Belmont, Calif.: Brooks/Cole.

California State Water Resources Control Board 2013 “Fact sheet for NPDES General Permit and Waste Discharge Requirements for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems” http://www.swrcb.ca.gov/water_issues/programs/stormwater/docs/phsii2012_5th/fs_final_sidenote.pdf (accessed April 7, 2016).

California State Water Resources Control Board 2016a “Water Board’s Structure” http://www.swrcb.ca.gov/about_us/water_boards_structure/index.shtml (accessed April 06, 2016).

California State Water Resources Control Board 2016b “ Stormwater Program: Municipal Program” http://www.swrcb.ca.gov/water_issues/programs/stormwater/municipal.shtml (accessed April 7, 2016).

California Stormwater staff one. Personal Communication, 2016.

California Stormwater staff two. Personal Communication, 2016.

California Stormwater staff three. Personal Communication, 2016.

California Stormwater staff four. Personal Communication, 2016.

California Stormwater staff five. Personal Communication, 2016.

California Stormwater staff six. Personal Communication, 2016.

California Stormwater staff seven. Personal Communication, 2016.

California Stormwater staff eight. Personal Communication, 2016.

California Stormwater staff nine. Personal Communication, 2016.

California Stormwater staff ten. Personal Communication, 2016.

Chang Yu-Min 1999 *Factors contributing to the effectiveness of implementing a national policy at the local level: A case study of community-specific regulation of municipal water pollution control* Proquest Dissertation and Theses Global http://search.proquest.com/docview/304540646?accountid=10223 (accessed December 5, 2015).

Cho, Chung-Lae, Kelleher Christine, Wright Deil and Yackee Susan 2005. “Translating National Policy Objectives into Local Achievements across Planes of Governance and among Multiple Actors: Second-Order Devolution and Welfare Reform Implementation” Journal of Public Administration Research and Theory (15) 1: 31-54.

City of Harrisonburg MS4 Program Plan 2014. https://www.harrisonburgva.gov/sites/default/files/PublicWorks/files/stormwater/2013-2018%20Program/MS4%20Program%20Plan%202014.pdf (accessed March 20, 2017).
CNSMaryland.org 2013 “Population Growth Makes Stormwater Runoff A Challenge for Chesapeake Bay”. http://cnsmaryland.org/2013/01/16/population-growth-makes-stormwater-runoff-a-challenge-for-chesapeake-bay/ (accessed December 7, 2015).

Creigthton James 2005. *The Public Participation Handbook: Making Better Decisions Through Citizen Involvement.* Jossey-Bass, Wiley Brand

Daley, Dorothy M., Megan Mullin, and Meghan E. Rubado. 2013. "State Agency Discretion in a Delegated Federal Program: Evidence from Drinking Water Investment." Publius: The Journal of Federalism. Advance Access September 2, 2013 doi: 10.1093/publius/pjt033.

deLeon and deLeon 2002. *Whatever Happened to Policy Implementation? An Alternative* Approach. Journal of Public Administration Research and Theory. Vol. 12. No. 4 pp. 467-492

Denhardt, R. B. and Denhardt, J. V. 2000. "The New Public Service: Serving Rather than Steering". Public Administration Review, 60: 549–559.

Derthick Martha 1972 *New Towns In-Town* Urban Institute Press Washington D.C.

Dunlap, Riley E., Chenyang Xiao, and Aaron McCright. 2001. "Politics and Environment in America: Partisan and Ideological Cleavages in Public Support for Environmentalism." *Environmental Politics* 10(4): 23-48.

Elazar, Daniel. 1984. *American Federalism: A View from the States.* Third Edition. New York: Harper and Row Publishers.

_____ 1987. *Exploring federalism*. University of Alabama Press.

Elmore Richard 1979 "Backward Mapping: Implementation Research and Policy Decisions", Political Science Quarterly 94, no. 4 601-616.

Environmental Protection Agency 2000. "Stormwater Phase II Final Rule: Small MS4 Stormwater Program Overview" http://www.epa.gov/npdes/pubs/fact2-0.pdf (accessed April 21, 2014).

Environmental Protection Agency 2000a "Stormwater Phase II Final Rule: Public Education and Outreach Minimum Control Measure" http://www.epa.gov/npdes/pubs/fact2-3.pdf (accessed April 21, 2014).

Environmental Protection Agency 2000b. "Stormwater Phase II Final Rule: Public Participation/Involvement Minimum Control Measure" http://www.epa.gov/npdes/pubs/fact2-4.pdf (accessed April 21, 2014).

Environmental Protection Agency 2000c. "Stormwater Phase II Final Rule: Illicit Discharge Detection and Elimination Minimum Control Measure" http://www.epa.gov/npdes/pubs/fact2-5.pdf (accessed April 21, 2014).

Environmental Protection Agency 2000d. “Stormwater Phase II Final Rule: Construction Site Runoff Control Minimum Control Measure” http://www.epa.gov/npdes/pubs/fact2-6.pdf (accessed April 21, 2014).

Environmental Protection Agency 2000e. “Stormwater Phase II Final Rule: Post-Construction Runoff Control Minimum Control Measure” http://www.epa.gov/npdes/pubs/fact2-7.pdf (accessed April 21, 2014).

Environmental Protection Agency 2000f. “Stormwater Phase II Final Rule: Pollution Prevention/Good Housekeeping Minimum Control Measure” http://www.epa.gov/npdes/pubs/fact2-8.pdf (accessed April 21, 2014).

Environmental Protection Agency 2014. “Stormwater Discharges from Municipal Storm Sewer Systems” http://cfpub.epa.gov/npdes/stormwater/munic.cfm (accessed April 21, 2014).

Environmental Protection Agency 2014a. “Stormwater Frequently Asked Questions” http://cfpub.epa.gov/npdes/faqs.cfm?program_id=6#7 (accessed April 21, 2014).

