PAYING FOR RAIN: THE EMERGENCE, DIFFUSION, AND FORM OF STORMWATER FEES IN THE UNITED STATES, 1964-2017

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Across the United States, at least 1,600 local governments in 40 states have enacted stormwater fees since the mid-1960s. Many of these local governments enacted stormwater fees to finance costly infrastructure upgrades required by increasingly stringent federal and state regulation of stormwater systems and combined sewer overflows. The sustained spread of stormwater fees across the United States over the past five decades reflects a significant shift of fiscal responsibility for operating, maintaining, and improving key public infrastructure systems to the local level. This dissertation investigates the emergence, diffusion, and form of stormwater fees enacted by local governments in the United States over the past 50 years. Structured by several theoretical frameworks and utilizing a combination of qualitative and quantitative methods, this research identifies key vertical and horizontal intergovernmental dynamics influencing the enactment of stormwater fees by local governments across the country. While underscoring the strong influence that federal and state regulation of municipal stormwater systems has played in popularizing stormwater fees among local governments in the United States, my research also highlights the crucial role that state-level statutory law, case law, and administrative approaches have had on expanding or contracting the options local governments have for implementing stormwater fees individually within their own jurisdictions and collectively across metropolitan regions. My case studies of stormwater fee form suggest that the challenges to broadly scoped collective action characterizing stormwater management and finance in highly fragmented metropolitan regions may present transaction cost barriers too high to be surmounted without coercive intervention from a higher level of government, but that collective action of more limited scope can be achieved in relatively self-organized manner. This research also demonstrates the enduring and important role that consulting firms and professional industry associations have played in influencing stormwater fee enactment by local governments across the United States over the past half-century.

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PREFACE

Most of the figures in this dissertation use color to represent certain information. As such, viewing figures in black and white or greyscale will wash out some key information.

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1.0 INTRODUCTION

1.1 STORMWATER FEES

1.1.1 What is a stormwater fee?

A stormwater fee is a fee assessed by a governmental entity – typically a municipality, county, or special regional district in the United States – used to fund the operation, maintenance, and/or capital improvement of stormwater infrastructure. Although various jurisdictions levy a variety of fees related to stormwater, this dissertation – similar to Matichich et al. (2013) – focuses on recurring (e.g., monthly, quarterly, annual) fees assessed against parcels of real property based on some estimate of the demands those parcels impose on a stormwater drainage system. These recurring, parcel-based fees are distinct from one-time stormwater "impact" or "development" fees levied against new developments (e.g., Nelson 1995), although both recurring and one-time stormwater fees can use similar methodologies to calculate rates. Recurring fees specifically designed to estimate the amount of stormwater runoff from parcels of real property also contrast with millage rates used to finance stormwater-related expenditures primarily in that property values do not bear any necessary or direct relation to the amount of stormwater runoff flowing from each parcel of real property. Just as drinking water utilities charge user fees for drinking water collection, treatment, and distribution services, recurring, parcel-based stormwater fees –

often implemented as part of a stormwater utility[1] – serve as user fees for stormwater conveyance, treatment, and/or other services. Unless otherwise specified, any subsequent use of the term "stormwater fee" in this dissertation refers to this type of recurring, parcel-based stormwater fee.[2]

The basis and formulae for calculating stormwater fees varies among jurisdictions, but the most common constructions calculate a fee based on the areal extent of impervious surfaces on a parcel of real property within the relevant jurisdiction. The areal extent of impervious surfaces serves to estimate the amount of runoff generated from a parcel of real property as rain falls or as snow and ice melts, which – in turn and in theory – approximates demands placed on stormwater infrastructure and services. Some jurisdictions vary or tier stormwater fee rates by customer class (e.g., residential, commercial, industrial). Certain jurisdictions also exempt various properties (e.g., undeveloped land, roads, public parks, cemeteries) from stormwater fees. Revenues generated by stormwater fees usually fund the operation, maintenance, and/or capital improvement of stormwater systems, although revenue use also varies among jurisdictions and can include financing activities such as flood mitigation, water quality protection, and administration of associated regulatory programs. In some jurisdictions, stormwater fees are also combined with rebates, grants, customer assistance programs, credit programs, and – in at least one instance – a credit trading program (District of Columbia Department of Energy & Environment, 2018).

[1] The term "stormwater utility" is often used to refer to one of three distinct concepts: (1) in an administrative or organizational sense, referring to an organization governing stormwater services and infrastructure in a certain jurisdiction; (2) in a programmatic sense, referring to a program of stormwater services and infrastructure provided by a governing organization; or (3) in a narrower sense, referring only to a stormwater fee. In the organizational sense, the term "stormwater authority" is also used in place of "stormwater utility" in some states (e.g., Pennsylvania). Even in the narrow sense, the term "stormwater utility" is sometimes used to distinguish different types of stormwater fee rate structures. For instance, Kea, Dymond, and Campbell (2016) distinguish between "stormwater fees" charging customers a flat rate (e.g., $2 per month) and "stormwater utilities" charging customers a variable rate (e.g., based on the amount of impervious surface on each parcel of real property). For purposes of this dissertation, I do not make this same distinction. Rather, I refer to both flat and variable rate approaches as "stormwater fees." Furthermore, throughout this dissertation, I use the term "stormwater utility" in the organizational or programmatic sense, opting to use the term "stormwater fee" for the narrower sense.

[2] Names for these recurring, parcel-based stormwater fees vary by locality. Some examples include: drainage fee (Austin, Texas); storm drainage management fee (Dallas, Texas); storm drainage service charge (Union, Ohio); municipal drainage utility system charge (Galveston, Texas); storm water user fee (Wadsworth, Ohio); storm water utility charge (Washburn, Wisconsin); stormwater management utility fee (Anderson, South Carolina); and stormwater utility / EPA fee (Bucyrus, Ohio).

1.1.2 Why stormwater fees?

To understand why hundreds of local governments across the United States – as well as local governments in France (Le Nouveau, Deroubaix, Diou, & Tardivo, 2013), Germany (Bertram et al., 2017; Keeley, 2007), South Africa (Fisher-Jeffes & Armitage, 2013), Canada (Campbell, Dymond, Key, & Dritschel, 2017; Environmental Commissioner of Ontario, 2016), as well as Australia, Brazil, Ecuador, and Poland (Tasca, Assunção, & Finotti, 2017) – have enacted stormwater fees over the last 50 years, we need to consider: (1) what activities constitute stormwater services; (2) why stormwater services generally fall under the purview of local governments; and (3) what alternative institutional arrangements local governments have used – and might use – to finance provision and production of stormwater services.

The stormwater services expected and demanded by citizens – and increasingly required by regulatory agencies – in the United States and elsewhere have evolved to include not only drainage systems (e.g., ditches, swales, pipes) to keep roads passable, and detention ponds to mitigate downstream channel erosion and flooding, but also watershed management technologies and strategies designed to protect the quality of receiving waters (Debo & Reese, 2003; Matichich et al., 2013). Furthermore, in the roughly 800 communities across the United States that have combined sewer systems (United States Environmental Protection Agency - Office of Water, 2004) where stormwater and sanitary sewage flow together in one shared set of pipes, stormwater infrastructure and services directly interconnect with sanitary sewer services and infrastructure. Even in communities with nominally separate sewer systems for sanitary sewage and stormwater, the separation between stormwater and sanitary sewer systems is not entirely complete due to various sources of inflow and infiltration, such as illicit roof drain connections and cracked sanitary sewer pipes (Bhaskar, Welty, Maxwell, & Miller, 2015).

Stormwater services (e.g., flood prevention, drainage of real property, protection of water quality) exhibit two key characteristics of public services: economically or physically infeasible exclusion; and the potential for joint – albeit congestible (Buchanan, 1965; Craig, 1987; Hochman, 1982) – use (V. Ostrom & Ostrom, 1977). Accordingly, stormwater management is typically a public responsibility, at least in the United States (Poertner, 1981). However, activities on privately owned parcels of real property (e.g., expanding an impervious driveway, installing a stormwater cistern) directly affect public stormwater systems. Garner et al. (1994, p.

7) argue that stormwater fees involve a fundamental "redefinition of the way in which people think about runoff and stormwater management" from a conception of stormwater management "as a government service needed to solve a public problem" to a view that stormwater services are provided by the government primarily to manage runoff from privately owned real property.

Debo and Reese (2003, p. 118) note that "municipal stormwater programs have been funded using a number of mechanisms... including property taxes, sales taxes, state revolving funds, road funding, user fees, bonding, and surcharges on other utility fees" with property-tax funding being the most common. Debo and Reese (2003, p. 118-122) – among many others, including Bachhuber (2013), Brisman (2002), Garner et al. (1994), Honchell (1986), and Pigott (1993) – observe four primary advantages of stormwater fees as financing mechanisms for providing and producing municipal stormwater programs compared with other financing mechanisms: (1) stability, by virtue of being a dedicated, service-specific user fee[3] rather than a tax-derived revenue that has to compete in the budgetary process with other general government obligations such as schools and police protection;[4] (2) adequacy, with sufficient revenue generated while staying below citizen-customer[5] willingness to pay; (3) flexibility, both in how revenues are generated and towards what ends they are expended; and (4) perceived equity, with costs borne proportionally by users on the basis of the demands they place on stormwater service systems. Compared with other mechanisms for financing stormwater services, stormwater fees also have several disadvantages, including: higher design, implementation, and administration costs; and potential customer opposition (Keeley, 2007).

The economic appeal of stormwater fees – in terms of efficiency and equity – can be illustrated by briefly considering how stormwater services are currently financed in some locales. Many communities across the United States currently finance stormwater and sewer services with charges based on potable water use, as measured by metered water inflow to residences, commercial establishments, industrial facilities, and institutional buildings. While this financing mechanism adequately accounts for demands placed on sewer and stormwater conveyance

[3] Many local ordinances – and some state laws – require that any revenues generated by stormwater fees be expended only for costs related to the operation, maintenance, administration, or capital improvement of stormwater infrastructure.

[4] The stability and dedicated nature of stormwater fee revenues can also expand and enhance opportunities for local governments to finance stormwater-related capital projects through bonded borrowing.

[5] I use the term "citizen-customer" in the tradition and spirit of Thomas (2013) and others.

networks – which, as noted previously, are combined systems in some parts of the United States – by water flowing down sink, shower, and washing-machine drains, fees based on potable water use fail to capture demands placed on conveyance systems by stormwater, which can account for a preponderance of total demand in combined systems during and after wet weather events (3 Rivers Wet Weather, 2018). Thus, in many parts of the United States, stormwater service demands are essentially unpriced, and a strong economic efficiency and equity argument can be made for implementing stormwater fees to amend the current water-meter-based financing system. More specifically, if a local government finances investments in stormwater infrastructure systems solely with revenues derived from metered-water fees, a compelling argument can be made that properties with relatively high metered water use but relatively small stormwater demands (e.g., small residential parcels) bear an undue fiscal burden for these investments compared with properties with little or no metered water use but large stormwater demands (e.g., parking lots, shopping malls, big-box retail establishments). By putting a price on stormwater service demand through a stormwater fee – which opponents sometimes disparage, oppose, and legally challenge, as a "rain tax" – a local government can not only generate revenue needed to operate, maintain, and improve critical infrastructure, but can also incentivize citizen-customers to implement stormwater abatement practices on private property, especially by combining a stormwater fee with a concerted credit program. In other words, by aligning service fees with service demand, and by incentivizing decentralized stormwater management, stormwater fees can play a crucial role in the efficient and equitable allocation of stormwater and sewer services within and among hydrologically interconnected jurisdictions.

From an economic perspective, by pricing a previously unpriced economic externality, stormwater fees are a form of Pigouvian price instrument (Parikh, Taylor, Hoagland, Thurston, & Shuster, 2005; Thurston, 2006). Compared with quantity instruments (e.g., cap-and-trade approaches) and command-and-control regulations, price instruments like stormwater fees offer certain advantages and disadvantages for abating stormwater pollution (Parikh et al., 2005; Thurston, 2006).

1.2 STORMWATER REGULATION IN THE UNITED STATES

Two federal programs account for most of the increasing regulatory pressure on owners of stormwater infrastructure systems in recent decades: (1) regulation of municipal separate storm sewer systems (MS4s); and (2) regulation of combined sewer overflows (CSOs). Both of these regulatory programs were established as part of the National Pollution Discharge Elimination System (NPDES) under the Federal Water Pollution Control Act (also known as the Clean Water Act),[6] which prohibits any discharge of pollutants through "point sources" to any "water of the United States" that does not comply with the terms of an NPDES permit. While state regulatory agencies assume primary responsibility for the administration and enforcement of NPDES permits – including permits for MS4s and CSOs – in many states, the responsibility for enforcing and administering NPDES permits ultimately lies with the United States Environmental Protection Agency (USEPA).

1.2.1 MS4 regulations

As defined by USEPA (2018) an MS4 is, "a conveyance or system of conveyances that is: owned by a state, city, town, village, or other public entity that discharges to waters of the U.S.; designed or used to collect or convey stormwater (e.g., storm drains, pipes, ditches); not a combined sewer; and not part of a sewage treatment plant, or publicly owned treatment works." Federal regulation of MS4s was authorized by amendments to the federal Clean Water Act made by the Water Quality Act of 1987, reflecting an increased regulatory focus on pollution associated with "nonpoint sources" generally (United States Environmental Protection Agency, 1990; United States Environmental Protection Agency - Office of Water, 1985, 1992b) and stormwater specifically (United States Environmental Protection Agency - Office of Water, 1983, 1992a).

[6] The Federal Water Pollution Control Act was originally enacted in 1948, but was completely rewritten by amendments enacted in 1972. The NPDES program was established by the 1972 amendments.

The first phase of MS4 regulation by USEPA – known as Phase I MS4 regulations – were promulgated in December 1990,[7] and required any MS4 in an incorporated place or county with a population over 100,000 people to obtain an NPDES permit. Based on the population of the incorporated place or county, the Phase I MS4 regulations classified regulated MS4s as either "medium" (100,000 to 249,999 people) or "large" (more than 250,000 people). In some states, the responsible state agency regulated some MS4s in places with populations less than 100,000 under the Phase I regulations. For example, the Florida Department of Environmental Protection regulated MS4s in many smaller towns and villages under the Phase I regulations, usually if the smaller communities were in the same county as or were in close geographic proximity to a medium or large MS4. According to USEPA (2018), approximately 855 MS4s are regulated under the Phase I MS4 regulations. The Phase I MS4 regulations also applied to certain construction and industrial activities (United States Environmental Protection Agency - Office of Water, 2005b).

The Phase II MS4 regulations – finalized by USEPA in December 1999[8] – required any MS4 in an urbanized area,[9,10] as well as any other MS4 designated by an NPDES permitting authority that was not regulated under the Phase I MS4 regulations, to obtain an NPDES permit.[11] In addition to being located in an urbanized area, the Phase II MS4 regulations included two additional ways that MS4s could be regulated: (1) serving a population of at least

[7] Although the Phase I MS4 regulations were finalized in December 1990, the first permit application deadline was 18 November 1991 for large MS4s and 18 May 1992 for medium MS4s (Franzetti, 2005).

[8] Although the Phase II MS4 regulations were finalized in December 1999, the deadline for local governments to obtain permit coverage was 10 March 2003 (United States Environmental Protection Agency - Office of Water, 2000).

[9] The United States Census Bureau designates "urbanized areas" as Census-recognized communities of 50,000 people or more. Since the Census Bureau updates the urbanized area designations after each decennial national census, the population of MS4s regulated under the Phase II MS4 regulations expands over time. However, the number of newly regulated Phase II MS4s following the 2010 census was very small compared with the number of MS4s regulated based on the 2000 census.

[10] Although the Phase II MS4 regulations technically only require permits for those areas delineated as urbanized areas by the Census Bureau, the permitted area for most regulated MS4s is the entire local jurisdiction, including non-urbanized areas (Galavotti et al., 2012). In fact, 14 states require the entire local jurisdiction be included under Phase II MS4 regulations if any portion of the jurisdiction is delineated as an urbanized area (Galavotti et al., 2012).

[11] Although most MS4s are regulated under either the Phase I or Phase II MS4 regulations, some relatively small number of MS4s are regulated under both Phase I and Phase II MS4 regulations (Galavotti et al., 2012).

10,000 with a population density of at least 1,000 people per square mile; or (2) contributing substantially to the pollutant loadings of a physically interconnected, regulated MS4 (United States Environmental Protection Agency - Office of Water, 2012). The "small" MS4s regulated under the Phase II regulations include a variety of "non-traditional" (i.e., non-municipal) MS4s, such as MS4s owned by universities, hospitals, prisons, federal military installations, as well as state and local departments of transportation. According to USEPA (2018), roughly 6,700 MS4s are regulated under the Phase II MS4 regulations. The Phase II MS4 regulations provided some flexibility in permitting, specifically regarding permit waivers and phasing-in of permits (United States Environmental Protection Agency - Office of Water, 2005b, 2012). The Phase II MS4 regulations also applied to certain construction activities (United States Environmental Protection Agency - Office of Water, 2005b).

The MS4 regulations require a permit holder to develop a stormwater management plan comprising six elements, known as "minimum control measures": (1) public education and outreach; (2) public participation/involvement; (3) illicit discharge detection and elimination; (4) construction site runoff; (5) post-construction runoff control; and (6) pollution prevention / good housekeeping (United States Environmental Protection Agency - Office of Water, 2005a).

Local governments required to obtain NPDES permit coverage under the Phase I and Phase II MS4 regulations are located in every state (Figure 1.1). The federal Clean Water Act limits the term of NPDES permits – including MS4 permits – to five years, meaning that most Phase I MS4s are currently in their sixth permit cycle, while most Phase II MS4s are currently in their third or fourth permit cycle (Galavotti et al., 2012).

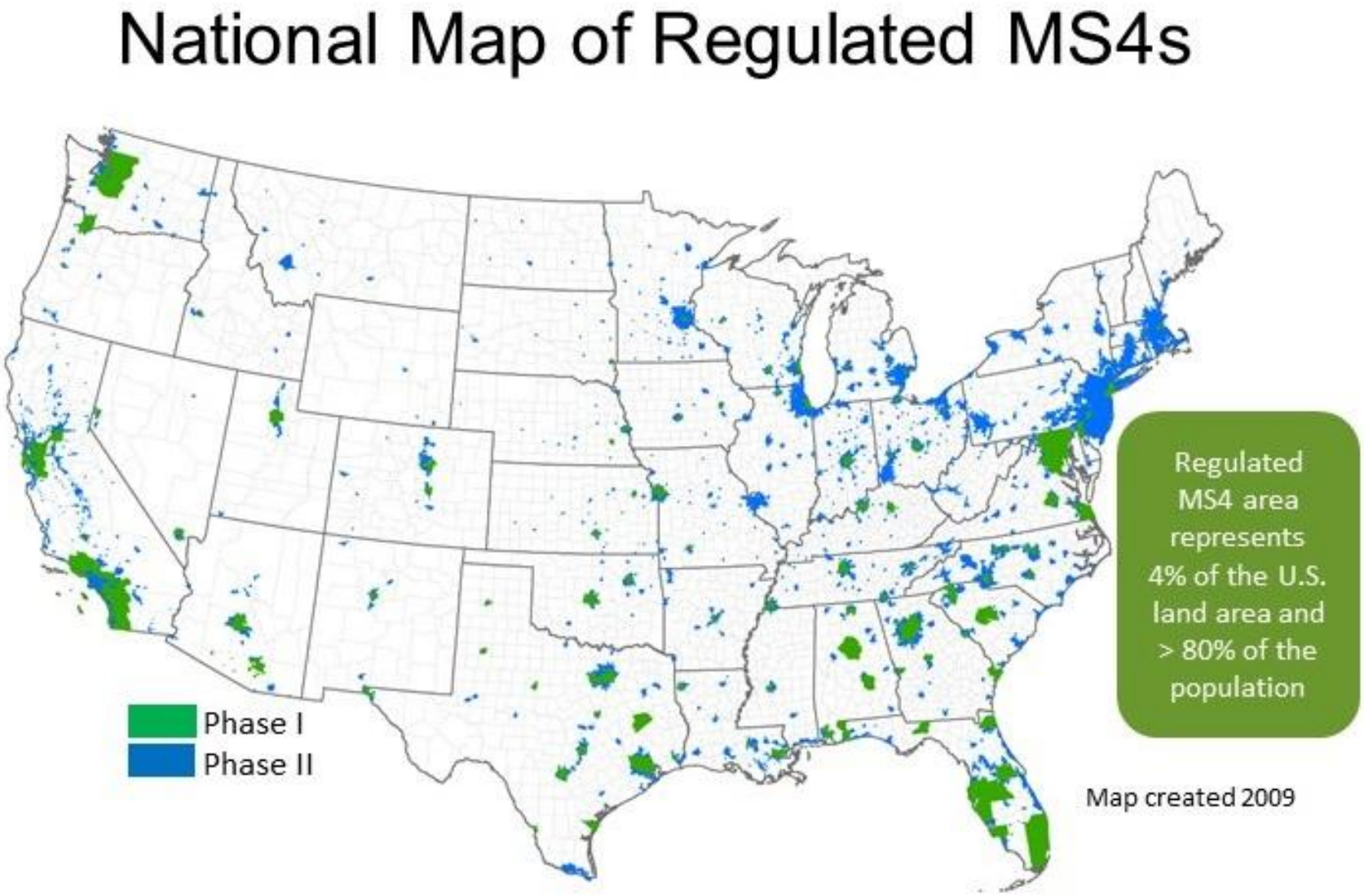

Figure 1.1. Map of regulated MS4s in the contiguous United States.
[Map image from www.epa.gov/npdes/stormwater-discharges-municipal-sources.]

1.2.2 CSO regulations

In 1994, USEPA finalized its CSO Control Policy (United States Environmental Protection Agency, 1994),[12] which defines combined sewer systems (CSSs) and CSOs as follows:

> "A combined sewer system (CSS) is a wastewater collection system owned by a State or municipality... which conveys sanitary wastewaters (domestic, commercial, and industrial wastewaters) and storm water through a single-pipe system to a Publicly Owned Treatment Works (POTW) Treatment Plant... A CSO is the discharge from a CSS at a point prior to the POTW Treatment Plant."

The CSO Control Policy set the stage for USEPA and state permitting authorities to begin regulating CSOs through NPDES permits. In many places across the United States, enforcement of the CSO Control Policy has largely taken the form of consent decrees or consent agreements between USEPA, state and/or local regulatory agencies, and CSO permittees. While the terms of these consent decrees, orders, and agreements vary, the CSO Control Policy generally aims to bring CSO permittees into compliance with the Clean Water Act by abating CSOs.

The estimated 830 combined sewer systems in the United States (United States Environmental Protection Agency - Office of Water, 2004) are mostly concentrated in states in the northeastern quadrant of the country, especially Pennsylvania, Indiana, Illinois, Ohio, New York, Michigan, West Virginia, Maine, New Jersey, Massachusetts, and Vermont (Figure 1.2). The infrastructure upgrades required by enforcement of the CSO Control Policy are significant. For instance, in the Pittsburgh region, current estimates place the cost of bringing existing CSOs in compliance with the CSO Control Policy between $2 billion and $4 billion over the next 15 to 20 years (Allegheny County Sanitary Authority, 2012). Similar multi-billion-dollar investments are being mandated and made in many other metropolitan regions across the United States (United States Environmental Protection Agency, 2018a).

[12] The CSO Control Policy codified and elaborated the CSO Control Strategy finalized by USEPA in 1989 (United States Environmental Protection Agency, 1989).

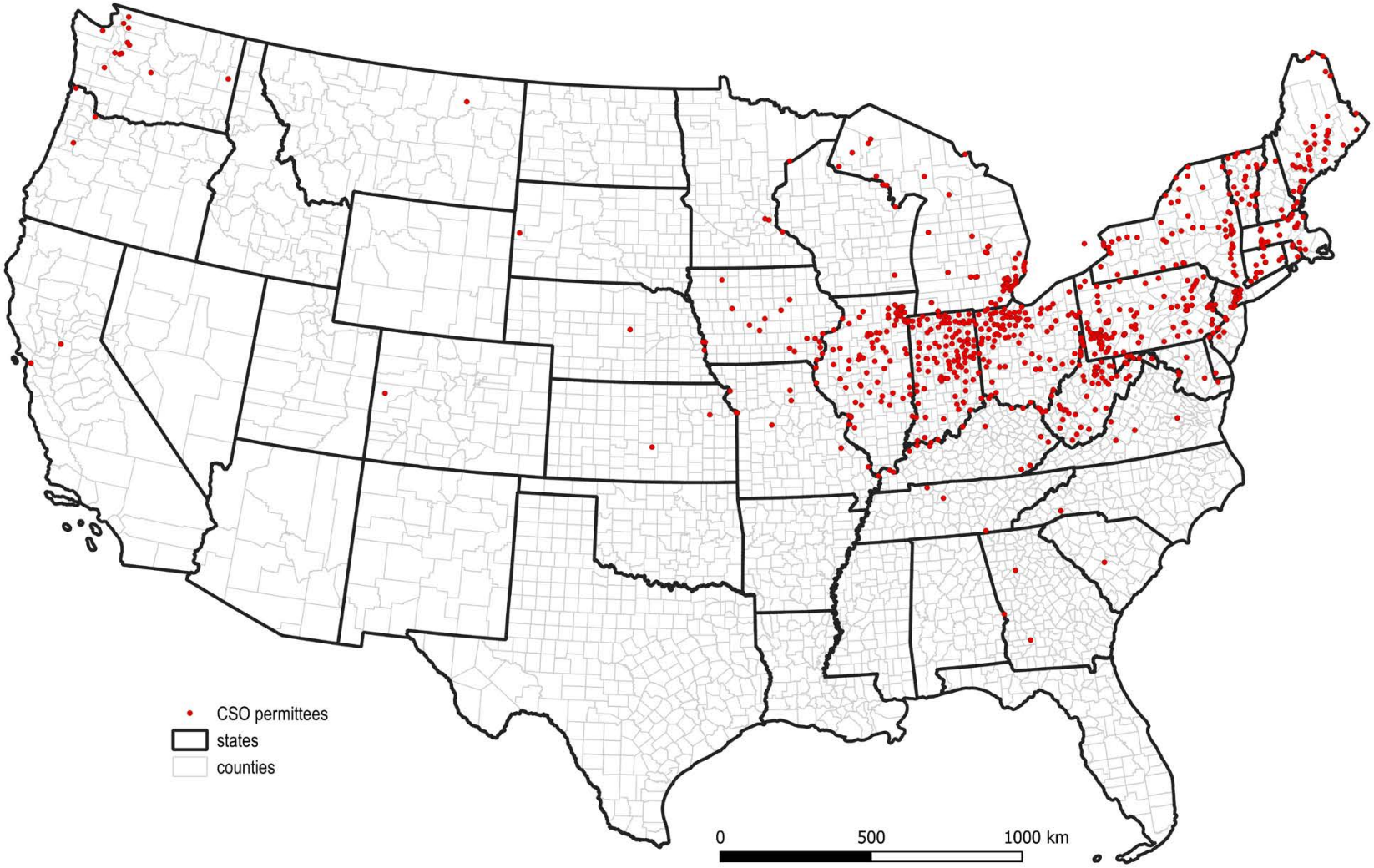

Figure 1.2. Map of CSO permittees in the contiguous United States.
[CSO permittee data from www.arcgis.com/home/item.html?id=004909c6679a4289b629a1c26278224c.
Jurisdiction boundary source is United States Census Bureau 2014 TIGER/Line shapefiles.]

1.3 RESEARCH QUESTIONS

This research consists of three primary branches: emergence, diffusion[13], and form. These three branches of inquiry focus on the following research questions:

> emergence: Why, how, and under what conditions was the first stormwater fee in the United States enacted?
>
> diffusion: How, why, and under what conditions did stormwater fees spread among local governments across the United States during the last 50 years?
>
> form: Why have most stormwater fees in the United States been independently enacted by individual local governments rather than collectively by groups of local governments (e.g., all or some of the subcounty governments in a county or special-purpose district)?

In other words, this dissertation inquires why certain local governments in the United States enacted stormwater fees in certain places, at certain times, and in certain forms. Specific hypotheses associated with each of these broad research questions are presented in subsequent chapters.

[13] Throughout this dissertation – especially in Chapter 3 – I use the term "diffusion" in the tradition of social and political scientists studying the diffusion of ideas or innovations (e.g., Rogers 2003) and policies (e.g., Berry and Berry 2014). Whereas physical and natural scientists use the term diffusion to describe the movement of particles within physical, chemical, or biological systems according to certain physiochemical principles, political and social scientists use the term to describe the movement of ideas, innovations, or policies within social or political systems according to sociopolitical principles. I discuss theories of policy diffusion in greater detail in Chapter 3.

1.4 MOTIVATIONS AND CONTRIBUTIONS

The primary motivation of this research is to better understand the birth, growth, and institutional structure of stormwater fees in the United States, phenomena that – to date – have been minimally examined with rigorous, systematic research. As such, this research can be considered primarily "phenomenon-driven" research (Eisenhardt & Graebner, 2007). In addition to contributing to theoretical developments in an array of interrelated domains, this dissertation also advances the praxis of local and regional governance, particularly as pertains to stormwater and sewer management, especially in metropolitan regions within the American federalist system of government. With respect to theory, the main challenge for this research was not in discovering or building appropriate theoretical frameworks, but rather in selecting from among an abundance of relevant frameworks. This theoretical richness was particularly pronounced in framing my inquiry into stormwater fee forms, with many potentially applicable frameworks that focus on various aspects of institutional collective action and the governance of metropolitan regions. Given this theoretical cornucopia, my research does not seek to build or discover new theory so much as to test, compare, and refine the scope and parameters of existing frameworks.

1.4.1 Theoretical motivations and contributions

Theoretically, this research is motivated by and contributes to the development of several theoretical frameworks: collective learning; multiple streams; policy innovation and diffusion; and institutional collective action. Specific motivations and contributions of this dissertation with respect to these primary theoretical frameworks are discussed in subsequent chapters.

More generally, this research is theoretically framed in the extensive literature on intergovernmental relations, particularly in federalist systems like the United States, and particularly with respect to environmental regulation. As noted previously, federal legislation – often filtered through state agencies – has predominately driven regulation of local and regional stormwater systems in the United States. As such, regulation of stormwater systems in the United States can be seen as a continuation and extension of the "rise of mandates" era in American federalism, with the federal government asserting more direct control over domestic affairs once largely the purview of state and/or local governments (Derthick, 2008). The

increased federal regulatory focus on stormwater and combined sewer systems over the past three decades has also occurred during a period when public spending on water and wastewater infrastructure by state and local governments increasingly outpaced federal spending (Musick & Petz, 2015). Moreover, the federal regulatory focus on stormwater and combined sewer systems also followed the wave of "tax revolt" that began in the late 1970s, when many states imposed strong limitations on the taxing and spending powers of local governments (Bennett & Dilorenzo, 1982; Lowery & Sigelman, 1981).

While regulation of stormwater systems in the United States has been mandated primarily by federal legislation, the processes leading to relevant federal regulations have often involved substantial negotiations with states, local governments, and other stakeholders. For instance, the Phase 2 MS4 regulations arose out of a decade-long negotiated rulemaking process involving intense negotiations between USEPA and members of an advisory committee including representatives of local governments, industry groups, and other stakeholders (Ryan, 2011). Recognizing the wide variation in local circumstances, the final Phase 2 MS4 regulations specified only a set of minimum measures (i.e., the six minimum control measures), leaving regulated entities substantial flexibility in designing and implementing stormwater management programs (Aguilar & Dymond, 2016; Galavotti et al., 2012; Ryan, 2011).

Along with the "vertical" dimension involving relations among federal, state, regional, and local levels of government, the regulation of stormwater systems in the United States also involves "horizontal" relationships among local governments, often within metropolitan or other geographic regions. Like many problems of inter-municipal governance, the physical forces governing stormwater and sewer flows disregard jurisdictional borders, creating significant interdependences and potential externalities among neighboring local governments. As such, the problem of managing interdependent stormwater and sewer systems involving multiple local governments represents one of many contentious and consequential challenges in inter-municipal, regional, and metropolitan governance. In an increasingly interconnected and globalized world, metropolitan regions have emerged as an important "unit of political process and economic competition" (D. Y. Miller & Lee, 2011). However, in the absence of general-purpose regional metropolitan governments, the highly decentralized, federalist system of American government presents many challenges to – and opportunities for – coordinated, cooperative, collaborative, and – failing all else – coerced collective action among quasi-

sovereign metropolitan municipalities (D. Y. Miller, 2002; D. Y. Miller & Cox, III, 2014). These horizontal, inter-municipal aspects of intergovernmental relations are particularly pertinent to my inquiries into stormwater fee form.

1.4.2 Practical motivations and contributions

Across the United States, especially in many metropolitan regions, heated debates rage about the most efficient and equitable means to meet the interrelated and expensive regulatory requirements to abate water pollution from CSOs and MS4s. Hundreds of municipalities across the country have decided that stormwater fees are a crucial component of overall, integrated stormwater and sewer management strategies because – as noted above – these fees not only provide vital revenues, but also more accurately price service demand, and can incentivize distributed investment in "green" infrastructure projects that attenuate stormwater runoff by retaining rainfall where it falls and meltwater where it melts. Proponents maintain that such distributed, "green" strategies represent more efficient and equitable approaches than exclusively building larger pipes and treatment plants in the systems' downstream reaches, a strategy which may place disproportionate financial burden on lowland municipalities. By providing a comprehensive, rigorous evaluation of the evolution of stormwater fees among local governments in the United States, this research aims to help citizens, engineers, and elected officials better understand, debate, and design stormwater fees in their own jurisdictions.

1.4.3 Existing stormwater fee literature

A large body of publications over the past four decades have surveyed, documented, and analyzed various aspects of stormwater fees in the United States. Some of the earliest publications detail the histories, characteristics, and benefits of stormwater fees and stormwater utilities implemented by specific local governments (Cyre, 1982, 1990; Diessner, 1990; Ferrari, 1987; Garner, 1990; Honchell, 1986; Lynard, Finnemore, Loop, & Finn, 1980; Poertner, 1981; Stitt, 1986; H. Wilson, 1990). From such case studies, and from principles and theories of public finance, these and other early publications (Cyre, 1983; Hardten, Benson, & Thomson, 1990; Mussman & Greig, 1991; Priede, 1990a, 1990b) discern sets of best practices, principles, and

strategies for local governments interested in establishing a stormwater fee or stormwater utility. At least one early study prospectively assessed the feasibility and potential impact of stormwater fees for a particular set of local governments (Lindsey, 1990a). Building on the implementation principles, practices, and strategies emerging from the early literature, some publications following the promulgation of the Phase 2 MS4 regulations in December 1999 focused specifically on assessing the potential of stormwater fees to help local governments meet the anticipated costs associated with the Phase 2 MS4 permit requirements (Brisman, 2002; Treadway & Reese, 2000). Since the earliest case studies, researchers and practitioners have continued to document and analyze specific cases of local governments enacting, implementing, and defending stormwater fees and utilities (Anantapadmanabhan, 2016; Atherton & Kutz, 1995; A. T. Brown, 2001; Chandler, 2012, 2015; Charles River Watershed Association, 2007; Diessner, 1993; N. E. Gray, 1995; Grimes & Schumacher, 1992; Hargett, 1992; Hoskins, 2006; B. D. Keller, 1999; Lindsey, Rubleske, & Rummel, 1996; Niermeyer, 1993; Null, 1995; Preston, 2008; Spray & Hoag, 2004; Veal & Mullins, 2003; Ward, Kabalin, & Sawatzky, 2003; Zolezi, 2009).

As stormwater fees and stormwater utilities became more prevalent across the United States, publications began to present comparisons among larger numbers of cases, continuing to document emerging trends and recommend implementation practices, principles, and strategies (American Public Works Association, 1991; Busco & Lindsey, 2001; Damico & Curtis, 2003; Finck & Tam, 2012; Forester Media, 2015a, 2015b; Grigg, 2013; Kaspersen, 2000; Lindsey, 1988; Matichich et al., 2013; Metropolitan Area Planning Council, 2010; New England Environmental Finance Center, 2005; Reese, 2007a; Sharples, 2007; B. R. Smith, 2007; van der Tak, Bishton, Taylor, & Matichich, 2012; B. P. Walker, 2001; Woolson, 2004). Some publications have focused solely on generalized practices, principles, and strategies for implementing stormwater utilities and fees with little to no mention of specific cases (Berthiaume, Quiroz, & Ivey, 2015; Duncan, 2001; Pigott, 1993).

In analyzing the legal, administrative, and political issues facing local governments interested in implementing stormwater fees and utilities, some literature also focuses on or incorporate insights from court cases challenging various aspects of stormwater utilities and fees implemented by several local governments (Cyre, 1987; Garner et al., 1994; McCarter, 2014; Schoettle & Richardson, 1993; Zielke, 1990), including cases compiled and analyzed by a

national organization representing stormwater and wastewater agencies (National Association of Clean Water Agencies, 2014, 2016). Building on earlier works, some publications also examined issues relevant to the enactment of stormwater fees and utilities by local governments in specific states, such as state statutes and case law (Anantapadmanabhan, 2016; Bowen, 2013; Chiaruttini, 2014; Chicago Metropolitan Agency for Planning, 2013; Cooperwasser, 2012; Glass, 2014; Horstmann & Bakare, 2017; Hoskins, 2006; Keehner & Trivedi, 2013; Lienhart et al., 2013; Marsello, 2011; Maryland Department of the Environment, 2008; Palmer, 1993; PennFuture, 2017; Sauer, 2011; J. Smith, 2006; L. Wilson & Lindsey, 1995). Some works have specifically focused on the feasibility of multi-municipal stormwater fees in specific areas (Rybarczyk, 2012). One study even assessed the feasibility of a statewide stormwater utility in Vermont (Ali, Sandoval, & Schorr, 2013).

Other publications have focused on specific aspects of stormwater fees and stormwater utilities, such as: credit programs, credit trading programs, and other stormwater retrofit financing programs (S. Brown & Sanneman, 2017; Doll & Lindsey, 1999; Doll, Scodari, & Lindsey, 1998; Dougherty, Hammer, & Valderrama, 2016; Ellard, 2010; Kertesz, Green, & Shuster, 2014; Reese, 1996, 2007b; Sands, 2012; Szalay, 2011; Twigg, 2014; Valderrama et al., 2013; Valderrama, Levine, Yeh, & Bloomgarden, 2012); the impact of different fee structures (Fedorchak, Dymond, & Campbell, 2017); multi-jurisdictional approaches (Taylor, Thomas, Baughman, Taylor, & Abercrombie, 2007); assessment of stormwater fees on federal property (Kaspersen, 2011); public outreach (American Rivers, 2016; Beierle, Chinn, & Williams, 2013; Chandler, 2012, 2015; Henderson & Eckl, 2012; A. Vicari, 2015); and public perception (OpinionWorks, 2015).