Environmental Protection Agency 2014b. “Small MS4 Stormwater Program Requirements” http://cfpub.epa.gov/npdes/stormwater/permreq.cfm (accessed April 21, 2014).

Environmental Protection Agency 2014c. “Permitting Authority Implementation Options” http://cfpub.epa.gov/npdes/stormwater/permitop.cfm (accessed April 21, 2014).

Environmental Protection Agency 2015. “Stormwater Phase II Final Rule: Public Participation/Involvement Minimum Control Measure”. https://www.epa.gov/sites/production/files/2015-11/documents/fact2-4_0.pdf. (accessed December 23, 2016).

Environmental Protection Agency 2016 “NPDES State Program Information” https://www.epa.gov/npdes/npdes-state-program-information (accessed April 7, 2016).

Environmental Protection Agency 2016a. “Implementing Clean Water Act Section 303d” https://www.epa.gov/tmdl (accessed April 16, 2016).

Environmental Protection Agency 2016b. “Stormwater Discharges from Municipal Sources” https://www.epa.gov/npdes/stormwater-discharges-municipal-sources#overview . (Accessed December 26, 2016).

Environmental Protection Agency Stormwater staff One. Personal Communication, 2016

Environmental Protection Agency Stormwater staff Two. Personal Communication, 2016

Environmental Protection Agency Stormwater staff Three. Personal Communication, 2016.

Environmental Protection Agency Stormwater staff Four. Personal Communication, 2016.

Erikson, Robert S., Gerald C. Wright, and John P. McIver. 1993. Statehouse Democracy: Public Opinion and Policy in the American States. Cambridge, UK: Cambridge University Press.

Feiock and West 1993. Testing Competing Explanations for Policy Adoption: Municipal Solid Waste Recycling Programs. Political Research Quarterly, vol 46, no. 2 pp.399-419

Feldman, Martha S., and Anne M. Khademian. 2002. To Manage Is to Govern. *Public Administration Review* 62(5): 541–54.

Forbes 2012. "The 10 Fastest-Growing U.S. States" http://www.forbes.com/sites/morganbrennan/2012/12/20/north-dakota-leads-list-of-americas-fastest-growing-states/ (accessed February 27, 2014).

Fording, Richard C., Joe Soss, and Sanford F. Schram. 2007. "Devolution, Discretion, and the Effect of Local Political Values on TANF Sanctioning." Social Service Review 81(2): 285-316.

Friends of the Rappahannock 2017. http://www.riverfriends.org/ (accessed March 20, 2017).

Fredericksburg Clean and Green Commission 2017. http://www.fredericksburgva.gov/index.aspx?NID=234 (accessed March 20, 2017).

Fredericksburg Wetlands Board 2017. http://www.fredericksburgva.gov/index.aspx?NID=257 (accessed March 20, 2017).

General Accounting Office (GAO). (1990). Case study evaluations.

Gerring John 2006. *Case Study Research Principles and Practice* Cambridge University Press New York

Goggin, Malcom, Ann O. Bowman, James Lester, and Lawrence O'Toole. 1990. *Implementation Theory and Practice: Toward a Third Generation.* Glenview, IL: Scott, Foresman and Company.

Gray, Virginia, Russell Hanson, and Herbert Jacob. 1999. *Politics in the American States: A Comparative Analysis.* Washington, D.C.: Congressional Quarterly Press.

Grodzins, Morton 1960. "American political parties and the political system". Western Political Quarterly issue 13. 974-98.

_____ 1966 *The American system: A new view of government in the United States*, ed. Daniel Elazar. Chicago: Rand McNally.

Handley, Donna Milam, & Michael Howell- Moroney. (2010). "Ordering stakeholder relationships and citizen participation: Evidence from the community development block grant program". Public Administration Review, 70(4): 601–609.

Hanover County Stormwater Program Plan. https://www.hanovercounty.gov/PW/Municipal_Separate_Storm_Sewer_System_MS4_Stormwater_Program_Plan.pdf (accessed March 20, 2017).

Hoornbeek John 2004. "Runaway Bureacracies or Congressional Control? Water pollution policies in the American states" Proquest Disserataton and Thesis Global. http://search.proquest.com/docview/305147470?accountid=10223 (accessed December 5, 2015).

Ingram, Helen, and Anne Schneider. 1990. "Improving Implementation Through Framing Smarter Statutes." Journal of Public Policy 10 (1): 67-88.

International Association for Public Participation (IAP2) 2015 .http://c.ymcdn.com/sites/www.iap2.org/resource/resmgr/imported/IAP2%20Spectrum_vertical.pdf (accessed December 6th, 2015).

Irvin, Renée A., & John Stansbury. 2004. "Citizen participation in decision making: Is it worth the effort?" Public Administration Review, 64(1): 55–65.

James City County MS4 Program Plan. http://jamescitycountyva.gov/DocumentCenter/View/8893 (accessed March 20, 2017).

Kettering foundation 2015. "Interview: Tina Nabatchi & Matt Leighninger on 21st Century Public Participation". https://www.kettering.org/blogs/interview-tina-nabatchi-matt-leighninger (accessed January 13, 2017).

King, Cheryl Simrell, Kathryn M. Feltey, and Bridget O'Neill Susel. 1998. The Question of Participation: Toward Authentic Public Participation in Public Administration. Public Administration Review 58(4): 317-326.

Krane, Rigos and Hill 2000. *Home Rule in America: A Fifty-State Handbook*. CQ Press

Krause 2011. Policy Innovation, Intergovernmental Relations, and the Adoption of Climate Protection Initiatives by U.S. Cities. Journal of Urban Affairs vol. 33 no. 1 pp.45-60.

Leighninger, Matt. 2006. "The next form of democracy: How expert rule is giving way to shared governance—and why politics will never be the same". Nashville, TN: Vanderbilt University Press.