As stormwater fees and utilities became more widespread across the United States, a number of formal and semi-formal surveys (Benson, 1993, 2002; B. D. Keller, 2002; Lindsey, 1990b) – and even meta-surveys (Lindsey & Doll, 1998) – emerged documenting and analyzing various characteristics of stormwater fees and utilities.[14] While many of the earliest surveys are not readily accessible today, several surveys of stormwater utilities and fees have been and continue to be regularly administered at national (Campbell et al., 2017; Kumar, White, Jha, &

[14] At least one survey of stormwater fees and utilities was conducted and reported as part of a survey of drinking water and sanitary wastewater fees (Raftelis Environmental Consulting Group, 1998).

Merritt, 2016),[15] regional (Southeast Stormwater Association, 2015), and statewide (Florida Stormwater Association, 2016) scales. The results of at least two state-specific stormwater fee surveys are available through interactive web applications (Harkins & Berahzer, 2017; Hughes & Kirk, 2018).

In addition to the literature published by researchers and practitioners, USEPA has also directly published (United States Environmental Protection Agency, 1997, 2008, 2009a, 2009b) or financed (Burchmore, Cyre, Harrison, Reese, & Tucker, 2006; LaDuca & Kosco, 2014) several guidance documents intended to provide information to help local governments assess, implement, and improve financing mechanisms for stormwater management programs.

Although much of the literature on stormwater fees has focused on the United States, some publications examine stormwater fees in other countries including France (Le Nouveau et al., 2013), Germany (Bertram et al., 2017; Keeley, 2007), South Africa (Fisher-Jeffes & Armitage, 2013), Canada (Campbell et al., 2017; Environmental Commissioner of Ontario, 2016), as well as Australia, Brazil, Ecuador, and Poland (Tasca et al., 2017).

While the existing rich body of literature on stormwater fees is full of individual case studies as well as many cross-case comparisons and syntheses, very little existing literature – excepting Kea, Dymond, and Campbell (2016) – systematically or rigorously analyzes the political, demographic, geographic, and other factors driving the diffusion and form of stormwater fees in the United States.

My research advances the existing literature on stormwater fees in the United States in four key ways. First, the emergence branch of this dissertation presents a novel case study of what appears to be the first stormwater fee in the United States, a case that is largely overlooked, dismissed, or mischaracterized in the existing literature. This case study identifies several important issues and themes that continue to characterize stormwater fee debates and deliberations today. Second, building on Kea, Dymond, and Campbell (2016) and on Campbell et al. (2017), the diffusion branch of this research significantly advances the data and analyses on the patterns of stormwater fee diffusion among local governments in the United States. Third, by contributing structured analyses of factors facilitating or inhibiting the formation and endurance of multi-jurisdictional stormwater fees, the form branch of this dissertation substantially extends the relatively limited subset of existing research into multi-jurisdictional stormwater fees.

[15] In addition to the United States, Campbell et al. (2017) also survey stormwater utilities in Canada.

The fourth way this research advances the existing literature on stormwater fees is by analyzing stormwater fee phenomena through the lens of various established and emerging theoretical frameworks of public policy processes. Although stormwater fees are undoubtedly public policies, this dissertation appears to be the first research to use theoretical frameworks of the policy process to frame inquiries into stormwater fee phenomena. By structuring inquiries according to policy theoretic frameworks, this dissertation represents a first step towards organizing, executing, and interpreting stormwater fee research in more structured, consistent, and comparable ways. This theoretically framed inquiry is crucial for discerning key causal mechanisms and contextual factors shaping stormwater fee policy outcomes across states, regions, and localities. The existing literature is full of principles, strategies, best practices, and learned lessons inductively generalized from numerous case studies and cross-case comparisons. However, local elected officials, engineers, and citizens may benefit little – and may even potentially be misled – by recommendations or lessons inductively derived from the experiences other communities if those recommendations or experiences are not framed in a way that allows structured analyses of which contextual factors shaping stormwater fee outcomes vary between the relevant communities. This research aims to provide practitioners of local and regional governance across the United States – and potentially in other countries – with theoretically structured sets of insights they can use to better understand, deliberate, and design stormwater fees in their own communities. These insights should prove particularly useful in the many states where stormwater fees are not yet well or widely established (e.g., Pennsylvania, Maine, Missouri, Delaware, the Dakotas), especially those states currently without any documented stormwater fees (i.e., Connecticut, Louisiana, Mississippi, New Hampshire, New Jersey, New York, Rhode Island, Wyoming). However, since stormwater fees are living institutions undergoing constant reevaluation, redesign, repeal, and resurrection, this research may also prove useful for communities in states where stormwater fees are long-established and already widespread (e.g., Florida, Minnesota, Wisconsin, Washington, Texas, Ohio).

1.5 METHODOLOGY

To investigate my research questions, I applied a medley of methods from along the quantitative-qualitative spectrum. I applied different modes of inquiry, methods of data collection, and analytical techniques along each of the three branches of inquiry outlined above. By using a variety of methods and conceptual frameworks, this dissertation aims to provide rich, robust analyses of stormwater fee emergence, diffusion, and forms in the United States. Further details about the methods used to investigate each of the three branches of this research are provided in the respective chapters.

1.5.1 Qualitative case studies: emergence and form

To investigate stormwater fee emergence and form, I conducted largely qualitative case studies. While the emergence case study was necessarily historical, I considered a mixture of historical and contemporary evidence in the case studies of stormwater fee form. In all the case studies, I extracted and collected evidence from archival records and documentation. In the case studies of stormwater fee form, I amended the documentary and archival sources of evidence with a set of in-person, semi-structured interviews, the details of which I discuss further in Chapter 4.

Since my motivation was to assess the applicability of existing theoretical frameworks rather than to build new theory, I used primarily descriptive and deductive rather than inductive analytical strategies to analyze the evidence generated in the case studies. More specifically, I assessed the fit of each selected theoretical framework by comparing posited concepts and causal mechanisms with the empirically observed evidence in each case. In this respect, my case study analyses employed deductive, theory-testing process tracing within each case (Beach & Pedersen, 2013). In the form case studies where I had multiple cases, I also compared evidence and synthesized findings across the cases using explanatory typological analysis (Elman, 2005) based on selection of “diverse” (Gerring & Seawright, 2007) or “polar” (Eisenhardt, 1989; Eisenhardt & Graebner, 2007) cases. Whereas I compared across multiple cases using a single theoretical framework in inquiring into stormwater fee form, I compared the perspectives and fit of two distinct theoretical frameworks in a single case in inquiring into stormwater fee

emergence. I discuss my approach to case selection for the emergence and form case studies in greater detail in Chapter 2 and Chapter 4, respectively.

1.5.2 Quantitative analyses: diffusion

To investigate stormwater fee diffusion, I conducted a predominately quantitative analysis of a cross-sectional dataset characterizing the approximately 39,000 legally recognized, general-purpose local governments in the United States. I used a variety of statistical, graphical, and mapping techniques to explore and explain patterns of stormwater fee diffusion in the dataset. The data and analytical techniques I used to inquire into stormwater fee diffusion are discussed in greater detail in Chapter 3.

1.5.3 Epistemology and ontology

Although a detailed discussion of the philosophical perspectives and personal worldview undergirding this research is beyond the scope of this dissertation, I take a brief moment here to address some key epistemological and ontological considerations, following the advice of Creswell (2014, p. 6) to "make explicit the larger philosophical ideas."

I adopt and apply a generally pragmatic perspective in this research, "focusing attention on the research problem... and then using pluralistic approaches to derive knowledge about the problem" (Creswell 2014, p. 11). This pragmatism, however, leans more towards a post-positivistic perspective in some parts (i.e., in the more quantitative diffusion inquiries) and more towards interpretive or constructivist positions in other parts (i.e., in the more qualitative emergence and form inquiries). In inquiring into stormwater fee diffusion, I rely on numerical and categorical data that I take to accurately represent, or at least estimate, some intersubjectively understood characteristics or concepts associated with some intersubjectively understood entities. For example, in the diffusion inquiries, I analyze quantitative relationships between stormwater fee enactment by local governments in the United States and certain demographic variables regularly quantized by an agency of the federal government. In conducting these analyses, I neither investigate the subjective meanings nor critically question the historical evolution of the concepts purported to be measured or estimated by these variables.

Relying primarily on words rather than numbers as representations of theorized concepts, the emergence and form branches of this research more centrally and explicitly focus on perception, interpretation, construction, and communication of individual and intersubjective realities. Still, in these more qualitative case studies, I largely presume that the words people use reflect some intersubjectively understood concepts without critically questioning the values or contradictions underlying the concepts. For example, in the emergence case study, several local officials express the importance of expanding storm sewers in the city to facilitate future "development." In this research, I generally accept that "development" has or had some intersubjectively understood meaning without critically questioning the historical construction of the concept of "development" or exploring how the meaning of "development" varied among individuals in the case study beyond what those individuals expressed through their documented words.

This pragmatic, flexible, and eclectic philosophical perspective is well suited to my mixed-methods mode of inquiry, and to the diverse, but interrelated array of phenomena and processes on which this research focuses.

1.5.4 Validity and reliability

A thorough review of the extensive literature on research validity and reliability (e.g., Creswell and Miller 2000; Cypress 2017; Denzin 1978; Lincoln and Guba 1985; Morse et al. 2002) is beyond the scope of this dissertation.[16] However, the importance of these issues to all research endeavors merits at least brief discussion here. Adopting the largely post-positivist perspective described above, I relied on several procedures and techniques to ensure the validity and reliability of this research.

Since the dataset used to inquire into stormwater fee diffusion was constructed primarily by compiling and extending several other datasets, the validity of my research into stormwater fee diffusion rests largely on the validity of the constituent datasets. The reliability of my research into stormwater fee diffusion mainly rests on my use of standardized statistical techniques to analyze publicly available data. Anyone with the time and a mind to do so can recreate the dataset and analyses used in my inquiries into stormwater fee diffusion.

[16] Although I focus here on validity and reliability, I recognize that these terms are somewhat controversial, especially as applied to qualitative research where some researchers prefer terms like rigor or trustworthiness.

The procedural validity of the more qualitative parts of this research rely mainly on conceptual triangulation among data sources, theories, and methods (Creswell & Miller, 2000; Denzin, 1978). As the sole investigator, it was not possible for me to triangulate with other investigators (Creswell & Miller, 2000; Denzin, 1978) during the course of this research. However, review of this research by my committee members and others has served as an additional validity check. The validity of this research can be further examined *post hoc* through member checks by participants[17] as well as auditing of my documentation by other researchers (Creswell & Miller, 2000; Lincoln & Guba, 1985). The reliability of my case studies into stormwater fee emergence and form rests on three main pillars: (1) the publicly accessible nature of most of the evidence; (2) use of established theoretical frameworks; and (3) use of fairly standard coding techniques. Although the interviews I conducted in inquiring into stormwater fee forms are not replicable in any exact sense, I aimed to ensure the reliability of these sources of evidence by interviewing public officials using a semi-structured format and by providing a copy of the script I used in conducting the interviews (see Appendix C).

[17] Some people I interviewed already confirmed the validity of the form case studies.

2.0 EMERGENCE

Stormwater fees started somewhere. This chapter investigates why, how, and under what conditions the first stormwater fee in the United States emerged.[18]

2.1 THEORY

In investigating the emergence of the first stormwater fee in the United States, I apply, compare, and contrast two theoretical frameworks: the multiple streams approach – or framework – (Kingdon, 1984, 1995; Zahariadis, 2014) and the collective learning framework (Gerlak & Heikkila, 2011; Heikkila & Gerlak, 2013). These two frameworks are most appropriate to apply to the emergence branch of this research due to the focus of these frameworks on processes of policy production, creation, selection, innovation, emergence, and implementation.

2.1.1 Multiple streams

With roots in the "garbage can model" of organizational choice (M. D. Cohen, March, & Olsen, 1972), the multiple streams approach envisions public policies emerging from a turbulent, ambiguous decision-making system in which policy entrepreneurs create or take advantage of opportune moments (i.e., policy windows) to merge together the three streams posited to comprise a policy system: problems, policies, and politics (Kingdon, 1984, 1995; Zahariadis, 2014). The multiple streams approach takes as its unit of analysis either an entire policy system

[18] My claim that this case study examines the first stormwater fee enacted in the United States is based on review of the existing stormwater fee literature. If a stormwater fee was enacted in the United States earlier than the case studied here, I did not find it documented in the existing stormwater fee literature.

or a particular decision within a policy system. Here, I apply the multiple streams framework to analyze the particular decision of a local American government to invent and enact the stormwater fee policy. The motivating question behind the multiple streams approach, as originally expressed by Kingdon (1984, p. 1) is "what makes an idea's time come?" The focus on the multiple streams approach on explaining the ripening of ideas makes this framework particularly well suited to frame my analyses of stormwater fee emergence.

Although other theoretical frameworks could be defensibly applied to my inquiry of stormwater fee emergence, the multiple streams approach is an especially suitable theoretical framework to apply to this branch of my research because management and financing of jurisdictionally and physically complex stormwater and sewer systems – especially in institutionally fragmented metropolitan regions – often exhibit many of the policy system characteristics on which the multiple streams approach focuses. By focusing on the process of political manipulation, the multiple streams approach flourishes in situations where problem definition and solution identification arise from dynamic, highly ambiguous, and inherently political processes of competitive, contentious meaning-making and information interpretation that no one person controls entirely, and within which end goals of various participants may not be completely clear or well defined (Zahariadis, 2014). In the multiple streams approach, the process of political manipulation is characterized by actors using labels and symbols to strategically alter meaning and emphasize certain problem or solution dimension over others (Zahariadis, 2014). The multiple streams approach posits a policy process wherein certain actors (i.e., policy entrepreneurs) with clear, typically self-interested goals manipulate policy-makers so that the policy-makers consider certain problem definitions and policy solutions (i.e., the definitions and solutions that serve the interests of the policy entrepreneur) over others. However, the multiple streams approach also posits that the acceptability of a policy solution is ultimately decided not by policy entrepreneurs, but by policy-makers acting in political and institutional contexts (Zahariadis, 2014). I also consider the multiple streams approach to be an appropriate framework with which to analyze stormwater fee emergence because – in many respects – adoption of a stormwater fee represents a significant alteration of a normative structure in a community (i.e., beliefs about the appropriate relationship between private property and public services), just the sort of a situation posited by Rommetveit (1976) to be prime candidates for garbage-can decision-making (Zahariadis, 2014).

As reflected in my hypotheses regarding stormwater fee emergence – presented below – I focus on a few particular aspects within the multiple streams framework to help explain the emergence of the first stormwater fee in the United States. Within the problem stream, I focus on how local indicators of stormwater impacts as well as focusing events (Birkland, 1997) combined to open a policy window within which the first stormwater fee in the United States emerged. In the politics stream, I explore how the national mood regarding environmental protection – as reflected in the spate of federal environmental protection legislation enacted in the early and mid-1970s – influenced the emergence of the first stormwater fee in the United States. With respect to policy entrepreneurs, I primarily explore which individuals and organizations played the role of policy entrepreneurs in the invention, consideration, and enactment of the first stormwater fee. I specifically focus on the access policy entrepreneurs had to local decision-makers, the resources available to those policy entrepreneurs, and the strategies those policy entrepreneurs used to define the problem and sell the solution to policy-makers, taking into account the various elements posited to comprise the "primeval soup" (Kingdon, 1984, 1995) of competing ideas in the policy stream (i.e., value acceptability, technical feasibility, resource adequacy, network integration).

By applying the multiple streams approach in a novel case study of a stormwater fee policy enacted by a local government, I intend to contribute to the community of what Zahariadis (2014, p. 44) terms "second-generation" multiple streams scholars demonstrating the "versatility and breadth of the framework" by applying it to different levels of government (i.e., sub-nationally and internationally) and to new policies.

2.1.2 Collective learning

The collective learning framework integrates insights from organizational theory, network analysis, and public policy research in seeking to explain how learning products (e.g., new policies) emerge from learning processes, and how various features of collective settings (i.e., institutional structure, social dynamics, and technological / functional domains) – along with exogenous sociopolitical, physical, and economic shocks – influence individual and collective learning processes (Gerlak & Heikkila, 2011; Heikkila & Gerlak, 2013). It is this focus of the collective learning framework on the processes by which new policies emerge that makes it an

appropriate choice for inquiring into the emergence of the first stormwater fee in the United States.

The collective learning framework considers collective learning processes to occur as knowledge, information, and experience pass – although not necessarily in a linear or intentional fashion – through three phases: acquisition, translation, and dissemination (Gerlak & Heikkila, 2011; Heikkila & Gerlak, 2013). Within each of these learning phases, the collective learning framework posits a number of mechanisms, most of which can operate at the individual or collective level, such as: informational search and deliberative dialogue in the acquisition phase; analysis and heuristic processing in the translation phase; and transference and collective routines in the dissemination phase (Heikkila & Gerlak, 2013). The collective learning framework also posits two types of learning products, each identified in earlier collective learning literature: cognitive changes, such as new or altered ideas, beliefs, or values; and changes in collective behaviors or actions, such as new or altered routines, programs, plans, strategies, rules, or policies (Heikkila & Gerlak, 2013). Heikkila and Gerlak (2013) posit that cognitive learning products necessarily precede – although do not always lead to – behavioral learning products.

The collective learning framework also posits that an array of contextual factors can influence collective learning processes and products. The collective learning framework categorizes three broad "internal" characteristics of a collective context – structure, social dynamics, and the technological / functional domain – all of which are likely to be influenced by prevailing rules and norms (Gerlak & Heikkila, 2011; Heikkila & Gerlak, 2013). The collective learning framework also posits an array of "external" or exogenous factors outside the control of the actors in the collective" (Heikkila & Gerlak, 2013). Exogenous factors – such as the political, social, and economic climate – can influence collective learning processes and products, often in highly context-dependent ways.

As a relatively new framework, my policy emergence research contributes to the development of the collective learning framework simply by examining how particular factors

shape collective learning processes in a novel[19] case study. My emergence case study also contributes to the development of the collective learning framework by applying the framework alongside the multiple streams framework, which provides points of contrast and comparison between the two frameworks.

2.1.3 Multiple streams and collective learning: complements and contrasts

The collective learning framework offers an apposite contrasting – and, in some respects, complementary – perspective to the multiple streams framework. For one, the information translation mechanisms posited in the collective learning framework (e.g., heuristic processing, mental framing) provide useful explanations of how exactly policy-makers and policy entrepreneurs interpret ambiguous information in the multiple streams framework. Similarly, the information dissemination mechanisms in the collective learning framework (e.g., storytelling) also help explain how policy entrepreneurs strategically manipulate policy-makers in the multiple streams framework. Moreover, both the multiple streams framework and the collective learning framework recognize the central role of values and beliefs in policy processes, and both highlight the importance of institutional structures.

Despite these and other complementary points of connection between the multiple streams framework and the collective learning framework, there are also enough distinctions between the two frameworks to allow for contrasting interpretations and points of emphasis of how and why new policies emerge. In fact, Heikkila and Gerlak (2013) explicitly distinguish learning processes from the action of policy entrepreneurs as two distinct paths by which policy change may occur. Heikkila and Gerlak (2013) suggest that more research is needed to better understand how learning processes interact with other influences (e.g., policy entrepreneurs) on policy processes. By applying both the multiple streams framework and the collective learning

[19] Some existing literature discusses a stormwater fee enacted by the local government in my emergence case study. However, as discussed below, the literature I reviewed identifies the stormwater fee enacted by this local government as having been enacted years later than the stormwater fee on which my case study focuses. As such, my emergence case study is novel not in the sense that it is the first research to identify and analyze a stormwater fee enacted by this particular local government, but in the sense that it does appear to be the first research to inquire into a stormwater fee enacted by this local government years before the stormwater fee identified in the existing literature.

framework to my inquiry into the emergence of stormwater fees in the United States, this research is well positioned to assess the conceptual interconnections and gaps between the two.

2.1.4 Hypotheses on stormwater fee emergence

Informed by the multiple streams and the collective learning frameworks, as well as previous publications on stormwater fees in the United States, my inquiry into the emergence of the first stormwater fee in the United States aims to test the following hypotheses.

multiple streams

emergence hypothesis 1:
The first stormwater fee enacted in the United States was motivated in part by local public officials anticipating increased compliance costs flowing from the focusing event of the 1972 amendments to the federal Clean Water Act, an event which also reflected a shifting balance of interests towards environmental protection nationally, but also and especially locally.

emergence hypothesis 2:
Indicators of local stormwater impacts (e.g., water quality deterioration, flood damage) brought to the attention of local decision-makers drove – in part – the consideration and eventual enactment of the first stormwater fee in the United States, activating interest and attention by indicating a violation of certain values (e.g., environmental stewardship, socioeconomic equity) or beliefs.

emergence hypothesis 3:
A policy entrepreneur or entrepreneurs with sufficient access, resources, and strategies played a key role in the enactment of the first stormwater fee in the United States by using the aforementioned indicators, focusing event, and shift in national and local mood to create a policy window from which the first fee emerged.

collective learning

emergence hypothesis 4:
The enactment of the 1972 amendments to the federal Clean Water Act spurred the community that enacted the first stormwater fee in the United States to engage in search and deliberative dialogue to acquire information as to how they were going to meet anticipated compliance costs.

2.2 METHODS

To investigate the emergence of the first stormwater fee in the United States, I conducted an historical case study of the stormwater fee enacted in Billings, Montana in 1964. The case study method dovetails well with the theoretical frameworks I selected for the emergence branch of this research, particularly because the multiple streams approach emphasizes the strong context dependence of policy decisions and because the collective learning framework suggests that process-based research strategies are best suited for inquiring and understanding how learning products emerge from learning processes.

2.2.1 Case selection

According to previously published work (Campbell et al., 2017; Cyre, 1982; Diessner, 1990, 1993; Lindsey, 1990b; Poertner, 1981), the earliest stormwater fees in the United States were implemented between 1968 and 1974, primarily by city governments in the Pacific Northwest and Mountain West, including: Bellevue, Washington; Portland, Oregon; Boulder, Colorado; and Billings, Montana.[20] Although I designed this research and formulated hypotheses about stormwater fee emergence based on indications in previous work that the first stormwater fees in the United States were enacted in the late-1960s to mid-1970s, my initial research revealed that the stormwater fee in Billings, Montana was first implemented in 1964.[21] While stormwater fees first enacted in the late-1960s and throughout the 1970s may represent cases of policy emergence or invention (Berry & Berry, 2014) independent of the Billings stormwater fee enacted in 1964, this research focuses on the Billings case as apparently the first instance of stormwater fee enactment in the United States.

[20] While disagreeing on the year in which some of the earliest stormwater fees were first enacted, these previously published works agree – or at least do not contradict the other works – that the year of first implementation was prior to 1980 for these four cities.

[21] The existing literate may largely overlook the Billings case as the first stormwater fee in the United States because the stormwater fee enacted in Billings in 1964 was not implemented as part of a "stormwater utility." As noted by Burchmore et al. (2006), the existing literature on the earliest stormwater fees in the United States largely focuses on stormwater fees implemented as part of a stormwater utility, such as in Bellevue, Portland, and Boulder. The stormwater fee enacted in Billings in 1964 was implemented not as part of a stormwater utility but as a mechanism to finance a citywide bond issuance for a storm sewer expansion project.

2.2.2 Sources of evidence

The primary sources of evidence for this case study were newspaper articles. I reviewed microfilms of three newspapers operating in the Billings area in the mid-1960s: the *Billings Gazette*, the *Billings Times*, and the *Laurel Outlook*.[22] Having obtained evidence that the Billings city council enacted a stormwater fee in July 1964, I focused my review of the newspaper articles on the timeframe between April and November 1964, a few months before and after enactment of the stormwater fee. I browsed microfilms from the three newspapers looking for articles, advertisements, editorials, public notices, and any other items potentially related to stormwater issues in the city. I supplemented the newspaper records with evidence obtained through personal communication with several people in Billings. Another key piece of evidence was a legal opinion written by a justice on the Supreme Court of Montana in a court case about the stormwater fee enacted in Billings in 1964. In Appendix A, I present images of each piece of evidence cited in the main text, with key passages highlighted.[23]

2.2.3 Evidence coding

I coded sources of evidence using a coding framework comprised of key concepts identified in the multiple streams framework (Figure A.1) and the collective learning framework (Figure A.2).[24]

[22] Microfilms borrowed through inter-library loan from the Montana Historical Society.

[23] For ease of navigation, the parenthetical citations of evidence in the main text are hyperlinked to the relevant images in Appendix A, and the evidence images in Appendix A are hyperlinked back to the section of this chapter in which each piece of evidence is first cited.

[24] Coding performed using NVivo 11 software.

2.3 RESULTS

2.3.1 A fee is born

On the evening of Monday 27 July 1964, members of the city council in Billings, Montana voted 9-1 to approve Ordinance 3082 (Billings City Council, 1964), which established the first recurring, parcel-based stormwater fee in the United States (Blythe, 1964f). The stormwater fee enacted in Billings in 1964 was a tiered structure based on the total square footage of parcels of residential and commercial real property in the city (Blythe, 1964f; "Council Sets Rates, Charges and Rentals to Pay for $4 Million Dollar Storm Sewer," 1964).

The Billings city council enacted the stormwater fee to finance a $4,000,000, 20-year bond issue to expand and improve storm sewers in the city (Blythe, 1964f; "Notice of Special Election: City of Billings, Montana," 1964). Billings voters narrowly approved the storm sewer bond issuance – 6,827 votes (51.2%) in favor versus 6,512 votes (48.8%) against[25] – as part of a primary election on Tuesday 02 June 1964 ("Bond Issues Appear to Make Clean Sweep," 1964). As a revenue bond issue, the storm sewer bond issue required only a simple majority of votes for approval (Blythe, 1964c). In addition to candidates for the federal and state legislatures, governor, state supreme court, and a variety of other elected offices, two other bond issues – a $380,000, 20-year city bond issue for construction of a new fire station in western Billings[26] and a $500,000, 20-year county bond issue for construction and furnishing of a new nursing home – were on the same ballot as the city storm sewer bond issue. Although voters approved all three bond issues, the vote on the storm sewer bond issue was much closer – a roughly 2.4% margin –

[25] According to decennial census records, the population of Billings aged 18 years or older was 32,715 in 1960 and 39,843 in 1970. With 13,339 total votes cast, this means roughly 33% to 40% of the city's voting-age population cast votes on the storm sewer bond issue. However, the number of voters registered for the 1964 primary election in Yellowstone County was 33,322 ("Primary Ballots Could Be 203,000," 1964). With the population of Billings accounting for roughly 66% of the county population in 1960 and 70% in 1970, the number of registered voters in the city casting votes in the storm sewer bond issue can be estimated at closer to 56% to 60%.

[26] The fire station city bond issue was to finance relocation of two existing fire stations – the south side and Pioneer Park stations – to a newly constructed station in the West End subdivision as well as purchase of some additional firefighting equipment and construction of a firemen's training tower ("For a Better Billings," 1964).

than the nursing home and fire station issues, which were each approved by more than 35% margins ("Bond Issues Appear to Make Clean Sweep," 1964).

The 1964 storm sewer bond issuance in Billings focused on a sizable area of western and southwestern Billings (Figure 2.1, Figure 2.2, Figure 2.3), parts of which had been recently annexed into the city, and much of which was prone to flooding. Prior to the storm sewer expansions, drainage in the western parts of the city primarily relied on a series of irrigation and drainage ditches. The storm sewer expansions associated with the bond issuance would roughly double the city's then-existing storm sewer conveyance capacity (Blythe, 1964b).

Much of the technical work designing the proposed storm sewer expansion (Figure 2.1, Figure 2.2) was done by Morrison-Maierle Co., a local engineering firm contracted by the city. While available evidence does not directly indicate who came up with the idea for a stormwater fee to finance the storm sewer bond issue, some evidence suggests that Morrison-Maierle – which signed a contract with the city for the storm sewer expansion project in 1961 – may have not only originated the idea of a stormwater fee and introduced it to the city council as part of the "vast amount of research" the firm put into designing the project (Blythe, 1964c), but was also – along with two other engineering firms with offices in Billings – involved in planning "the promotion and public relations for acquiring the necessary financing" for the project ("Hearing Set in Airport Manager Dismissal Case," 1964). Other evidence, discussed below, indicates that the city considered five alternative methods of assessing fees to finance the storm sewer bond issue, but the available evidence does not clearly indicate who proposed these alternative financing mechanisms or if the city evaluated these alternatives independently or in consultation with Morrison-Maierle.

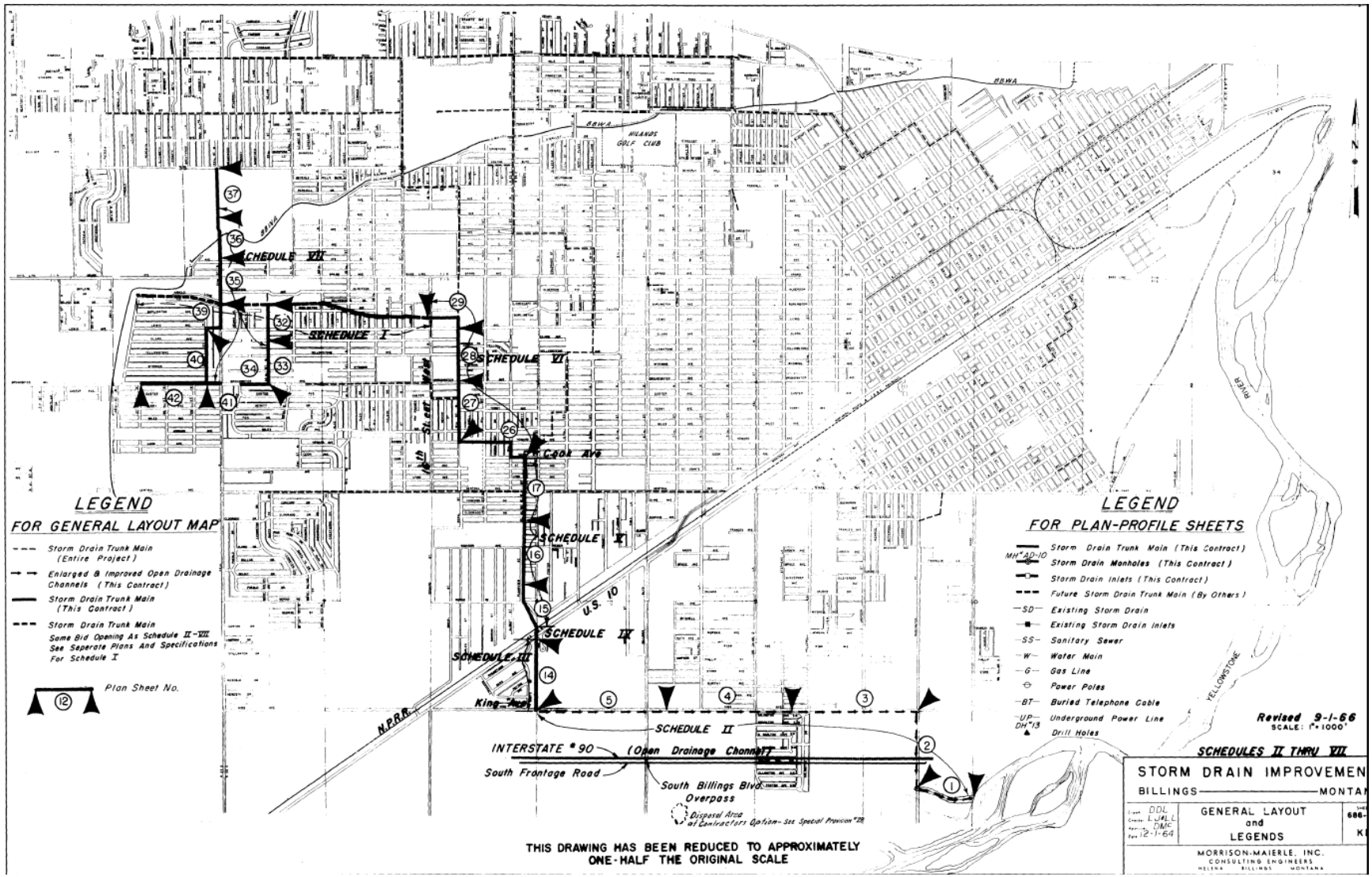

Figure 2.1. Storm sewer expansion plans (schedules II-VII) produced by Morrison-Maierle for the City of Billings in the mid-1960s.

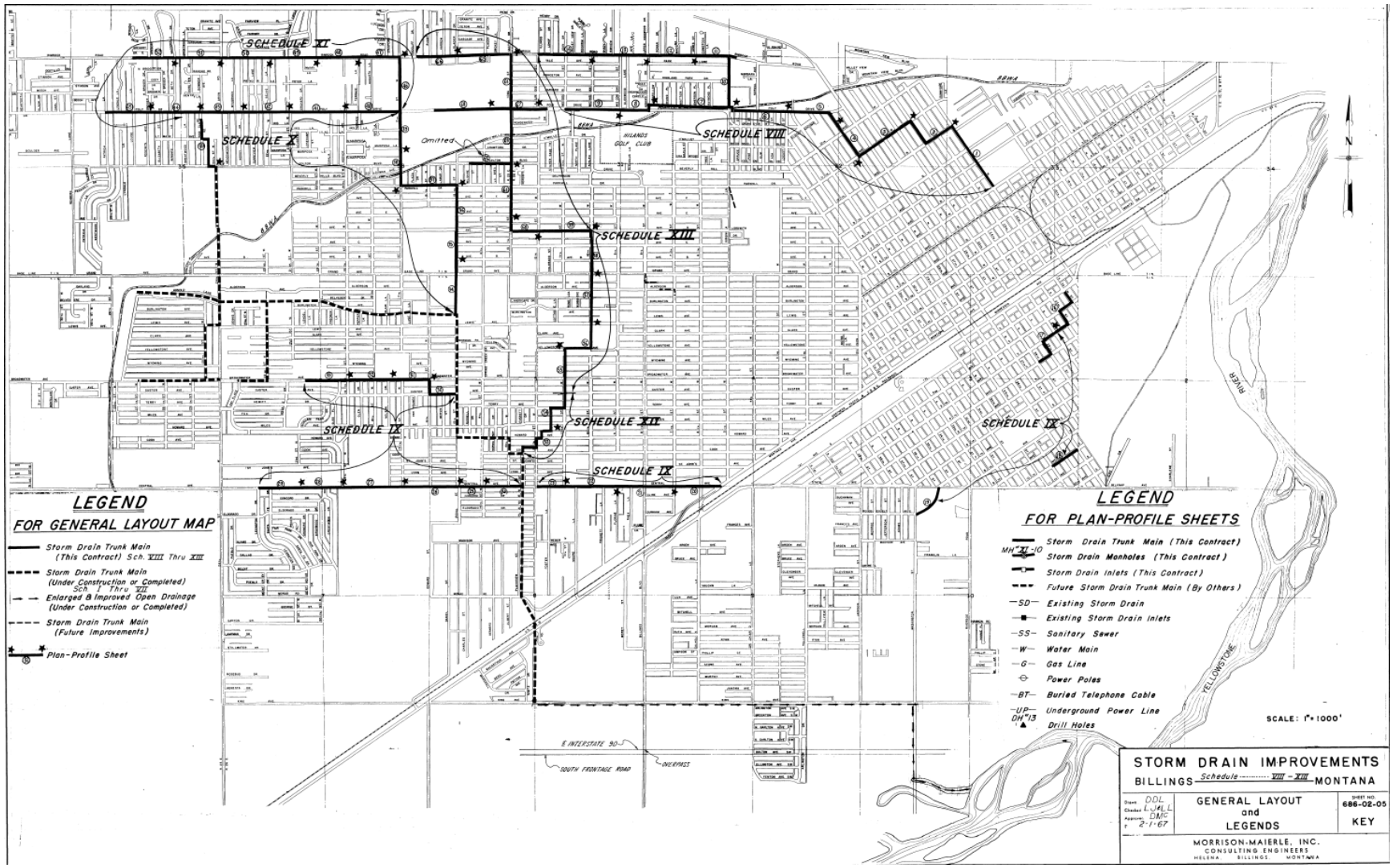

Figure 2.2. Storm sewer expansion plans (schedules VIII-XIII) produced by Morrison-Maierle for the City of Billings in the mid-1960s.

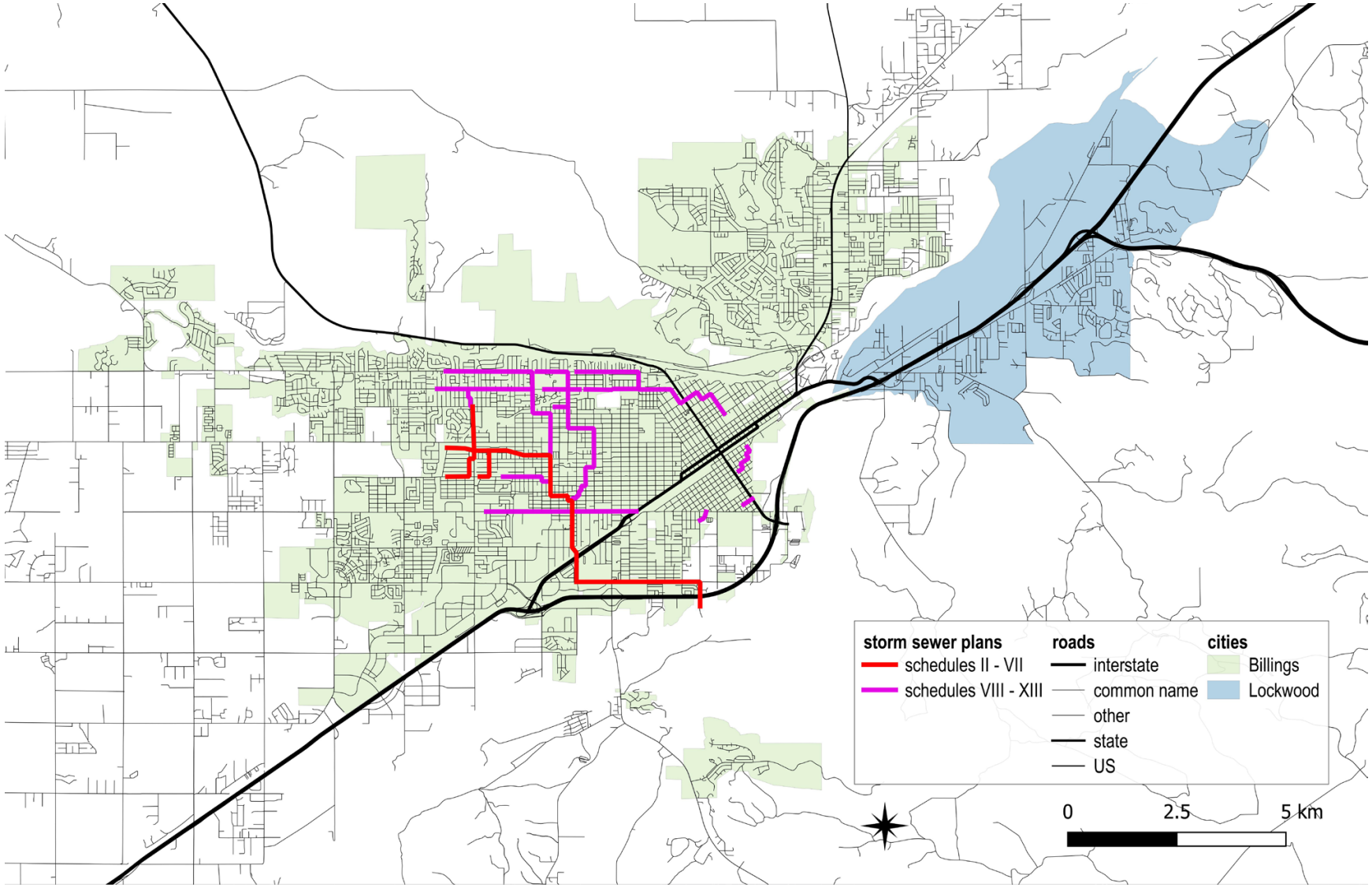

Figure 2.3. Mid-1960s storm sewer planned expansions in Billings, Montana shown relative to the current road networks and city boundaries in the Billings region. [Storm sewer plans digitized from original schedules. Road and jurisdiction boundary source is United States Census Bureau 2014 TIGER/Line shapefiles.]