_____2012. "Mapping deliberative civic engagement: Pictures from a (r) evolution" In T. Nabatchi, J. Gastil, M. Weiksner, & M. Leighninger (Eds.), Democracy in motion: Evaluating

the practice and impact of deliberative civic engagement, 19–39. New York, NY: Oxford University Press

_____ 2014."What We're Talking About When We Talk About the "Civic Field" (And why we should clarify what we mean)," Journal of Public Deliberation: Vol. 10: Iss. 1, Article 8.

Linder, Stephen H., and B. Guy Peters. 1987. "A Design Perspective on Policy Implementation: The Fallacies of Misplaced Prescription." Policy Studies Review 6 (3): 459-75.

Lipsky, Michael. 1971 "Street Level Bureaucracy and the Analysis of Urban Reform." Urban Affairs Quarterly 6:391 - 409.

Lowry, William R. 1992. *The Dimensions of Federalism: State Governments and Pollution Control Policies.* Durham, NC: Duke University Press.

Lubell, Feiock and Handy 2009. City Adoption of Environmentally Sustainable Policies in California's Central Valley. Journal of the American Planning Association.

Majone, Giandomenico, and Aaron Wildavskey. 1984. "Implementation as Evolution." In Implementation, Third Edition, eds Jeffrey Pressman and Aaron Wildavskey. Los Angeles: University of California Press.

Matland, Richard E. 1995. "Synthesizing the Implementation Literature: The Ambiguity-Conflict Model of Policy Implementation." Journal of Public Administration Research and Theory 5 (2): 145-74.

Mazmanian Daniel and Sabatier Paul 1980 "Policy Implementation: A Framework for Analysis" *Policy Studies Journal* 8, no. 2 538-60

Matisoff, Daniel. 2008. "The Adoption of State Climate Change Policies and Renewable Portfolio Standards: Regional Diffusion or Internal Determinants?" *Review of Policy Research* 25(6): 527-546.

Mazmanian Daniel and Sabatier Paul 1989, *Implementation and Public Policy*. University Press of America, Lanham, MD.

McGuire 2006. Collaborative Public Management: Assessing What We Know and How We Know It. Special issue, *Public Administration Review* 66: 33–43.

Nabatchi, Tina and Leighninger, Matt 2015. *Public Participation for 21st Century Democracy.* Jossey-Bass Wiley Brand.

Nabatchi, Tina, & Lisa Blomgren Amsler. (2014). "Direct public engagement in local government". American Review of Public Administration, 44(4suppl): 63s–88s.

Nabatchi, Tina 2012. “Putting the ‘Public’ Back in Public Values Research: Designing Public Participation to Identify and Respond to Public Values”. Public Administration Review, 72(5): 699-708.

National Resource Council 2013 “Urban Stormwater Management in the United States” The National Academy Press. Washington D.C.

National Resource Defense Council 2013 “Rooftops to River II: Green Strategies for Controlling Stormwater and Combined Sewer Overflows” http://www.nrdc.org/water/pollution/rooftopsii/ (accessed December 5, 2015).

National Resource Defense Council 2011 “Thirsty for Answers: Preparing for the water-related impacts of Climate Change in American Cities”. http://www.nrdc.org/water/files/thirstyforanswers.pdf (accessed December 7, 2015).

O’Connell 2008. “Exploring the Social Roots of Smart Growth Policy Adoption by Cities” Social Science Quarterly. Vol. 89 issue 5 pp.1356- 1372

O'Toole, Laurence J. Jr. 2000 "Research on Policy Implementation: Assessment and Prospects. Journal of Public Administration Research and Theory 20:263-88.
_____2007. *American Intergovernmental Relations: Foundations, Perspectives and Issues.* CQ Press.
Personal communication, Fort Collins Stormwater Program administrator 2015.

Peterson, Paul. E. 1995. *The Price of Federalism.* Washington D.C.: Brookings Institution Press.

Portsmouth Listens. 2017. http://portsmouthlistens.org/ (Accessed January 13, 2017).

Pressman L Jeffrey and Wildavsky Aaron 1973 *Implementation* University of California Press, Berkeley.

Putnam, Robert D. 1995. *Bowling Alone: America’s Declining Social Capital*. Journal of Democracy 6(1): 65-78.

Ringquist, Evan. 1993. *Environmental Protection at the State Level: Politics and Progress in Controlling Pollution.* Armonk, NY: M.E. Sharpe.

Sabatier Paul A. 1986 “Top-Down and Bottom-Up Approaches in Implementation Research A Critical Analysis and Suggested Synthesis” Journal of Public Policy 6, no.1 21-48

Scheberle, Denise. 2004. *Federalism and environmental policy: Trust and The Politics of Implementation.* fourth edition, Georgetown University Press

Seawright Jason and Gerring John 2008. “Case Selection Techniques in Case Study Research: A Menu of Qualitative and Quantitative Options” *Political Research Quarterly* 61: 294.

Shipan and Volden 2008. The Mechanisms of Policy Diffusion. The American Journal of Political Science vol. 52, no.4 840-857

Smith, Kevin and Larimer Christopher. 2013. *The Public Policy Theory Primer*. Westview Press.

Spangler Kaitlyn, Kaminski Michelle, Shutt Elizabeth, Gnepp Karika, Kissel Sara, 2015 "How do Impervious Surface Development and Population Growth affect Stormwater Management?" http://springcreekwatershed.org/images/stories/pdf/PSUStudentProjects/SMPPCED309M.pdf (accessed May 3, 2016).

Steel and Lovrich. 2000. Growth Management Policy and County Government: Correlates of Policy Adoption across the United States. State and Local Government Review Vol. 32, no. 1 pp.7-19.

Stephens, G. Ross. 1974. ''State Centralization and the Erosion of Local Autonomy.'' Journal of Politics 36:44-76.
Stephens, Ross and Wikstrom Nelson. 2007. *American Intergovernmental Relations: A Fragmented Federal Polity*. Oxford University Press.