2.3.2 Advocates

Supporters of the storm sewer bond issue recognized that sewers – as underground infrastructure, largely out of sight of the public – may be a harder sell to voters than for more visible initiatives such as a fire station or nursing home. However – in addition to framing the project as crucial to the long-term development of the city – supporters of the storm sewer bond issue maintained that the storm sewer expansion would save all city taxpayers money in the long run by preventing significant maintenance and repair costs for flooded and washed out streets, since road maintenance was managed on a city-wide basis.

Supporters of the storm sewer bond issue included some prominent civic organizations in the city. In advance of the storm sewer bond issue vote, the community planning committee of the Billings Chamber of Commerce released a statement supporting the project ("Absentee Voters Cast Bond Ballots," 1964). Organized support for the storm sewer bond issue also included the posting of a relief map illustrating the need for expanded storm sewers placed in west end shopping centers, pamphlets enclosed in water bills mailed out before the vote, and letters of support mailed to approximately 50 local civic organizations by the Greater Billings Association ("Absentee Voters Cast Bond Ballots," 1964). The Greater Billings Association also took out a full-page ad supporting the storm sewer and two other bond issues, which ran in the *Billings Gazette* on 26 May and 01 June 1964 (Greater Billings Association, 1964). The League of Women Voters of Billings also published more impartial, factual information about the three bond issues in the May 1964 issue of *Campaign Facts* (League of Women Voters of Billings, 1964).

Local newspaper coverage – especially in the *Billings Gazette* – leading up to the 02 June 1964 vote was generally very supportive of the storm sewer bond issue. In addition to two articles by reporter Sam Blythe, the *Gazette* ran unattributed editorials and other articles explicitly supporting the bond issue (Blythe, 1964b, 1964c, "For a Better Billings," 1964, "Mayor Sees Major Need for Sewers," 1964, "Vote 'Yes' on the Bond Issues," 1964). After the vote, the president of the Billings Chamber of Commerce publicly thanked the *Gazette* for "its outstanding efforts in its educational work" on the bond issues ("Bond Issue Votes Please Officials," 1964).

2.3.3 Opposition

Opposition to the storm sewer bond issue seems to have been centered around Billings residents in the proposed project area who felt they did not need and would not benefit from storm sewers ("Absentee Voters Cast Bond Ballots," 1964) and residents in areas already served by storm sewers who felt that they would be paying to improve other people's property with little or no tangible benefit to their own property (Blythe, 1964b). Regarding the latter group, the lone councilmember to vote against the stormwater fee ordinance summarized the opposition succinctly: "The rich people of the fourth ward are helping to pay for sewers for the poor people of northwest Billings" (Blythe, 1964f). Supporters of the storm sewer bond issue, however, emphasized the interconnected nature of the city's storm drainage system and that the expanded drainage infrastructure would alleviate overloading of existing drainage facilities (Blythe, 1964b, 1964c; Greater Billings Association, 1964). Some of the opposition to the storm sewer bond issue also apparently arose from concerns and confusion related to charges associated with the city's sewage treatment plant (Blythe, 1964c, 1964d).

2.3.4 When it rains

In addition to positive coverage in the *Billings Gazette*, and support from the mayor and other key city officials, the weather also may have played a role in voters approving the storm sewer bond issue. After a particularly dry winter, a series of spring rainstorms caused substantial flooding in parts of the city – particularly the west end ("Rain Sends Creek Over Banks," 1964) – which the city engineer believed would help approval of the storm sewer bond issue ("Storm Leaves Road, Bridge Crews Busy," 1964). For April 1964, the United States Weather Bureau recorded 4.11 inches of precipitation in Billings, well above the historical average for April of 1.31 inches ("City's Rainfall 3 Times Normal," 1964, "Torrential Rains Hit Billings," 1964). On Thursday 28 May 1964 – just days before the vote on the storm sewer bond issue – a collapsed irrigation ditch washed out a 100-foot section of street in the western part of the city, which the city street superintendent and a school district consultant said acutely illustrated the need for storm sewers in the area (Proctor, 1964). Wet weather and flooding – particularly in the western and southern parts of the city – continued leading up to the storm sewer bond issue vote, with

another storm dumping over 1.5 inches of rain Friday 29 May 1964 (Blythe, 1964e; "Southeast Billings Slough," 1964, "Torrential Rains Hit Billings," 1964).

2.3.5 Who benefits? Who pays?

Around the same time as citizens of Billings were debating and voting on the storm sewer expansion project and associated bond issue, the recently annexed area in southwest Billings was also the subject of public debate with respect to provision of sanitary sewerage. In early May 1964, Mayor Willard Fraser voted against the creation of two new sanitary sewer special improvement districts to serve the area, breaking a 5-5 tie vote by the city council (Blythe, 1964a). The members of city council voting against the sanitary sewer special improvement districts were primarily concerned that the city would become fiscally responsible for the costs of the proposed districts if the annexation of the area in question were found to be illegal in a then-unresolved lawsuit (Blythe, 1964a). Other members of city council argued that residents of the newly annexed area were now officially part of the city and that many of these residents supported annexation specifically so they could receive sanitary sewer services from the city (Blythe, 1964a). In mid-May 1964, after the city declined to create a special improvement district for sanitary sewers in the recently annexed area, commissioners for Yellowstone County passed a resolution of intent to create a metropolitan special improvement district to provide sewers for the area ("Commissioners Approve MSID," 1964).

In the mid-1960s, special improvement districts and other special districts were very common institutions for financing the provision of an array of services in and around Billings, including: garbage collection; construction of curbs, gutters, and sidewalks; installing and maintaining fire hydrants; weed cutting and removal; street light maintenance; and street sprinkling (i.e., dust suppression). As such, a special improvement district for storm sewers represented a conceivable alternative to a city-wide bond issue for financing storm sewer expansions in the western parts of the city in 1964. In fact, Jack Mueller – then the surveyor for Yellowstone County – filed a suit against the city in 1962 alleging that an interceptor sanitary sewer trunk line in the city's west end was illegally financed through a special improvement district, and that the sanitary trunk lines should have been financed through city-wide bonds

("Sanitary Sewer Suit Still On," 1964).[27] The choice between a city-wide bond issue versus a special improvement district largely boils down to a choice about how widely distributed the costs of a project should be. As noted previously, some people opposed the storm sewer bond issue precisely because they felt that the costs of the project should be borne only by those who would directly benefit from the project, a position which implicates a special improvement district. Meanwhile, supporters of the storm sewer bond issue contended that the city-wide bond issue was an appropriate financing mechanism because the entire city would benefit from the project. The city apparently had considered a special improvement district for the storm sewer expansion project, but abandoned the idea after the lawsuit was filed contesting the legality of the annexation of the area that was the focus of the project ("Mayor Sees Major Need for Sewers," 1964). Supporters of the city-wide bond issue repeatedly argued that the benefits of the storm sewer expansion project would extend beyond the immediate project area, including the city engineer's reported assertion that, "All of the city will benefit from construction of Billings proposed storm sewer system even if some areas are not in the immediate construction zone" (Blythe, 1964c).

Arguments about the distribution of costs and benefits of the storm sewer expansion project featured prominently in a crucial legal challenge of the Billings stormwater fee. After the stormwater fee became effective in Billings in September 1964, reports circulated that the Yellowstone County Taxpayers' Association planned to protest the city's stormwater fee ("Group May Protest Charges for $4 Million Bond Issue," 1964). The county taxpayer association, joined by some individual property owners in the city, did in fact challenge the Billings stormwater fee in a lawsuit that was ultimately decided by the Supreme Court of Montana (*City of Billings v. Nore*, 417 P.2d 458, 1966).[28] The city's stormwater fee was upheld in the initial case tried in the District Court of Yellowstone County[29] as well as in the case before the state supreme court, but a brief examination of some of the legal arguments and reasoning in

[27] As of late May 1964, Mueller's suit remained unresolved and reviewed evidence did not indicate the outcome of this suit.

[28] My discussion of the county taxpayer association's legal opposition to the Billings stormwater fee is based on the opinion written by Justice Wesley Castles in the case before the Supreme Court of Montana. This opinion is available at http://law.justia.com/cases/montana/supreme-court/1966/11038-0.html.

[29] In the legal challenge of the Billings stormwater fee, the District Court of Yellowstone County entered two judgments – one on 15 March 1965 and one on 26 October 1965 – that were combined on appeal to the state Supreme Court.

this dispute illustrates some salient points. One of the crucial objections raised by the parties opposing the Billings stormwater fee was that, despite a uniform fee structure across the city, the proposed storm sewer expansion project would disproportionately benefit residents living in the immediate project area.[30] In assessing this and other objections to the Billings stormwater fee, the Supreme Court relied largely on testimony given in the county district court trial by Ed Waldo, the general manager of the city's water department. Waldo testified that the city considered five possible methods of setting rates to finance the storm sewer bond issuance, namely a charge for each property based on: (1) the number of water connections; (2) the amount of water consumption; (3) the assessed land valuation; (4) area alone; and (5) a combination of area and use class. In explaining why the city decided on the combination of area and use class, Waldo connected the decision to considerations of equity, proportionality of fees and usage, impervious surfaces, and runoff:

> "We were charged with... determining an equitable means of arriving at a charge and as this involved the construction of a storm sewer system we wanted to apportion our cost or the charge... in proportion to the utilization of that facility by the property that was going to be served. To do this we differentiated between commercial and residential property. On the average in Billings here the commercial property is more impervious than residential property... and the runoff from the commercial property generally speaking would be greater than the runoff from residential property... The other factors of course would be the actual area of the property itself, and by using a combination of these we felt that we were arriving at the most equitable means of paying for the storm sewer system."
>
> Ed Waldo
> City of Billings
> Water Department Manager
> as quoted in *City of Billings v. Nore*, 417 P.2d 458 (1966)

[30] The parties opposing the Billings stormwater fee raised numerous other objections, most of which the court dismissed as ill-founded in fairly short order. The other key issue seriously considered by the court centered on whether the ordinance enacting the fee was a legislative act subject to ballot initiative, or an administrative act not subject to initiative. This issue was central to the case because the dispute over the stormwater fee formally began on 14 December 1964 when citizens filed petitions with the city clerk demanding a vote to either uphold or repeal the ordinance enacting the stormwater fee. In response to the petitions, the city contended that the ordinance was not a legislative act, but an administrative act. The city's position was that the ordinance establishing the stormwater fee passed by a vote of city council 27 July 1964 was an administrative act to finance the bond proposition which the necessary majority of city voters had approved 02 June 1964. Based on the provisions in the bond proposition, the ordinance establishing the stormwater fee, and relevant sections of state statutes, the court agreed with the city's position on the "merely administrative" – as opposed to legislative – nature of the stormwater fee ordinance. Moreover, based on state statute, the court found that the city council "had the duty to impose the rates following the affirmative bond issue vote" (*City of Billings v. Nore*, 417 P.2d 458, 1966).

The proportionality of the stormwater fee to the estimated runoff and utilization of storm sewer service was crucial to the court's reasoning in upholding the fee:

> "The charges are imposed and determined according to the nature and area of the real property which will be served by the storm sewer system, in other words, for the use of the facilities."
>
> *City of Billings v. Nore*, 417 P.2d 458 (1966)

In addition to Waldo's testimony, the court found ample evidence in the record that the storm sewer expansion project would benefit residents living outside the immediate project area:

> "The record shows the following reasons for the proposed improvements: the present storm sewer system has been overloaded causing surcharging of water back into homes and business properties; excess water is collecting in the streets and other places causing excessive maintenance expenses and danger to the health and welfare of city residents; and the present sanitary sewer system is receiving excessive infiltration of water which would be stopped by a proper storm sewer system. Furthermore, if the proposed improvements are made, the cost of street repairs necessitated by the poor drainage will be minimized, the construction of permanent-type pavements will be encouraged, the flow of vehicular traffic will be protected and improved, safety and health standards will be enhanced, and unsightly and unsanitary conditions will be removed.
>
> When we examine the foregoing reasons, it becomes apparent at once that not only are residents within the proposed sewer extension system to be benefited by its adoption, but also residents living within the present storm sewer system will be benefitted."
>
> *City of Billings v. Nore*, 417 P.2d 458 (1966)

In assessing the claim about unequal benefits, the court also cited a pertinent section of state statute, which refers to indirect as well as direct services and benefits:

> "Any city... may when authorized so to do by a majority vote of the qualified electors voting on the question... construct... and/or extend a storm and/or sanitary sewerage system... and may operate and maintain such facilities for public use... such municipality shall have authority, by ordinance duly adopted by the governing body to charge just and equitable rates, charges or rentals for the services and benefits directly or indirectly furnished thereby."
>
> Revised Codes of Montana
> Section 11-2217, as quoted in
> *City of Billings v. Nore*, 417 P.2d 458 (1966)

2.4 DISCUSSION

The case study of the stormwater fee enacted in Billings, Montana in 1964 illustrates that a few key issues central to the emergence of the first stormwater fee in the United States continue to permeate contemporary discussions and debates about stormwater fees. First, as evinced in Chapter 4, the arguments about the distribution of costs and benefits associated with the Billings stormwater fee continue to be a prominent theme in debates about stormwater fees in the United States more than 50 years later. This theme has also been recognized throughout the existing literature on stormwater fees. For example, Cyre (1986) observed that, "a utility approach to stormwater management and financing may create controversy in your community. It will alter 'who pays' for stormwater services and facilities, with financial impacts sufficient to provoke political and legal challenges." A second key aspect of the Billings case study is the crucial role that state statutes and a decision from the state supreme court played in the Billings stormwater fee withstanding a legal challenge. The continuing importance of state-specific statutory law and case law on the diffusion and form of stormwater fees in the United States will be prominently evinced and discussed in Chapter 3 and Chapter 4, respectively. Thirdly, the Billings case also suggests the key role that private consulting firms can play in enactment of a stormwater fee. While the available evidence does not definitively identify with whom the stormwater fee idea originated, the evidence does strongly suggest that Morrison-Maierle played a key role in the enactment of the stormwater fee in Billings in 1964. The importance of private consulting firms in the enactment of stormwater fees in the United States is a theme that remerges in both subsequent chapters, and that is strongly indicated in the existing stormwater fee literature, as discussed towards the end of Chapter 3.

2.4.1 Comparing frameworks

Available evidence on the enactment of the stormwater fee in Billings, Montana in 1964 reflects many concepts identified in the multiple streams framework and collective learning framework (Table 2.1, Figure A.31).

Table 2.1. Coding summary for the emergence case study.
Numbers indicate how many times each concept was coded by source and timing.

concepts	source		timing					
			pre-vote			post-vote		
	Gazette	*Times*	May 05 - 14	May 19 - 26	May 29 - Jun 01	Jun 03 - 04	Jun 25	Jul 28 to 30
COLLECTIVE LEARNING								
Learning Processes								
acquisition								
deliberative dialogue	4	0	0	3	1	0	0	0
search	0	0	0	0	0	0	0	0
dissemination								
collective routines	0	0	0	0	0	0	0	0
transference	7	0	0	4	2	1	0	0
translation								
analysis	2	0	0	2	0	0	0	0
heuristic processing	1	0	0	1	0	0	0	0
Learning Products								
behavior changes	0	0	0	0	0	0	0	0
cognitive changes	0	0	0	0	0	0	0	0
Contextual Factors								
institutional structure	2	0	0	1	1	0	0	0
social dynamics	1	0	1	0	0	0	0	0
technological / functional domain	4	0	1	0	3	0	0	0
Exogenous Factors	10	0	4	0	5	1	0	0
Prevailing Rules and Norms	14	0	1	7	4	1	0	1
MULTIPLE STREAMS								
Problem Stream								
focusing events	11	0	4	0	5	2	0	0
indicators	10	0	2	3	5	0	0	0
Politics Stream								
balance of interests	13	1	1	7	3	1	0	2
Policy Stream								
technical feasibility	4	0	0	3	1	0	0	0
value acceptability	15	0	1	6	4	3	0	1
Policy Entrepreneurs								
access	3	1	0	2	0	1	1	0
resources	0	0	0	0	0	0	0	0

The most frequently expressed concepts in the available evidence were related to what the collective learning framework terms "prevailing rules and norms" or what the multiple streams framework terms "value acceptability" (Table 2.1, Figure A.31). The strong concurrence of these related concepts across the two frameworks reflects the central role of values and beliefs in policy processes posited by both frameworks. These related concepts were expressed most frequently by advocates of the storm sewer bond issue – especially in the weeks leading up to the vote (Table 2.1) – who typically framed the issue in terms of community values and norms including moral obligation and economic progress. The other most frequently expressed concept was the "balance of interests" posited by the multiple streams framework (Table 2.1, Figure A.31). This concept was central to the issue of who benefits and who pays in the debate over the storm sewer bond issue.

Another prominent set of interrelated concepts in the available evidence manifested in the weather. The unusually wet weather in the days, weeks, and months leading up to the vote represents a key "exogenous factor" through the lens of the collective learning framework, or a series of "focusing events" through the lens of the multiple streams framework (Table 2.1, Figure A.31). In the multiple streams framework, these focusing events acutely emphasized conditions that many actors in the policy system cited as indicators of the need for the storm sewer expansion project, including flooding and damage to roadways (Table 2.1, Figure A.31).

Overall, the multiple streams framework provided a better fit for this case, or at least for the evidence presently available for this case. More than 50 years after the case occurred, many of the learning processes on which the collective learning framework focuses are not readily apparent in the available evidence. For instance, while the available evidence strongly suggests that Morrison-Maierle played an important role in the emergence of the stormwater fee, this evidence does not provide many details about how the firm acquired, disseminated, and translated information regarding the fee within the Billings community. Such details would be more readily obtained through direct observation or targeted interviews with firsthand participants in a more recent or contemporary case. That said, the conversations and debates presented in the archival newspaper articles – and even the newspaper articles themselves – can be seen through the lens of the collective learning framework as deliberative dialogue that served to disseminate and translate information within the Billings community related to the learning product of the stormwater fee policy.