Town of Blacksburg Stormwater Utility 2017. http://www.blacksburg.gov/departments/departments-a-k/engineering-and-gis/stormwater/stormwater-utility (accessed March 20, 2017).

Town of Vinton Stormwater Quality Information 2017. http://www.vintonva.gov/index.aspx?NID=209 (accessed March 20, 2017).

United States Census Bureau 2010. http://www.census.gov/geo/reference/urban-rural.html (accessed April 21, 2014).

Utah Department of Environmental Quality 2010 "General Permit" http://www.deq.utah.gov/Permits/water/updes/docs/2010/07Jul/2010SmallMS4GPfinal7-26-2010.pdf (accessed April 8, 2016).

Utah Department of Environmental Quality 2016 "Fact Sheet: Statement of Basis" http://www.deq.utah.gov/Permits/water/updes/docs/2016/03mar/2016-MS4-FSSOB.pdf (accessed April 8, 2016).

Vig Norman and Kraft Michael E. 2009. *Environmental Politics & Policy*, 7th ed. eds. Norman Vig and Michael E. Kraft. Washington, DC: CQ Press.

Virginia Stormwater Administrator two. Personal Communication, 2016

Virginia Stormwater Administrator three. Personal Communication, 2016

Virginia Stormwater Administrator four. Personal Communication, 2016

Virginia Stormwater Administrator five. Personal Communication, 2016.

Virginia Stormwater Administrator six. Personal Communication, 2016.

Virginia Stormwater Staff. Personal Communication, 2016.

Wood, Curtis. 2010. ‘‘Understanding the Consequences of Municipal Discretion.’’ American Review of Public Administration.

Woods, Neil and Potoski Matthew 2010. “Environmental Federalism Revisited: Second-order Devolution in Air Quality Regulation” Review of Policy Research 27 (6)721-739.

Wright, Deil. S and Cho 2000 “State administration and intergovernmental interdependency: do national impacts on state agencies contribute to organizational turbulence”. In Handbook of State Government Administration. Ed. John J. Gargan 33-66. New York: Marcel Dekker.

Yang, Kaifeng, and Kathe Callahan. 2007. Citizen Involvement Efforts and Bureaucratic Responsiveness: Participatory Values, Stakeholder Pressures, and Administrative Practicality. *Public Administration Review* 67(2): 249–64.

Yin, R.K. 2009. *Case Study Research Design and Methods*. 4th ed. Thousand Oaks, CA: Sage Publications Inc.

Zahmatkesh, Z., Karamouz, M., Goharian, E., Burian, S., and Tavakol-Davani, H. (2014) Climate Change Impacts on Urban Runoff in a New York City Watershed. World Environmental and Water Resources Congress 2014: pp. 938-951

APPENDIX A

Chapter One Qualitative Interview Questions

1. What is your primary function in the development and implementation of phase II of the municipal stormwater program?
2. What is the primary role of the state agency (or regional board, or EPA) in phase II of the municipal stormwater program?
    a. Has the state gone beyond standards set by the EPA?
        i. Why or Why not?
3. How many municipalities are covered under phase II of the stormwater program?
    a. How many of these are traditional? Nontraditional?
4. How do state administrators work with EPA regional counterparts (and vice-versa)?
    a. Do they help in development of state permit requirements?
    b. Is the working relationship positive between regional EPA and state administrators?
5. How do state administrators work with municipalities?
    a. What does that relationship entail?
    b. What are the primary functions of each?
6. What are state administrators looking for when auditing municipal stormwater programs?
    a. How do you determine if a municipality is meeting their minimum control measures?
    b. Is there a way of enforcing actions?

APPENDIX B

Codes for Chapter One Qualitative Analysis

Major Themes	Total number of Coded Sentences
Permit Development	53
TMDL Requirements	
Low Impact Development	
EPA Role	
Permit Implementation	89
Post-Construction Requirements	
Type of phase II (traditional or not)	
Compliance assistance	
Enforcement	
Working Relations	16
Partnerships	
CA regional board and EPA	
CA regional board and permittee	
State-Federal relations	
State-permittee	
State and EPA region	
Going Beyond	22
Challenges	20
Resources	
Region/Geographic location	
Staff	
Permit language	

APPENDIX C

Table of Citizen Ideology

States selected	Level of Urbanization (2010)	Rate of Urbanization (2000-2010)	2013 Citizen Ideology	EPA Region	Primacy
California	95%	0.64%	57.3	9	Y
Utah	90.6%	2.72%	20.9	8	Y
Virigina	75.5%	3.42%	46.4	3	Y

APPENDIX D

Chapter Two Summary Statistics

**Summary statistics if dependent variable has no missing observations*

Variable	Observations	Mean	Std. Dev.	Min	Max
EPA region	69	7	2.68985	3	9
Total Population	69	88096.8	235905.3	236	1841569
pct_white	69	0.657492	0.215261	0.12374	0.99159
pct_black	69	0.0661	0.127257	0	0.77046
pct_hispanic	69	0.219727	0.215958	0.012959	0.9381
totalarea	69	230.3645	603.4379	0.670813	3789.078
totalland	69	208.5923	506.1799	0.484639	2735.085
totalwater	69	21.7722	128.5945	0	1053.993
pct_arealand	69	0.939622	0.147818	0.215811	1
pctareawater	69	0.060378	0.147818	0	0.784189
pctpop25	69	0.637353	0.091488	0.418008	0.894068
pctpop25degree	69	0.188637	0.083313	0.020838	0.391388
generalrule	56	0.660714	0.477752	0	1
state	69	1.782609	0.888978	1	3
muntype	69	0.811594	0.393901	0	1
govtype	69	0.753623	0.434057	0	1
dedstaff	67	0.597015	0.4942	0	1
staffsize	68	0.382353	0.69173	0	2
yearsprogram	66	1.227273	0.890902	0	2
popsize	69	2.086957	0.781009	1	3
mgmtplan	69	0.869565	0.339249	0	1
mgmtplan_sustissues	69	0.246377	0.434057	0	1
envtsustissues_waterscarcity	69	0.057971	0.235401	0	1
envtsustissues_climatechange	69	0.072464	0.261154	0	1
envtsustissues_lid	69	0.144928	0.354607	0	1
envtsustissues_species	69	0.072464	0.261154	0	1
envtsustissues_waterflow	69	0.188406	0.393901	0	1
envtsustissues_biofunction	69	0.072464	0.261154	0	1
envtsustissues_other	69	0.086957	0.283836	0	1
numenvtsustissues	69	0.681159	1.594962	0	7
discretion	69	2.434783	0.674717	1	3
goesbeyond	69	0.362319	0.484192	0	1
tmdl	55	0.672727	0.473542	0	1
tmdl_swprogram	55	0.545455	0.502519	0	1
work_ms4	64	0.90625	0.293785	0	1

diversity		69	0.617743	0.247012	-0.07518	0.988791
govsupport_local		62	3.693548	1.26217	1	5
govsupport_state		62	3.306452	1.110143	1	5
govsupport_regepa		62	2.403226	1.108236	1	5
govsupport_fedepa		62	2.274194	1.073822	1	4
zpctpop25degree		69	-0.08997	0.438345	-0.97283	0.976795
zmedianvalue		69	0.047221	1.089231	-1.27672	4.477578
zmedianhouseholdincome		69	-0.01752	1.036757	-1.5569	5.030242
state2		69	0.521739	0.503187	0	1
numenvtsustissues2		69	0.202899	0.405104	0	1
.						

APPENDIX E

Chapter Two Survey Instrument

Q. 1 In relation to the Phase II municipal stormwater program, what position do you hold?

1. program manager

2. program engineer

3. stormwater specialist

4. other: (open ended—text box on survey monkey)

Q. 2 Under the phase II general state permit, is your ms4 characterized as a traditional or a non-traditional phase II permittee?

1. traditional (please respond to question 2a)

2. non-traditional (please respond to question 2b)

Q.2a If you are designated as a traditional phase II permittee, what best characterizes your organization?

a. city

b. county

c. township

d. census-designated place

e. other: (open ended—text box on survey monkey)

Q. 2b If you are designated as a non-traditional phase II permittee, what best characterizes your organization?

a. Hospital

b. Department of transportation

c. university campus

d. state park

e. military base

f. school district

g. special service district

h. other: (open ended—text box on survey monkey)

Q.2c, If you are a designated non-traditional ms4, do you have different or additional requirements as traditional phase II ms4s covered under the state-wide general permit?

a. yes

b. no

Q. 2d If yes, what are those additional requirements?

Q.3 Does your organization have a designated stormwater person or are they also responsible for other programs?

a. yes

b. no

Q. 4 Including yourself, how many employees work on the municipal stormwater program?

Q. 5 How many years has your organization been required to obtain coverage under the state wide general phase II stormwater permit?

Q. 6 What is the population size served by your organization?

1. less than 2,500

2. 2,500-10,000

3. 10,000-50,000

4. 50,000 or more

Q. 7 Is your organization required to develop/write a management plan outlining how your organization plans on meeting the requirements of the state-wide general ms4 permit? Do you have a stormwater management plan for your organization?

1. Yes (proceed to question 9)

2. No

Q.7a If yes, what type of management plan do you have?

a. Stormwater Management Plan (SWMP)

b. Stormwater Pollution Prevention Plan (SWPP)

c. Other (text box in survey monkey)

Q.7b If no, is there a management plan developed by another organization?

a. yes

b. no

Q. 8 If you are not required to develop and write a stormwater management plan do you have another form of documentation that outlines how your organization meets the requirements of the state-wide general phase II permit?

a. yes

b. no

Q. 8a Please describe how you document how you meet the phase II requirements.

Q. 8b Are you required to provide documentation for each minimum control measure?

a. yes

b. no

Q. 9 Is your management plan formally affiliated with any other internal environmental sustainability efforts or policies for your organization?

1. Yes

2. No

Q. 9a If yes, what types of environmental sustainability efforts / policies is your stormwater plan associated with? (please check all that apply)

a. water scarcity issues

b. climate change issues

c. issues related to threatened or endangered species

d. Low impact development/green infrastructure practices

e. sediment and flow issues in waterways

f. biological functions of water bodies

g. other water quality issues

d. other (text box here).

Q.9b Please describe additional environmental sustainability efforts the stormwater plan is associated with.

Q. 10 How much discretion/latitude does the state-wide general permit provide your organization when developing a stormwater management plan?

a. No discretion/latitude

b. very little discretion/latitude

c. some discretion/latitude

d. complete discretion/latitude

Q. 10a Why did you choose the option that you did?

a. ability (or inability) to choose best management practices for each minimum control measure

b. ability to include measures in the stormwater management plan that meets community's specific needs

c. other (please elaborate)

Q. 11 On a scale of one to seven, with one being very ineffective and seven being very effective, how effective or ineffective do you believe your stormwater management plan is in complying with each of the six minimum control measures?

1. Public education and outreach

1) very effective
2) mostly effective
3) somewhat effective
4) neither effective or ineffective

5) somewhat ineffective
6) mostly effective
7) very ineffective

2. Public participation and involvement

1) very effective
2) mostly effective
3) somewhat effective
4) neither effective or ineffective
5) somewhat ineffective
6) mostly effective
7) very ineffective

3. Illicit discharge detection and elimination

1) very effective
2) mostly effective
3) somewhat effective
4) neither effective or ineffective
5) somewhat ineffective
6) mostly effective
7) very ineffective

4. Construction site runoff control

1) very effective
2) mostly effective
3) somewhat effective
4) neither effective or ineffective
5) somewhat ineffective
6) mostly effective
7) very ineffective

5. Post Construction runoff control

1) very effective
2) mostly effective

3) somewhat effective
4) neither effective or ineffective
5) somewhat ineffective
6) mostly effective
7) very ineffective

6. Pollution Prevention/Good Housekeeping

1) very effective
2) mostly effective
3) somewhat effective
4) neither effective or ineffective
5) somewhat ineffective
6) mostly effective
7) very ineffective

Q. 12 To your knowledge, in efforts to reduce stormwater runoff pollution does your organization go beyond or include more than the minimum control measures outlined by the general permit?