Whereas much of the available evidence in the emergence case study falls outside the primary foci of the collective learning framework, key concepts from most of the main components of the multiple streams framework – the problem, politics, and policy streams – can be found in fair abundance throughout the available evidence. As noted for the collective learning framework, the available evidence does not provide much detail regarding the role of a key policy entrepreneur I identified in this case, Morrison-Maierle. This lack of evidence about how the actions of an apparently important policy entrepreneur influenced the stormwater fee policy output is reflected in the infrequent coding of the key concepts related to policy entrepreneurs (Table 2.1). However, the relative dearth of concepts related to policy entrepreneurs coded in the evidence reflects my choice to focus on Morrison-Maierle as the key policy entrepreneur. Insofar as they politically manipulated the inherent ambiguity around the storm sewer bond issue, many other actors identified in the available evidence can arguably be seen as policy entrepreneurs. In this respect, several key city officials (e.g., Mayor Willard Fraser, City Engineer Charles Linquin, Water Department Manager Ed Waldo, aldermen Joe Leone and Duane Smith)[31] and other actors in the city (e.g., the Billings Chamber of Commerce, the Greater Billings Association) also acted as crucial policy entrepreneurs. In this case, even the *Billings Gazette* and its reporters such as Sam Blythe can be characterized as policy entrepreneurs who had access not only to key decision-makers but also to the eyes and minds of thousands of citizens. In fact, most of the evidence in this case study came from the *Billings Gazette*, which had a decidedly positive take on the storm sewer bond issue. Coverage of the issue in the *Billings Times* was more impartial but much less extensive.

2.4.2 Hypotheses on stormwater fee emergence

The available evidence is consistent with some aspects of my hypotheses about stormwater fee emergence in the United States.

[31] I chose not to code city officials and staff as policy entrepreneurs because the multiple streams framework defines policy entrepreneurs as actors with access to policy-makers rather than the policy-makers themselves.

emergence hypothesis 1:
The first stormwater fee enacted in the United States was motivated in part by local public officials anticipating increased compliance costs flowing from the focusing event of the 1972 amendments to the federal Clean Water Act, an event which also reflected a shifting balance of interests towards environmental protection nationally, but also and especially locally.

With regard to my first emergence hypothesis, the enactment of a stormwater fee in Billings in 1964 is clearly inconsistent with the notion that amendments to the federal Clean Water Act eight years later were a salient focusing event. In fact, the available evidence shows no indication that any national-level factors – including federal legislation and shifts in national interests regarding environmental protection – influenced the enactment of a stormwater fee in Billings in 1964. Rather, the available evidence indicates predominately local motivations behind the enactment of the stormwater fee in Billings in 1964, specifically, reducing flooding in the western parts of the city. Available evidence also strongly suggests that the unusually wet weather events in the days, weeks, and months leading up to the 02 June 1964 vote on the storm sewer bond focused the flooding issues in the minds of voters and decision-makers in Billings.

emergence hypothesis 2:
Indicators of local stormwater impacts (e.g., water quality deterioration, flood damage) brought to the attention of local decision-makers drove – in part – the consideration and eventual enactment of the first stormwater fee in the United States, activating interest and attention by indicating a violation of certain values (e.g., environmental stewardship, socioeconomic equity) or beliefs.

The available evidence is very much consistent with my second emergence hypothesis. While indicators of water quality impacts appear largely absent from the documented discussions about the stormwater fee enacted in Billings in 1964, indicators of flooding abound. The awareness of flooding in parts of the city appear to have activated interest and attention of local decision-makers by indicating violation of a few key values or beliefs: preventing damage to existing and future streets; flood relief, including reducing health and safety hazards associated with stagnant water, as well as preventing damage to private property due to overloading of existing storm sewers); and facilitating future growth, development, and progress for the city. While most of the values expressed in the documented discussion of the storm sewer bond issue in Billings in 1964 were of a fairly practical and fiscal variety, a few officials framed the issue in moral terms. For example, Mayor Willard Fraser issued a statement that argued the three bond

issues up for consideration by voters in the 02 June 1964 election were an "obligation of a responsible citizenry and a duty the people of Billings have no mind to shirk" (Blythe, 1964e). Duane Smith – the alderman from the city's fifth ward at the time – made a similarly moral argument regarding sanitary sewers: "We have a moral obligation to these people to provide them with sewers" (Blythe, 1964a). As noted above, much of the debate around the storm sewer project also concerned distributional values, particularly about how widespread the benefits and the costs of the project would and should be.

> emergence hypothesis 3:
> A policy entrepreneur or entrepreneurs with sufficient access, resources, and strategies played a key role in the enactment of the first stormwater fee in the United States by using the aforementioned indicators, focusing event, and shift in national and local mood to create a policy window from which the first fee emerged.

While my research found limited evidence regarding who initially came up with the idea for a stormwater fee in Billings in the early to mid-1960s, available evidence suggests Morrison-Maierle – the engineering firm contracted with the city to design the storm sewer expansion project – as a likely candidate. The available evidence indicates that Morrison-Maierle clearly had sufficient resources and access to key decision-makers – principally, the city council members who ultimately voted on the ordinance enacting the stormwater fee – to create and/or exploit the policy window in which the stormwater fee emerged. As noted above, other actors in the 1964 Billings policy system can also be viewed as policy entrepreneurs, including all those who made arguments for and against the storm sewer expansion project and the associated financing arrangements by emphasizing certain aspects of the project and associated financing alternatives over others.

> emergence hypothesis 4:
> The enactment of the 1972 amendments to the federal Clean Water Act spurred the community that enacted the first stormwater fee in the United States to engage in search and deliberative dialogue to acquire information as to how they were going to meet anticipated compliance costs.

As with my first hypothesis, the notion that amendments to the federal Clean Water Act in 1972 influenced the emergence of the first stormwater fee in the United States is clearly inconsistent with the evidence documenting enactment of a stormwater fee in Billings in 1964.

Although meeting regulatory compliance costs does not appear to have been a relevant factor in the enactment of a stormwater fee in Billings in 1964, available evidence does document a fairly robust deliberative dialogue in the city around the need for the storm sewer expansion project as well as alternative financing arrangements for the project.

2.5 FUTURE RESEARCH

Future research into why, how, and under what conditions the stormwater fee policy emerged in the United States might investigate if any of the other earliest stormwater fees in the country (e.g., Boulder, Portland, Bellevue) were actually cases of policy emergence or invention that occurred independently of the stormwater fee enacted in Billings in 1964 or if – following the distinctions identified by Berry and Berry (2014) – those early fees were cases of policy emulation, innovation, or diffusion. Other potential cases for stormwater fee emergence might include cases of large geographic "jumps" in stormwater fee enactment across the country. Given that many of the earliest stormwater fees in the United States were enacted in western states, future research into stormwater fee emergence may benefit by investigating the relationship between stormwater fee enactment and pre-existing drainage and/or irrigation institutions (i.e., drainage districts, irrigation districts) common in western states.

Within the case of the stormwater fee enacted in Billings in 1964, future research could build on my case study by finding additional evidence. More detailed evidence on the interactions between key actors in inventing, promoting, and opposing the stormwater fee policy would facilitate more robust application of the collective learning framework, particularly with respect to posited collective learning processes. Additional evidence along these lines would also facilitate refined and expanded application of the multiple streams framework, particularly with respect to the roles of key policy entrepreneurs and improved focus on posited mechanisms within the policy window, including problem politics, coupling logic, decision styles, and institutional context (Zahariadis, 2014). By better clarifying between collective learning processes and the actions of policy entrepreneurs, additional evidence for this case could also help clarify points of contrast and connection between the collective learning framework and the multiple streams framework.

3.0 DIFFUSION

Since apparently emerging in Billings, Montana in 1964, stormwater fees have been enacted by at least 1,600 local governments across the United States. This chapter investigates how, why, and under what conditions stormwater fees diffused among local governments in the United States over the past half-century.

3.1 THEORY

In the diffusion branch of this research, I rely mainly on the family of theories and models of policy innovation and diffusion (Berry & Berry, 2014) as well as the diffusion of innovation literature more generally (e.g., Rogers 2003). Berry and Berry (2014) distinguish policy innovation (i.e., when a government enacts a policy new to that government) from policy invention (i.e., when a government enacts a policy new to all governments – at least all governments in a relevant population of governments). Accordingly, the emergence branch of this research inquires into policy invention, while the diffusion branch inquires into policy innovation.

3.1.1 Policy innovation and diffusion

Building on the work of J. L. Walker (1969) and many others, Berry and Berry (1990) propose two types of explanations for policy innovation: diffusion (i.e., emulation of previous adoptions by other governments) and internal determinants (i.e., political, economic, and social characteristics of the innovating jurisdiction). Rogers (2003, p. 5) defines diffusion as "the process in which an innovation is communicated through certain channels over time among the

members of a social system." Likewise, Berry and Berry (2014, p. 310) offer that "we can say policy diffusion occurs if the probability of adoption of a policy by one governmental jurisdiction is influenced by the policy choices of other governments in the system."

Scholars have identified an array of mechanisms of policy diffusion. Currently, there seems to be general consensus around at least three policy diffusion mechanisms: learning, competition, and coercion (Berry & Berry, 2014; Graham, Shipan, & Volden, 2013; Shipan & Volden, 2008, 2012). Other widely discussed mechanisms of policy diffusion include imitation or emulation (Berry & Berry, 2014; Shipan & Volden, 2008, 2012) and socialization or normative pressure (Berry & Berry, 2014; Graham et al., 2013). As a policy diffusion mechanism, learning occurs when policy-makers in one jurisdiction obtain information about the efficacy or other merits of a particular policy from another jurisdiction that previously enacted the policy (Berry & Berry, 2014). Imitation differs from learning in that policy-makers imitating a policy enacted in another jurisdiction do not focus on the effects or characteristics of the policy, but simply copy the actions of other policy-makers perceived to be leaders (Shipan & Volden, 2008, 2012). Berry and Berry (2014) suggest at least two distinct types of competitive diffusion mechanisms: location-choice competition, where one government adopts a policy in an attempt to influence whether individuals choose to obtain some good or service within or outside of that government's jurisdiction; and spillover-induced competition, where adoption of a policy by one government creates an externality that changes another government's expected net benefit from adopting the same policy. Coercive diffusion, which can occur horizontally among jurisdictions at the same level of government or vertically among hierarchically nested jurisdictions, typically involves a more powerful government incentivizing or – in the extreme – forcing a less powerful government to adopt a policy (Berry & Berry, 2014).

Diffusion theory posits that the diffusion of a particular policy may be driven by more than one mechanism and that the mechanism(s) underlying the diffusion of a particular policy may vary over time as well as with the characteristics of adopting governments (Berry & Berry, 2014). Furthermore, Rogers (2003) posits that the perceived attributes of any innovation – including policies – influence its diffusion, particularly its rate of diffusion. Rogers (2003) identifies five perceived innovation attributes that influence its diffusion: relative advantage, compatibility, complexity, trialability, and observability. Moreover, Makse and Volden (2011) found that the innovation attributes posited by Rogers (2003) influenced which learning

mechanisms are relevant to the diffusion of particular policies and how those mechanisms geospatially pattern the diffusion of those policies.

Berry and Berry (2014) propose a general form for models of government innovation that incorporates both internal determinants as well as diffusive effects. In explaining the probability that any jurisdiction will adopt a policy of interest at any time, Berry and Berry (2014) recommend including variables measuring diffusion effects from other, external governments on that jurisdiction as well as three broad sets of variables measuring internal determinants of policy innovation: motivation of public officials; obstacles to innovation as well as resources for overcoming those obstacles; and the presence or effects other germane polices. Furthermore, Berry and Berry (2014) recommend that policy diffusion researchers design inquiries and specify models to allow the investigators to distinguish – where feasible – between different diffusive mechanisms. Berry and Berry (2014) suggest that such mechanism-discriminating studies, which account for both internal determinants and diffusive effects on policy innovation – like Shipan and Volden (2008) and many other studies published during the past decade – represent a vanguard third-generation of policy diffusion research.

In their review and synthesis of policy diffusion research across three subfields of political science – American politics, comparative politics, and international relations – Graham, Shipan, and Volden (2013) propose a set of central concepts and a common language for policy diffusion research with the goal of facilitating theoretical generalization as well as easing communication across subfields and studies. In their "who-what-when-where-why" framework, Graham, Shipan, and Volden (2013) propose three sets of actors who affect policy diffusion: internal actors within the government considering an innovation; external actors in governments from which policies may diffuse; and go-betweens who act across governments. To explore crucial questions of when and where policy diffusion occurs, Graham, Shipan, and Volden (2013) suggest focusing on characteristics and interactions of the internal, external, and go-between actors in a policy system and how those characteristics and interactions change over time.

My mixed-methods research design allows for robust and contextualized insights into the who, what, when, where, and why of stormwater fee diffusion in the United States. More specifically, my diffusion dataset provides a rich set of observations from which to analyze how patterns of stormwater fee diffusion among local governments in the United States changed over

time and across physical and political geographies. Further, combining analyses of this large diffusion dataset with detailed case studies of stormwater fee emergence and form facilitates more finely resolved analysis of the mechanisms driving stormwater fee diffusion and how various contextual factors influence this diffusion. This research also aims to contribute to the development of the policy innovation and diffusion literature by continuing the strong empirical tradition of analyzing policy innovation and diffusion horizontally among governments in the United States federalist system (e.g., Arsneault 2000; Boehmke and Witmer 2004; Boushey 2010; Gray 1973; Savage 1985a, 1985b; Shipan and Volden 2008), and particularly the subset of that literature analyzing vertical influences across levels of government (e.g., Allen, Pettus, and Haider-Markel 2004; Karch 2007; Krause 2011; Welch and Thompson 1980). Moreover, my research into stormwater fee diffusion extends the fairly limited set of existing research investigating policy diffusion among local governments (e.g., Krause 2011).

3.1.2 Hypotheses on stormwater fee diffusion

Informed by theories and models of policy innovation and diffusion, my inquiry into the diffusion of stormwater fees among local governments in the United States aims to test the following hypotheses.

> diffusion hypothesis 1:
> Stormwater fees were more likely to be enacted by local governments: (a) located in states with clear, unambiguous state legislation empowering local governments to enact stormwater fees; (b) that were regulated under the Phase 1 or Phase 2 MS4 regulations; (c) with CSO permits; (d) with relatively high proportions of developed land use; and (e) with relatively homogenous polities.
>
> diffusion hypothesis 2:
> Significant acceleration in stormwater fee enactment across the country followed announcement of the Phase I and Phase II MS4 regulations by USEPA in larger and smaller MS4 communities, respectively.
>
> diffusion hypothesis 3:
> Large, rich cities were the first local governments to enact stormwater fees in each state.

3.2 DATA

This section outlines the data I used to analyze stormwater fee diffusion. Further details on the diffusion dataset are provided in Appendix B.

3.2.1 Foundation

In constructing a dataset to serve as the basis for my analyses of stormwater fee diffusion among local governments in the United States, I merged three national GIS shapefiles from the United States Census Bureau: counties, county subdivisions, and places. From this merged shapefile, I extracted records for legally valid local[32] governments in the lower 48 states,[33] then pruned out redundant records that resulted from several city-county consolidations. The final dataset included 38,744 records: 19,352 places; 16,369 county subdivisions; 3,022 counties;[34] and Washington, D.C. To be clear, in this cross-sectional dataset, the units of observation and analysis are legally recognized, general-purpose county and subcounty governments in the contiguous United States. While every state except Connecticut and Rhode Island has counties, legally recognized Census places are located mostly in western and southern states, while legally recognized county subdivisions are more prevalent in the Northeast, Great Lakes, and Great Plains regions of the country (Figure 3.1).

[32] Unless otherwise specified, I use the term "local government" to refer to general-purpose county and subcounty governments throughout this chapter.

[33] I focus only on the contiguous 48 states because existing surveys and studies of stormwater fees in the United States (Campbell et al., 2017; Lindsey, 1990b; Poertner, 1981) document no stormwater fees in either Alaska or Hawaii, and because existing surveys indicate there are eight other states (i.e., Connecticut, Louisiana, Mississippi, Nebraska, New Hampshire, New Jersey, Rhode Island, Wyoming) with no stormwater fees, so excluding Hawaii and Alaska will not result in dropping all fee-free states from the diffusion inquiry.

[34] Here, I include parish governments as county governments. Parishes exist only in Louisiana, but are functionally and geospatially very similar to county governments in other states. The Census Bureau shapefiles also include parishes in with counties.

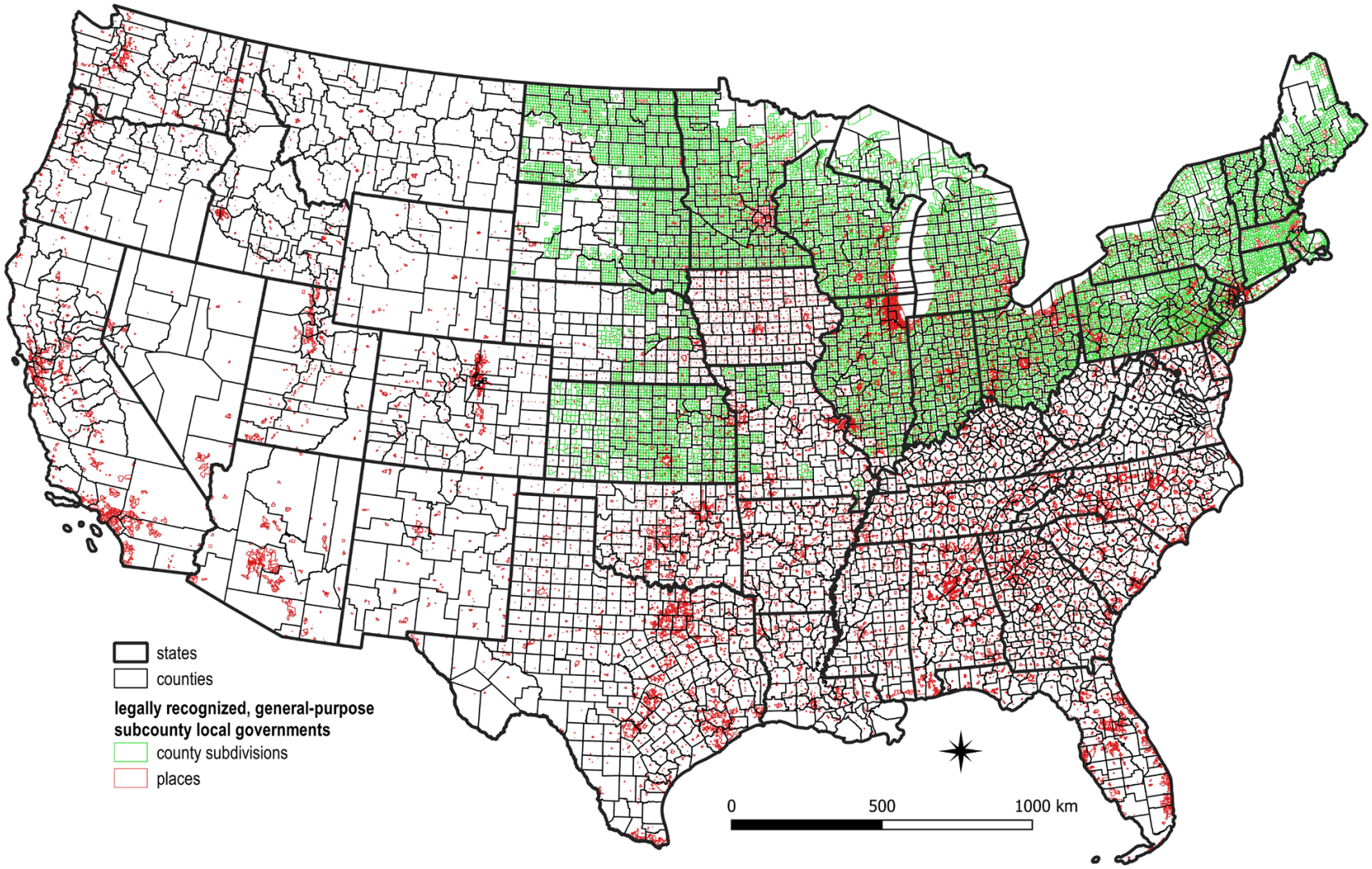

Figure 3.1. Map of general-purpose local governments in the contiguous United States.
[Jurisdiction boundary source is United States Census Bureau 2014 TIGER/Line shapefiles.]