1. Yes

2. No (please proceed to question 13)

Q. 12a If yes, why does your organization go beyond the minimum control measures to address stormwater pollution and prevention?

a. program is linked to other environmental sustainability efforts

b. program is linked to other water quality issues

c. other:

Q. 12b Please elaborate the ways in which your organization goes beyond the minimum control measures.

Q.12c Why were any measures beyond minimum control measures included as part of your stormwater management plan?

a. regional water concerns

b. partnerships with other municipalities or entities

c. concern from citizens

d. concern from environmental or stakeholder groups within the community

Q. 13 Why were any measures beyond minimum control measures excluded as part of your stormwater management plan?

a. concern from citizens

b. lack of financial resources

c. lack of staff or technical resources

d. concern from interest groups within the community

Q. 14 Overall, on a scale of one to seven, with one being very ineffective and seven being very effective, how effective or ineffective do you believe your organization is in reducing pollution from stormwater runoff?

1. very ineffective

2. mostly ineffective

3. somewhat ineffective

4. neither effective or ineffective

5. somewhat effective

6. mostly effective

7. very effective

Q. 14a. Why would you describe it that way?

Q. 15 What do you think your organization does best in regards to the phase II municipal program?

Q. 16 What is the primary challenge your organization faces when implementing the phase II program?

1. inadequate financial resources

2. inadequate staff size

3. technical assistance

4. other

Q. 17 Do you have a direct relationship with the ***federal*** EPA headquarters in relation to the municipal stormwater program?

a. Yes

b. No real relationship

Q**. 17a** If yes, what does that relationship include? Check all that apply

a. Reviewing stormwater management plans for approval

b. Answering questions related to the municipal stormwater program

c. Answering questions related to interpreting the general state permit

d. Auditing and inspecting stormwater programs

e. enforcement actions on the organization when needed

f. other)

Q. 17b If yes, on a scale of one to six, one being the most negative, and six being the most positive, how would you describe your relationship with the ***federal*** EPA headquarters as positive or negative?

1. very negative

2. mostly negative

3. slightly negative

4.slightly positive

5. mostly positive

6. very positive

Q.17c If yes, why would you describe it that way?

Q. 18 Do you have a direct relationship with the ***regional*** EPA staff in relation to the municipal stormwater program?

a. Yes

b. No real relationship

Q. 18a If yes, what does that relationship include? Check all that apply

a. Reviewing stormwater management plans for approval

b. Answering questions related to the municipal stormwater program

c. Answering questions related to interpreting the general state permit

d. Auditing and inspecting stormwater programs

e. enforcement actions on the organization when needed

f. other (open ended—text box on survey monkey)

Q. 18b On a scale of one to six, with one being the most negative, and six being the most positive, how would you describe your relationship with the ***regional*** EPA staff?

1. very negative

2. mostly negative

3. slightly negative

4.slightly positive

5. mostly positive

6. very positive

Q. 18c. If yes, why would you describe it that way?

Q. 19 Do you have a direct relationship with the State as the permitting authority in relation to the municipal stormwater program?

a. Yes

b. No real relationship

Q.19a If yes, what does that relationship include? Check all that apply

a. Reviewing stormwater management plans for approval

b. Answering questions related to the municipal stormwater program

c. Answering questions related to interpreting the general state permit

d. Auditing and inspecting stormwater programs

e. enforcement actions on the organization when needed

f. other (open ended—text box on survey monkey)

Q. 19b If yes, on a scale of one to six, with one being the most negative, and six, being the most positive, how would you describe your working relationship with the State as the permitting authority for phase II municipal stormwater as positive or negative?

1. very negative

2. mostly negative

3. slightly negative

4.slightly positive

5. mostly positive

6. very positive

Q. 19c. If yes, why would you describe it that way?

Q.20 Do you work cooperatively with other MS4s?

1. Yes

2. No (please answer 21c)

Q. 20a If yes, in what ways do you work cooperatively with other ms4s?

1. formal cooperative agreements

2. regional or state water boards or administrations.

3. water association within the state

4. other (please describe)

Q. 20b If yes, what is the primary reason to work cooperatively with other ms4s?

a. sharing of resources

b. sharing of ideas

c. similar jurisdictional needs

d. other (please elaborate)

Q. 20c If no, what is the primary reason not to work cooperatively with other ms4s?

a. inconsistent views on what actions should be taken

b. different priorities from citizens in community

c. different jurisdictional needs

d. other (please elaborate)

Q. 21 On a scale of one to seven, with one being the least support and seven being the most support, what is the level of political support you receive for implementing the phase II municipal program from the following:

1. local government
    - why did you rate this the way you did?

2. state government
    - why did you rate this the way you did?

3. regional EPA
    - why did you rate this the way you did?

4. federal EPA headquarters
    - why did you rate this the way you did?

California Specific Questions:

Q.1 Which California Regional Water Board does your organization fall under? (will have a drop down menu on survey monkey with options below)

a. North Coast Regional Water Board (1)

b. San Francisco Bay Regional (2)

c. Central Coast Regional (3)

d. Los Angeles Regional (4)

e. Central Valley Regional Water Board—Sacramento Office (5s)

f. Central Valley Regional Water Board—Redding Office (5r)

g. Central Valley Regional Water Board—Fresno Office (5f)

h. Lahontan Regional Water Board—South Lake Tahoe Office (6slt)

i. Lahontan Regional Water Board—Victorville Office (6v)

j. Palm Desert Regional Water Board (7)

k. Santa Ana Regional Water Board (8)

l. Sand Diego Regional Water Board (9)

Q. 2 Do you have a direct relationship with your respective California Regional Water Board as the implementing authority in relation to the municipal stormwater program?

a. Yes

b. No real relationship

Q.2a If yes, what does that relationship include? Check all that apply

a. Reviewing stormwater management plans for approval

b. Answering questions related to the municipal stormwater program

c. Answering questions related to interpreting the general state permit

d. Auditing and inspecting stormwater programs

e. enforcement actions on the organization when needed

f. other (open ended—text box on survey monkey)

Q. 2b If yes, on a scale of one to seven, with one being the most negative, and seven, being the most positive, how would you describe your working relationship with the State as the permitting authority for phase II municipal stormwater as positive or negative?

1. very negative

2. mostly negative

3. slightly negative

4. neutral

5. slightly positive

6. mostly positive

7. very positive

Q. 2c. If yes, why would you describe it that way?

Q.3. Does the Regional Water Board that you work with require that your organization include more than the state general permit in developing and implementing a plan for stormwater management?

a. yes

b. no

Q.3a If yes, please list the ways in which the Regional Water Board requires your organization to do more.

Q.4 Does your organization have TMDL requirements that they are required to meet?

a. yes

b. no

Q.4a. If yes, do TMDL requirements play a role how your organization approaches the municipal stormwater program?

a. yes

b. no

Q.4b If yes, how do TMDL requirements affect how your organization approaches stormwater management?

Q.5 Is your organization a member of the California Stormwater Quality Association (CASQA)

a. yes

b. no

Q.5a If yes, what is the primary purpose for being part of this organization?

a. sharing of ideas

b. sharing resources

c. implementation guidance

d. other (please elaborate)

Q.5b If yes, on a scale of one to four, with one being the least satisfied and four being the most beneficial, how beneficial is membership in CASQUA to achieving goals related to stormwater management?

1. not at all beneficial

2. slightly beneficial

3. somewhat beneficial

4. very beneficial

Q.5c. Why did you describe it that way?

Q. 6 To your knowledge, does your organization work with any other organizations or associations for stormwater management?

a. yes

b. no

Q. 6a If yes, please list the other associations your organization works with

<u>Utah Specific Questions</u>

Q. 1 To your knowledge, does your organization work with any other organizations or associations for stormwater management?

Q. 1a If yes, please list associations your organization works with for stormwater management.

Q. 1b If yes, on a scale of one to four, with one being the least satisfied and four being the most beneficial, how beneficial is your affiliation with these associations to achieving goals related to stormwater management?

1. not at all beneficial

2. slightly beneficial

3. somewhat beneficial

4. very beneficial

Q.1c. Why did you describe it that way?

Virginia Specific Questions

Q. 1 Does your organization have TMDL requirements that they are required to meet?

a. yes

b. no

Q.1a. If yes, do TMDL requirements play a role how your organization approaches the municipal stormwater program?

a. yes

b. no

Q.1b If yes, how do TMDL requirements affect how your organization approaches stormwater management?

Q. 2 Is your organization a member of the Virginia Municipal Stormwater Association (VAMSA)?

a. yes

b. no

Q.2a If yes, what is the primary purpose for being part of this organization?

a. sharing of ideas

b. sharing resources

c. implementation guidance

d. other (please elaborate)

Q.2b If yes, on a scale of one to four, with one being the least satisfied and four being the most beneficial, how beneficial is membership in VAMSA to achieving goals related to stormwater management?

1. not at all beneficial

2. slightly beneficial

3. somewhat beneficial

4. very beneficial

Q.2c. Why did you describe it that way?

Q. 3 To your knowledge, does your organization work with any other organizations or associations for stormwater management?

a. yes

b. no

Q. 3a If yes, please list the other associations your organization works with

APPENDIX F

Notes to Changes on Survey

Question three, when respondents listed themselves as traditional, when text response indicated they are actually non-traditional ms4s, the change was made. These are entities such as fairgrounds, joint power authorities and state agencies. The same thing was done when they responded as non-traditional and are actually traditional. These are entities such as small towns.

Question nine, asking how many employees they have designated to the phase II municipal program, there was some variation in answers dealing with full time and part time employees. For consistency purposes, I am measuring the number of full time employees that work on the phase II stormwater program.

Additionally, for question nine, if they indicated that they don't have any specific person designated for the phase II program, rather, multiple people that also work with other areas within their department, their answer to question 8 was changed from "yes" to "no" when asked if they had employees specifically designated for the phase II program because it does not fall under the full-time employee requirement.

Question nineteen dealing with "other" types of internal sustainability that permittees may link stormwater to, I included answers such as "environmental management systems" that mirror ISO standards or "eco-city" charters in a category called "comprehensive sustainability plan" because they tend to be more holistic and dealing with the economic, environmental and equitable pillars of sustainability (iso.org http://www.iso.org/iso/sustainable_development)

Question twenty-two: when respondents answered "other" on why they chose the option they did, if they indicated that the city or permittee had a little discretion (q 21) because they were best because of cost concerns or "best option for small city", I coded this as 2, or ability to include measures in the stormwater management plan that meets community's specific needs because it meets the intent of the question.

Also, one respondent marked "underfunded" as one reason why they have little discretion. I coded this as 4, or no options provided at all in relation to the stormwater management plan because it matched with data provided from interviewees suggesting that prescriptiveness of the permit makes it difficult for permittees who serve disadvantaged communities

Question thirty-two: if respondents listed “other” when describing the primary challenge to implementing the stormwater program and described issues with software, I listed this under technical assistance since that deals with monitoring and gets at the intent of the question.