3.2.2 Attributes

While the Census shapefiles contained many attribute fields for each record (e.g., local government names), I added demographic, housing stock, and income attributes for each record by joining data tables from the 2010 Census and the 2016 American Community Survey. I further attributed each record in the diffusion dataset with attributes derived from my own calculations (e.g., land area, border complexity[35]), some of which made use of other national datasets (e.g., land uses, urbanized areas). Finally, I joined in attributes from the 2017 Western Kentucky Stormwater Utility Survey (Campbell et al., 2017) as well as a data table on regulated MS4s personally provided by USEPA[36] and a publicly available data table on permitted CSOs.[37] Further details on the attributes comprising my diffusion dataset are presented in Appendix B.

3.2.3 Limitations

Like any dataset, my diffusion dataset has limitations and imperfections. First, by including all legally recognized, general-purpose county and subcounty governments in the universe of entities that could possibly enact a stormwater fee, my diffusion dataset likely includes some local governments that do not have the authority to actually enact a stormwater fee. As noted by Cohen (2007), while most incorporated places have a set of elected or appointed officials legally empowered to levy taxes, raise revenues, and provide local public services such as drinking water, sewers, sanitation, and fire and police protection, laws governing the formation and

[35] I calculated a border complexity metric for each local government by taking a ratio between the perimeter of the jurisdiction and the circumference of a circle encompassing an equivalent area. This morphological metric is commonly used in ecological sciences (e.g., shape complexity in landscape ecology, shoreline development in limnology). I posit two ways in which this metric may be relevant to stormwater fee diffusion. First, local governments directly adjacent to natural waterways (e.g., non-channelized rivers, streams, creeks) tend to have more complex borders. In the absence of better data, the border complexity metric may serve to measure the landscape position of each local government relative to bodies of water. Second, local governments in jurisdictionally fragmented metropolitan regions often have complex borders. As such, the border complexity metric may serve as a measure of the "metropolitan-ness" of each local government. The border complexity metric is further discussed in Appendix B.

[36] MS4 data from Holly Galavotti, Office of Wastewater Management, USEPA

[37] CSO permit data from www.arcgis.com/home/item.html?id=004909c6679a4289b629a1c26278224c

function of local governments in the United States vary widely from state to state. As such, the fact that certain types of local governments in certain states have enacted no stormwater fees to date[38] may reflect the fact that laws in these states prevent these types of local governments from enacting stormwater fees. If state law precludes certain forms of local government from assessing stormwater fees in certain states, a tenable argument can be made that these entities should not be included in the universe of potential stormwater fee enactors. Cognizant of this issue, I chose to err on the side of overinclusion in my diffusion dataset for two main reasons. First, as the first researcher – to my knowledge – to link an existing database of stormwater fees to the universe of local governments in the United States, I felt it would be easier for future researchers to whittle out any irrelevant records from an overinclusive database rather than attempt to add in unduly omitted records from an underinclusive database. Second, in some states, local governments that were previously not legally empowered to assess stormwater fees have more recently been granted such authority.[39] As state laws change, it may prove more efficient to add a field to my diffusion dataset indicating if state law authorizes each local government to assess a stormwater fee rather than adding or deleting records. Investigating the status of state laws in authorizing various types of local governments to assess stormwater fees is beyond the scope of this dissertation, but represents a potentially fruitful path of future research.

The second main limitation of my diffusion dataset – largely the product of fusing together several existing datasets – is that it is only as complete, accurate, and current as the constituent datasets. While there are known omissions, inaccuracies, and ambiguities in some of the datasets used to create my diffusion dataset, each constituent dataset represents the best readily available information of its kind. For example, while there are some known omissions and inaccuracies in Campbell et al. (2017), this survey is the only nationwide data available on local government stormwater fee enactment in the United States. Similarly, while the data from USEPA on regulated MS4s contains some ambiguous records and came with disclaimers about

[38] For example, Campbell et al. (2017) record zero stormwater fees enacted by townships in Illinois, Indiana, Kansas, Michigan, Missouri, North Dakota, South Dakota, and Nebraska. Furthermore, all of these states except the Dakotas are among the set of states where some municipal and township governments overlap (United States Census Bureau, 2013).

[39] In 2016, Pennsylvania passed a series of laws explicitly authorizing certain types of local governments (i.e., boroughs and townships) to enact stormwater fees. Prior to passage of these laws – as discussed further below – the legal authority of these forms of local government in Pennsylvania to independently assess stormwater fees was unclear. The state passed a law in 2013 explicitly empowering municipal authorities – legally distinct entities from the municipalities themselves – to assess fees for stormwater management.

its completeness, this is the only nationwide data available on regulated MS4s. Moreover, for general purpose local governments, certain data are only available at certain points in time. For example, population data was readily available for each local government nationwide only from the 2010 Census. As discussed below, future research building on my diffusion dataset would benefit from incorporating more temporally varying data.

3.2.4 Strengths

Despite these limitations, my diffusion dataset significantly advances the study of stormwater fees in the United States in several key ways. First, by using polygons to represent each local government's geographic jurisdiction – as opposed to the point representation used by Campbell et al. (2017) and others – my dataset allows for new kinds of analyses that incorporate explicitly areal characteristics of local governments (e.g., geographic size, land use composition). Second, by incorporating other sets of key variables – particularly variables related to MS4 regulation status – my dataset allows more explicit analyses of the factors animating stormwater fee diffusion in the United States. Third, by looking at the whole population of legally recognized, general-purpose county and subcounty local governments in the United States rather than just those local governments that have enacted stormwater fees, my dataset allows for more robust analyses of why stormwater fees have been enacted in certain places (i.e., positive cases) but not others (i.e., negative cases). Finally, by bringing together a set of regularly updated national datasets in a fairly straightforward manner, my dataset demonstrates the feasibility of creating a living national dataset on stormwater fee diffusion. With stormwater fee ordinances being newly enacted, revised, and repealed by local governments across the country on a regular and ongoing basis, a centralized, georeferenced, regularly updated, national dataset would represent a substantial step forward in the study of stormwater fees in the United States.

3.3 METHODS

To analyze patterns of stormwater fee diffusion among local governments in the United States, I primarily utilized exploratory visualizations (i.e., graphs, maps) and tabulations, along with regression modeling. For these analyses, I was interested in explaining variation in three types of dependent variables: (1) a binary variable indicating whether or not a local government has enacted a stormwater fee; (2) variables indicating when each local government enacted a stormwater fee;[40] and (3) variables indicating in what order local governments enacted a stormwater fee in each state. I analyzed other variables in the dataset (e.g., population, land use, MS4 regulation status) for potential explanatory relationships with the various dependent variables.

3.4 RESULTS

3.4.1 Special-district stormwater fees

While the vast majority of the 1,637 stormwater fees recorded by Campbell et al. (2017)[41] represent fees enacted by individual, general-purpose local governments, ten records represent stormwater fees enacted by special-purpose governments, each involving multiple general-purpose local governments (Figure 3.2, Table 3.1). Most of these stormwater fees enacted by special-purpose governments involve only a handful of general-purpose local governments, but three involve substantially more: Sanitation District 1 of Northern Kentucky (32) just across the Ohio River from Cincinnati; the Northeastern Ohio Regional Sewer District (57) in the greater

[40] For some analyses, I left the "when" dependent variable at the year level as recorded by Campbell et al. (2017). For other analyses, I aggregated enactment years into groups (e.g., five-year periods, decades).

[41] Although recorded by Campbell et al. (2017), I exclude Silver Spring, Maryland from my analyses because Silver Spring is an unincorporated Census-Designated Place, not a legally recognized local government jurisdiction. I also exclude the "Fitchburg (rural)" record recorded by Campbell et al. (2017). This record reflects the fact that the City of Fitchburg in Dane County, Wisconsin implemented a stormwater fee with different rates for the urban and rural parts of the city. I consider the "Fitchburg (rural)" and the "Fitchburg (city)" records recorded by Campbell et al. (2017) to represent different property classifications within the same stormwater fee rate structure rather than two distinct stormwater fees.

Cleveland area; and the Muskingum Watershed Conservancy District (381) in eastern Ohio (Figure 3.2, Table 3.1).[42] Further details on stormwater fees enacted by special-purpose governments are provided in Appendix B.

[42] Each special-district stormwater fee was considered a single entity for some preliminary exploratory analyses (i.e., Figure 3.3, Figure 3.4), but the individual general-purpose local governments implicated in each special-district stormwater fee were analyzed subsequently (i.e., Table 3.2 and after).

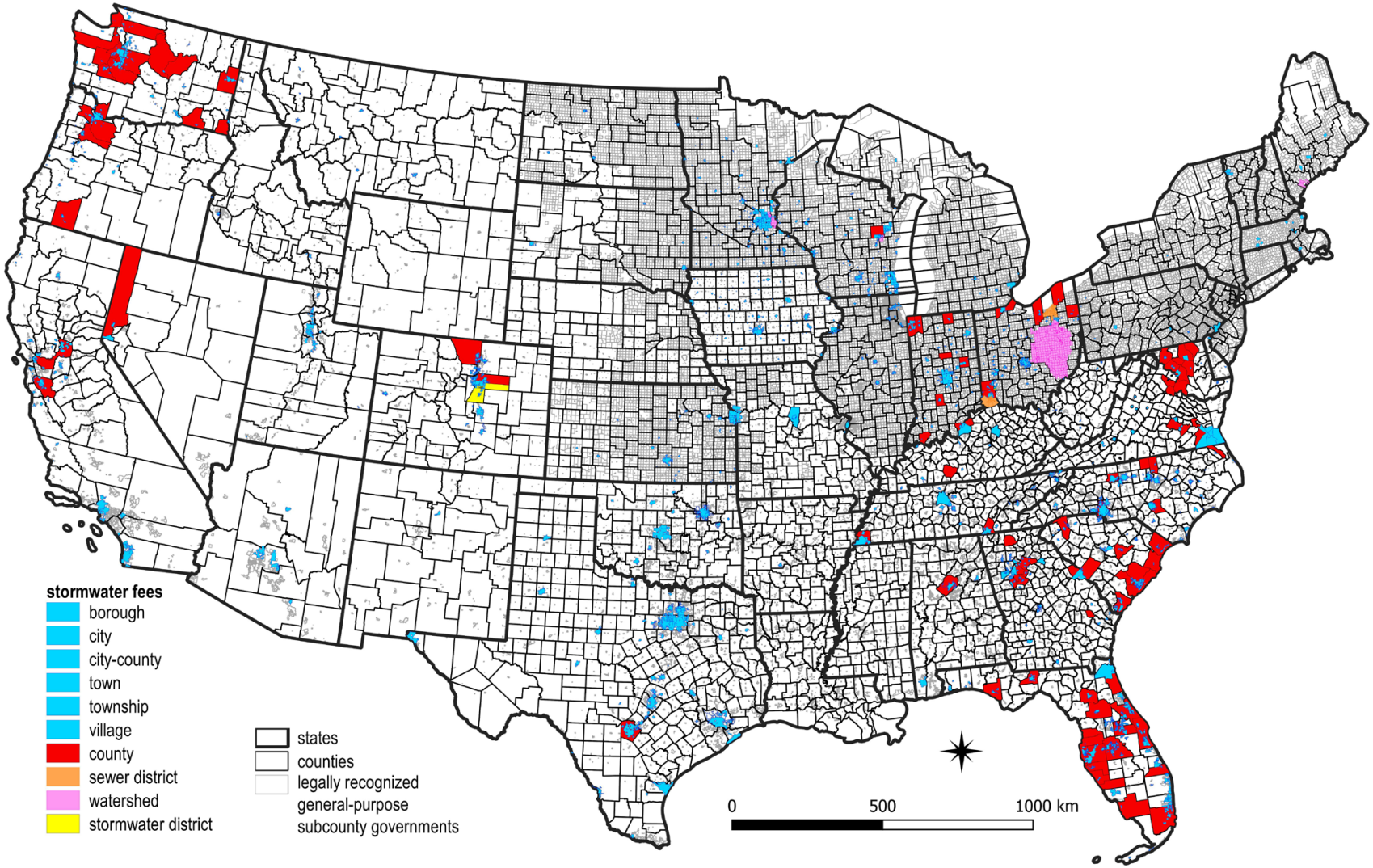

Figure 3.2. Map of local governments with stormwater fees in the contiguous United States.
[Stormwater fee data source is Campbell et al. (2017). Jurisdiction boundary source is United States Census Bureau 2014 TIGER/Line shapefiles.]
Animated version available at http://youtu.be/N9NfsNs6akQ.

Table 3.1. Special-district stormwater fees recorded in the 2017 Western Kentucky University Stormwater Utility Survey (Campbell et al., 2017).

special-purpose district name	state	# of general-purpose local governments
Southeast Metro Stormwater Authority	CO	3
Douglasville-Douglas County Water and Sewer Authority	GA	2
Sanitation District 1 of Northern Kentucky	KY	32
Long Creek Watershed Management District	ME	3
South Washington Watershed District	MN	3
Vadnais Lake Area Water Management Organization	MN	4
Columbia-Boone County	MO	2
Muskingum Watershed Conservancy District	OH	381
Northeast Ohio Regional Sewer District	OH	57
Garners Creek Storm Water Utility	WI	2

3.4.2 Exploratory analyses

The states with the greatest number of local governments that have enacted stormwater fees include Minnesota (197), Florida (183), Wisconsin (126), Washington (117), Texas (109), Iowa (106), Ohio (106), Indiana (80), North Carolina (75), Georgia (59), and Oregon (52) (Figure 3.3). Out of the 1,637 stormwater fees in the United States, Campbell et al. (2017) record the year of fee enactment for 1,218, roughly 74%. Although Campbell et al. (2017) record enactment years for over 70% of stormwater fees in most states, the percentage of stormwater fees with enactment years recorded is fairly low in some states, such as Iowa (41%), Indiana (49%), and North Carolina (51%) (Figure 3.3).

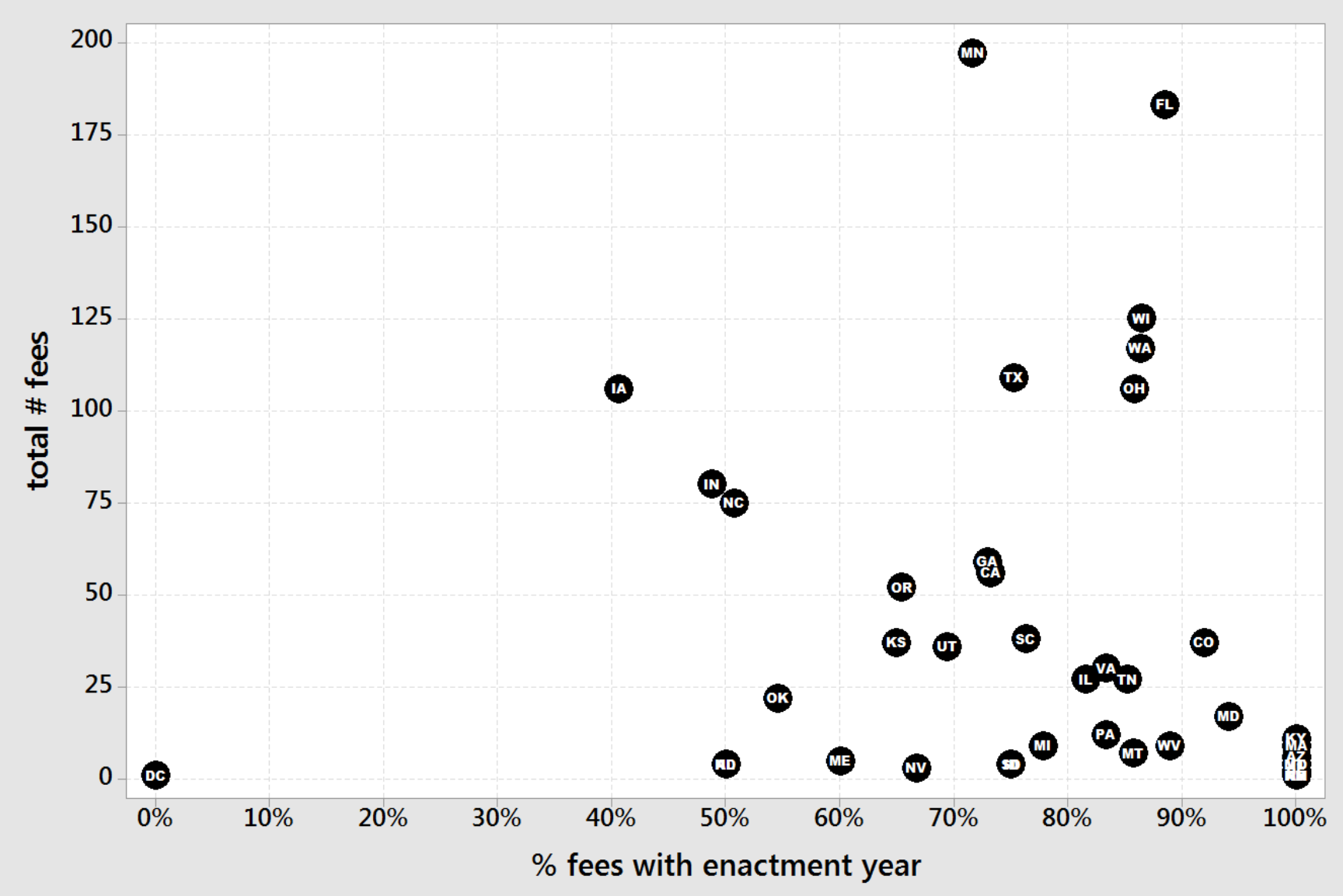

Figure 3.3. Scatterplot of total number of stormwater fees vs. percent with enactment year by state. [Data source is Campbell et al. (2017).]

3.4.2.1 Year of enactment

The number of newly enacted stormwater fees in the United States exhibited two notable spikes: in the early 1990s, particularly from 1991 to 1993; and again in the mid-2000s, especially from 2001 to 2007 (Figure 3.4). Prior to 1980, Campbell et al. (2017) record only six stormwater fees in five U.S. states, with the pace of new stormwater fee enactment ramping up substantially after 1985 (Figure 3.4). Prior to 1990, the states where the most new stormwater fees were enacted include Washington (20), Minnesota (15), Florida (15), Colorado (6), and Ohio (6) (Table B.2).

Between 1990 and 1999 stormwater fees expanded into 13 new states while the most new stormwater fees were enacted in states where stormwater fees were already fairly widely established, namely Florida (81), Washington (49), Minnesota (42), and Ohio (14) (Table B.2). However, during the 1990s, a substantial number of new stormwater fees were also enacted in states with relatively few existing stormwater fees – such as California (25) and Oregon (15) – or with no previously existing stormwater fees – such as Texas (14) and Wisconsin (14) (Table B.2).

The number of new stormwater fees enacted in the United States really exploded between 2000 and 2009, with numerous new fees enacted in states where stormwater fees were already well established – such as Wisconsin (81), Minnesota (76), Ohio (57), Florida (56), Texas (44), Washington (29), Colorado (19), California (11), and Oregon (11) (Table B.2). During the 2000s, a substantial number of new stormwater fees were also enacted by local governments in states with relatively few existing fees, such as Georgia (27), Indiana (25), Iowa (24), North Carolina (22), South Carolina (19), Kansas (14), and Tennessee (14) (Table B.2).