This process was repeated if respondents said something alluding to lack of financial or lack of staff resource

APPENDIX G

Chapter Two Survey Instrument Code Book

Question	Variable Name	Value labels	Code	Frequency	Total responses
State locality is located in	state	State	1: California 2: Utah 3: Virginia	48 17 23	88
Locality located in California	state2	State2	0: no 1: yes	40 48	88
What best characterizes your organization?	muntype	Municipality type	0: city/town 1: county	20 68	88
Type of government structure in place	govtype	Government structure in place	0: other 1: council manager	23 62	86
Dedicated staff for the stormwater program	dedstaff	Dedicated staff	0: no 1 :yes	32 48	80
Number of staff working on the stormwater program	staffsize	Staff Size	0: less than 5 1: 5-9 2: 10 or more	58 12 9	79
Number of years in program	yearsprogram	Years in program	0: less than 5 1: 5-9 2:10 or more	25 14 39	78
Population size served	popsize	Popsize	1: less than 2,500-10,000 2: 10,000-50,000 3: More than 50,000	21 34 28	83
Required to write a formal management plan	mgmtplan	Mgmtplan	0: no 1:yes	15 67	82
If management plan is related to other internal sustainability issues	mgmtplan_sustissues	Mgmtplan_sustissues	0:no 1: yes	70 18	88
Stormwater plan associated with water scarcity	envtsustissues_waterscarcity	Mgmtplan linked to water scarcity	0: no 1: yes	83 5	88
Stormwater plan associated with climate change	envtsustissues_climatechange	Mgmtplan linked to climate change	0: no 1: yes	83 5	88
Stormwater plan associated with low impact development	envtsustissues_lid	Mgmtplan linked to low impact development	0: no 1:yes	78 10	88
Stormwater plan associated with endangered species	envtsustissues_species	Mgmtplan linked to endangered species	0: no 1: yes	83 5	88
Stormwater plan associated with	envtsustissues_waterflow	Mgmtplan linked to water flow and sediment issues	0: no 1: yes	75 13	88

water flow and sediment issues					
Stormwater plan associated with biofunction	envtsustissues_biofunction	Mgmtplan linked to biofunction	0: no 1: yes	83 5	88
Stormwater plan associated with other sustainability issues	envtsustissues_other	Mgmtplan linked to other sustainability issues	0: no 1: yes	82 6	88
The number of environmental sustainability issues stormwater plan is associated with	numenvtsustissues	The number of environmental sustainability issues stormwater plan is associated with	0: 0 1: 1 2: 2 3: 3 4: 4 5: 5 6: 6 7: 7	72 2 6 3 1 1 2 1	88
Stormwater plan associated with more than one environmental sustainability issues	numenvtsustissues2	Stormwater management plan associated with more than one environmental sustainability issue	0: one or less 1: more than 1	72 16	88
Amount of discretion locality has when writing stormwater plans	discretion	Discretion	1: little to none 2: a moderate amount 3: a great deal to complete discretion	8 25 39	72
Management plan exceeds requirements of state permit	goesbeyond	Exceeds state permit requirements	0: no 1: yes	44 25	69
Locality has TMDL requirements	tmdl	TMDL requirements	0: no 1: yes	19 38	57
TMDL requirements are associated with stormwater plan	tmdl_swprogram	TMDL associated with stormwater plan	0: no 1: yes	26 31	57
Locality works cooperatively with other ms4s	work_ms4	Works with other ms4s	0: no 1: yes	8 60	68
Ethnic and racial composition of locality	Diversity	Diversity	Interval measure varies 0-100	--	88
Population over 25 with a college degree	zpctpop25degree	Standardized values of (pctpop25degree)	Interval measure varies 0-100	--	88
Median home value	zmedianvalue	Standardized values of (medianvalue)	Interval measure varies 0-100	--	88
Median household income	zmedianhouseholdincome	Standardized values of (medianhouseholdincome)	Interval measure varies 0-100	--	88
Level of support from local government	govsupport_local	Level of local support	1: very little support 2: somewhat unsupportive 3: neither supportive or unsupportive 4:somewhat supportive 5: very	6 8 25	69

			supportive	22 8	
Level of support from state government	govsupport_state	Level of state support	1: very little support 2: somewhat unsupportive 3: neither supportive or unsupportive 4:somewhat supportive 5: very supportive	6 8 25 22 8	69
Level of support from regional EPA	govsupport_regepa	Level of regional EPA support	1: very little support 2: somewhat unsupportive 3: neither supportive or unsupportive 4:somewhat supportive 5: very supportive	24 3 35 6 1	69
Level of support from federal EPA	govsupport_fedepa	Level of federal EPA support	1: very little support 2: somewhat unsupportive 3: neither supportive or unsupportive 4:somewhat supportive 5: very supportive	26 5 32 6 0	69
If locality considered Dillon's rule locality	generalrule	General rule	0: no 1: yes	25 44	69

APPENDIX H

Chapter Three Qualitative Interview Questions

1. What is your primary role in the development and execution of the best management practices to meet the public participation minimum control measure for your program?

2. Who or which groups are targeted for public participation in the municipal stormwater program?

    a. Public at large?
    b. Specific groups?
        i. If specific groups which ones?

3. Which best describes how you engage the public for the phase II municipal stormwater program?
    a. Providing the public with information about the stormwater program rather than allowing the public to share in the decision-making process.
    b. Consult the public which involves minimal decision-making on behalf of the public
    c. The public is consulted and included in the decision-making process as a way to ensure public opinions and concerns are reflected in the choices made
    d. There is collaboration between decision-makers and the public which results in shared decision-making authority.

4. What are some of the primary ways the public is engaged?

5. In your opinion, how effective are current best management practices in engaging the public with the stormwater program?
    a. Why would you describe it that way?

6. In your opinion, how could public participation best management programs be improved?