From 2010 to 2017, the most new stormwater fees were enacted in Texas (24), Iowa (16), Virginia (15), Ohio (14), Wisconsin (14), Georgia (13), Illinois (12), Maryland (12), Florida (10), Indiana (10), North Carolina (10), and Pennsylvania (10) (Table B.2).

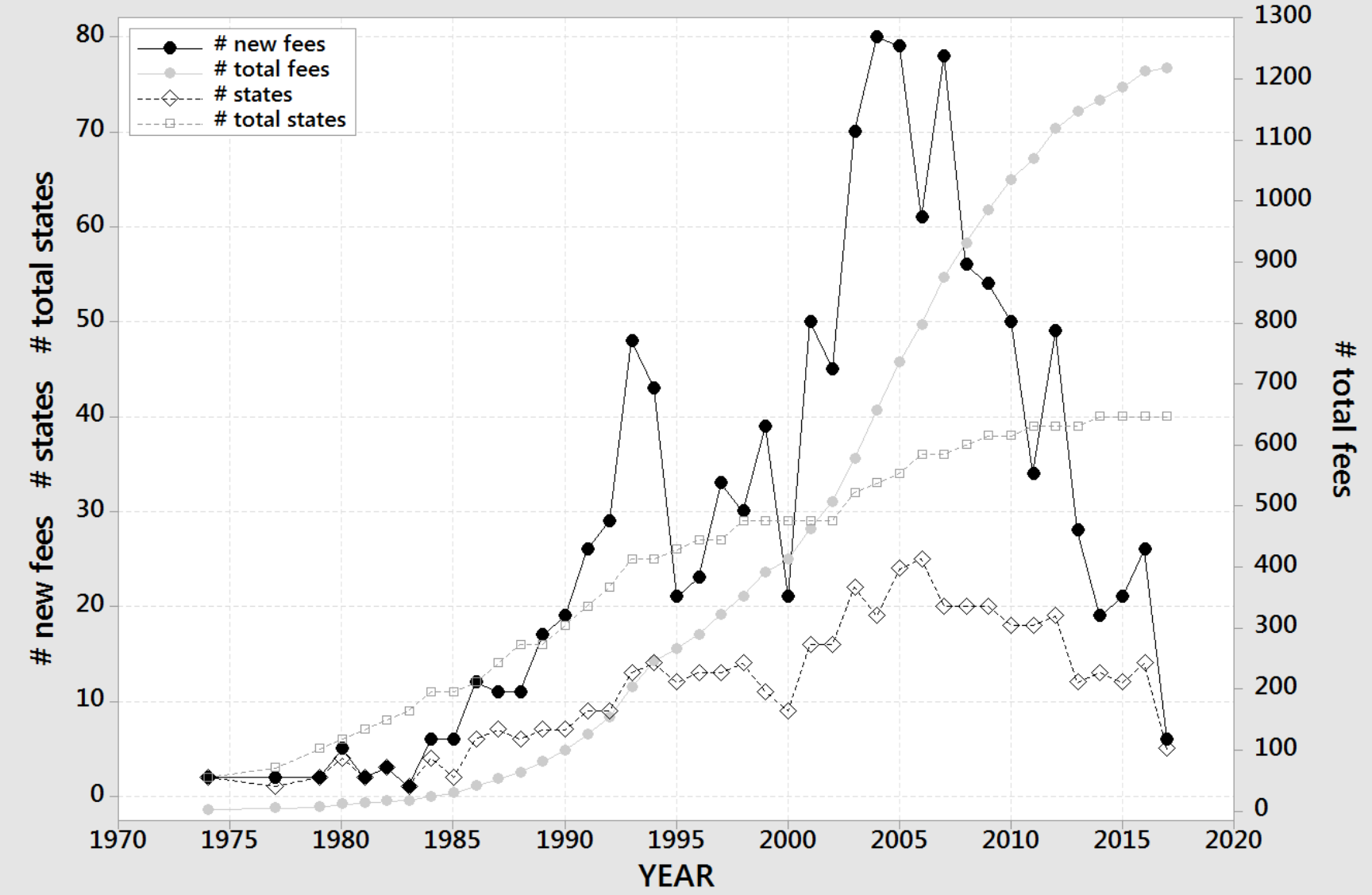

Figure 3.4. Chart of stormwater fee enactment by year.
Primary y-axis shows number of new stormwater fees enacted and number of states in which stormwater fees were enacted each year, plus cumulative number states in which stormwater fees were enacted through each year. Secondary y-axis shows cumulative number of stormwater fees enacted through each year.

3.4.2.2 Local government type

The pattern of stormwater fee diffusion among various types of local governments in the United States reflects the fact that certain local government forms only exist in certain states (Table 3.2). For instance, while all 48 of the coterminous states contain cities,[43] 38 contain towns, 19 contain villages, and 12 contain townships, certain types of general-purpose, subcounty local governments are only found in a few states: boroughs in Connecticut, New Jersey, and Pennsylvania; charter townships in Michigan; and plantations in Maine (Table 3.2). Similarly, Pennsylvania is the only state with local government forms referred to officially as municipalities (Table 3.2). Except for Connecticut and Rhode Island, all of the coterminous 48 states contain county or parish governments. Referred to by a variety of names including "unified government", "consolidated government", "metropolitan government", or "urban county government", seven states contain at least one local government formed as result of the merging of a city government and a county government (Table 3.2).

Most of the lower 48 states are home to three or four types of legally recognized, general-purpose local governments, most commonly villages, towns, cities, and counties (Table 3.2). However, four states are each home to only two legally recognized, general-purpose local government forms: cities and counties in Iowa, Idaho, and Nevada; and towns and cities in Rhode Island (Table 3.2). Six states have five forms of local governments, while New Jersey and Pennsylvania have the greatest diversity of local government forms, with six and seven types of local governments, respectively (Table 3.2).

The 1,637 stormwater fees recorded by Campbell et al. (2017) have been enacted by or involve[44] all or parts of 2,116 local governments in 40 states and Washington, D.C., with the vast majority of those local governments being subcounty governments: cities (1,376); townships

[43] Census data listed Ranson, West Virginia as a corporation, but the state now officially recognizes Ranson as a city, so Ranson is treated here as a city.

[44] I use verbiage like "enacted by" throughout this section to reflect the fact that the great majority of the stormwater fees recorded by Campbell et al. (2017) were in fact enacted by individual general-purpose local governments. However – as previously discussed – some general-purpose local governments did not independently enact stormwater fees, but are "subject to" or "implicated in" stormwater fees enacted by special-purpose governments.

(268); villages (214); towns (134); and boroughs (5) (Table 3.2).[45] Stormwater fees have also been enacted by many county governments (111)[46] as well as a handful of consolidated city-county governments (Table 3.2), such as the City of Augusta / Richmond County in Georgia, and the City of Lexington / Fayette County in Kentucky. While only about 2% of towns and townships across the lower 48 states have enacted stormwater fees, 50% of city-county governments and nearly 14% of cities have enacted stormwater fees (Table 3.2). However, the proportion of local government forms that have enacted stormwater fees varies substantially state-to-state (Table 3.2). For instance, over 50% of cities in Florida and in Ohio have enacted a stormwater fee, contrasted with less than 1% of cities in Arkansas, Idaho, and Missouri (Table 3.2).

While each of the 40 states home to at least one stormwater fee has at least one city that has enacted a stormwater fee, all of the stormwater fees enacted by townships are located in three states: Ohio (261),[47] Pennsylvania (4), and Minnesota (3) (Table 3.2). Similarly, stormwater fees have been enacted by villages in only five states: Ohio (145), Wisconsin (46), Illinois (13), Florida (8), and North Carolina (2) (Table 3.2). Of the three states with boroughs, only boroughs in Pennsylvania have enacted stormwater fees (Table 3.2). Almost half of the 40 states home to at least one stormwater fee have at least one stormwater fee enacted by a county (19) or a town (18) (Table 3.2).

[45] In these analyses, Washington, D.C. is treated as a city within its own state.

[46] While some stormwater fees enacted by county governments apply to all areas in the county, many county stormwater fees only apply to certain areas within the county. For example, the stormwater fee assessed by the Clayton County Storm Water Utility in northwestern Georgia applies to unincorporated areas of the county as well as all six cities in the county. In contrast, the stormwater fee assessed by the Columbia County Stormwater Utility in eastern Georgia only applies to the more intensively developed unincorporated areas in the eastern part of the county near the City of Augusta. The jurisdictional nuances of stormwater fees enacted by county governments are further discussed in Appendix B.

[47] All the townships subject to a stormwater fee in Ohio are part of a special-district stormwater fee, most in the Muskingum Watershed Conservancy District (253) or the Northeast Ohio Regional Sewer District (7).

Table 3.2. Number of local governments and stormwater fees by local government type in each state.

	borough			village			town			township			charter township			municipality			plantation			city			city-county			county			parish			SUM			COUNT	
	total	fees		total	fees		total	fees		total	fees		total	fees		total	fees		total	fees		total	fees		total	fees		total	fees		total	fees		total	fees		total	fees
state	#	#	%	#	#	%	#	#	%	#	#	%	#	#	%	#	#	%	#	#	%	#	#	%	#	#	%	#	#	%	#	#	%	#	#	%	#	#
AL							292	0	0													169	3	1.8				67	1	1.5				528	4	0.8	3	2
AR							190	0	0													312	1	0.3				75	0	0				577	1	0.2	3	1
AZ							46	1	2.2													45	5	11.1				15	0	0				106	6	5.7	3	2
CA							21	0	0													461	53	11.5				57	3	5.3				539	56	10.4	3	2
CO							196	7	3.6													75	28	37.3				62	4	6.5				333	39	11.7	3	3
CT	10	0	0				149	0	0													19	0	0										178	0	0	3	0
DC																						1	1	100.0										1	1	100.0	1	1
DE				3	0	0	44	0	0													10	2	20.0				3	0	0				60	2	3.3	4	1
FL				19	8	42.1	124	16	12.9													267	140	52.4				67	19	28.4				477	183	38.4	4	4
GA							105	1	1.0													425	46	10.8	6	2	33.3	153	11	7.2				689	60	8.7	4	4
IA																						946	106	11.2				99	0	0				1045	106	10.1	2	1
ID																						200	4	2.0				44	0	0				244	4	1.6	2	1
IL				982	13	1.3	16	1	6.3	1431	0	0										300	13	4.3				102	0	0				2831	27	1.0	5	3
IN							448	31	6.9	1005	0	0										118	40	33.9	1	1	100.0	91	8	8.8				1663	80	4.8	5	4
KS										1274	0	0										624	36	5.8	2	1	50.0	103	0	0				2003	37	1.9	4	2
KY																						416	35	8.4	2	2	100.0	118	5	4.2				536	42	7.8	3	3
LA				107	0	0	128	0	0													68	0	0	1	0	0				62	0	0	366	0	0	5	0
MA							298	3	1.0													53	6	11.3				5	0	0				356	9	2.5	3	2
MD				5	0	0	123	2	1.6													29	7	24.1				23	8	34.8				180	17	9.4	4	3
ME							432	1	0.2										34	0	0	23	6	26.1				16	0	0				505	7	1.4	4	2
MI				256	0	0				1123	0	0	117	0	0							277	9	3.2				83	0	0				1856	9	0.5	5	1
MN										1784	3	0.2										853	199	23.3				87	0	0				2724	202	7.4	3	2
MO				203	0	0	111	0	0	312	0	0										634	4	0.6				114	1	0.9				1374	5	0.4	5	2
MS				19	0	0	167	0	0													112	0	0				82	0	0				380	0	0	4	0
MT							75	0	0													52	7	13.5				56	0	0				183	7	3.8	3	1
NC				21	2	9.5	455	34	7.5													77	33	42.9				100	6	6.0				653	75	11.5	4	4
ND										1314	0	0										357	4	1.1				53	0	0				1724	4	0.2	3	1
NE				383	0	0				419	0	0										147	0	0				93	0	0				1042	0	0	4	0
NH							221	0	0													13	0	0				10	0	0				244	0	0	3	0

	borough			village			town			township			charter township			municipality			plantation			city			city-county			county			parish			SUM			COUNT	
	total	fees		total	fees		total	fees		total	fees		total	fees		total	fees		total	fees		total	fees		total	fees		total	fees		total	fees		total	fees			
state	#	#	%	#	#	%	#	#	%	#	#	%	#	#	%	#	#	%	#	#	%	#	#	%	#	#	%	#	#	%	#	#	%	#	#	%	total	fees
NJ	254	0	0	3	0	0	15	0	0	241	0	0										52	0	0				21	0	0				586	0	0	6	0
NM				48	0	0	19	0	0													36	1	2.8				33	0	0				136	1	0.7	4	1
NV																						19	2	10.5				16	1	6.3				35	3	8.6	2	2
NY				550	0	0	929	0	0													62	1	1.6				57	0	0				1598	1	0.1	4	1
OH				689	145	21.0				1308	261	20.0										247	130	52.6				88	6	6.8				2332	542	23.2	4	4
OK							425	0	0													164	22	13.4				77	0	0				666	22	3.3	3	1
OR							9	0	0													232	48	20.7				36	4	11.1				277	52	18.8	3	2
PA	955	5	1.0				1	0	0	1546	4	0.3				3	0	0				55	2	3.6	1	1	100.0	66	0	0				2627	12	0.5	7	4
RI							31	0	0													8	0	0										39	0	0	2	0
SC							201	7	3.5													69	22	31.9				46	9	19.6				316	38	12.0	3	3
SD				1	0	0	153	0	0	909	0	0										156	4	2.6				66	0	0				1285	4	0.3	5	1
TN							162	3	1.9													180	21	11.7	3	1	33.3	92	2	2.2				437	27	6.2	4	4
TX				23	0	0	233	6	2.6													959	102	10.6				254	1	0.4				1469	109	7.4	4	3
UT							100	0	0													144	36	25.0				29	0	0				273	36	13.2	3	1
VA							191	2	1.0													38	21	55.3				95	7	7.4				324	30	9.3	3	3
VT				34	0	0	237	2	0.8													9	2	22.2				14	0	0				294	4	1.4	4	2
WA							70	3	4.3													211	100	47.4				39	14	35.9				320	117	36.6	3	3
WI				407	46	11.3	1255	13	1.0													190	66	34.7				72	1	1.4				1924	126	6.5	4	4
WV				6	0	0	147	1	0.7													79	8	10.1				55	0	0				287	9	3.1	4	2
WY							80	0	0													19	0	0				23	0	0				122	0	0	3	0
SUM	1219	5	0.4	3759	214	5.7	7899	134	1.7	12666	268	2.1	117	0	0	3	0	0	34	0	0	10012	1376	13.7	16	8	50.0	2957	111	3.8	62	0	0	38744	2116	5.5		
COUNT	3	1		19	5		38	18		12	3		1	0		1	0		1	0		49	41		7	5		45	19		1	0		49	41			

In considering the geography of local governments across the United States, and in analyzing the diffusion of stormwater fees among those local governments, it is relevant to mention that states vary widely in the proportion of land area under the jurisdiction of various types of local government (Figure 3.1, Table B.3). For instance, while over 90% of the land area is not under the jurisdiction of any general-purpose subcounty government in many southern and western states (e.g., New Mexico, Idaho, Wyoming, Montana), over 80% of the land area is under the jurisdiction of some form of general-purpose subcounty government in most northeastern and Great Lakes states (Figure 3.1, Table B.3).

The proportion of stormwater fees with years of enactment recorded by Campbell et al. (2017) varies substantially by type of local government (Table 3.3). For example, while recording enactment years for stormwater fees enacted by more than 75% of cities and counties, 60% of towns, and 40% of villages, Campbell et al. (2017) record enactment years for just over 5% of stormwater fees involving townships (Table 3.3).[48]

Most of the stormwater fees established before 1990 were enacted by cities (Table 3.4). Most stormwater fees established by towns, villages, and counties were enacted after 2000 (Table 3.4).

[48] The primary reason for the low proportion of enactment years for stormwater fees applicable to townships is that almost all townships subject to a stormwater fee are associated with one of two special-district stormwater fees in Ohio with no enactment year recorded by Campbell et al. (2017): the Muskingum Watershed Conservancy District and the Northeast Ohio Regional Sewer District.

Table 3.3. Number and proportion of stormwater fees with enactment year recorded by government type. Enactment years as recorded by Campbell et al. (2017).

government level	government type	example government name with stormwater fee	state	total # governments	total # fees	% governments with fee	# fees with enactment year	% fees with enactment year
subcounty	borough	Dormont	PA	1,219	5	0.4	5	100.0
	village	Clemmons	NC	3,759	214	5.7	88	41.1
	town	Flower Mound	TX	7,899	134	1.7	83	61.9
	township	White Bear	MN	12,666	268	2.1	14	5.2
	charter township			117	0	0		
	municipality			3	0	0		
	plantation			34	0	0		
	city	San Diego	CA	10,012	1,376	13.7	1,034	75.3
city-county	city-county	Indianapolis	IN	16	8	50.0	6	75.0
county	county	King County	WA	2,957	111	3.8	87	78.4
	parish			62	0	0		

Table 3.4. Number of local governments that enacted new stormwater fees by decade and local government type.

government type	decade				
	1970 - 1979	1980 - 1989	1990 - 1999	2000 - 2009	2010 - 2017
borough					5
village		2	8	48	30
town		1	16	42	24
township			1	1	12
city	6	66	297	470	195
city-county		1		4	1
county		4	22	35	26
SUM	**6**	**74**	**344**	**600**	**293**

3.4.3 Regression modeling

To select continuous variables most correlated to the three aforementioned types of outcome variables (i.e., *which*, *when*, and *in what order within states* local governments enacted stormwater fees), I visually examined boxplots for each continuous variable grouped by the outcome variable of interest. Once I selected an initial set of explanatory variables, I eliminated certain variables that were highly correlated with other explanatory variables.[49] For categorical variables (e.g., MS4 regulation phase, local government type), I used cross-tabulation to examine relationships with outcome variables of interest, and I utilized boxplots to examine correlations with selected continuous variables. Definitions and descriptions of each variable (Table B.1), along with the boxplots, correlation matrices, and cross-tabulations I used to select variables for inclusion in the following regression models are presented in Appendix B. The analyses into the timing of stormwater fee enactment are necessarily restricted to the 1,317 records in the diffusion dataset with years of enactment recorded by Campbell et al. (2017). In each of the tables of regression model results, I indicate the statistical significance of effects with a set of asterisk symbols.[50]

3.4.3.1 Which

An initial regression model on the binary dependent variable indicating if each local government has or has not enacted a stormwater fee confirms the significant effects of most selected explanatory variables, except for population and two land use variables (Table 3.5). Adding effects for state and local government type to the initial regression model results in the effects of some factors in the initial model decreasing in significance, while the effects other factors in the initial model remain significant (Table 3.6).

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[49] To address concerns about intercorrelation among explanatory variables, I considered and evaluated some dimension reduction techniques (e.g., principal components analysis, factor analysis). However, I decided to build regression models with the original explanatory variables rather than reduced dimensions for two main reasons. First, collapsing the original variables into a smaller set of components or factors complicates interpretation of regression results, especially for data where the original variables are not easily separable into a smaller set of fairly distinct components or factors, as is the case here. Second, what intercorrelation remained among the final set of selected variables was fairly moderate (Table B.4, Table B.6, Table B.8).

[50] I use the following symbols to indicate the statistical significance of effects in the regression models: **** for p-values less than 0.01; *** for p-values between 0.01 and 0.05; ** for p-values between 0.05 and 0.10; and * for p-values between 0.10 and 0.15.

Table 3.5. Summary of regression model #1.
Logistic regression on binary dependent variable indicating if each local government enacted a stormwater fee or not.
Table sorted on rightmost column.

variable	coefficient	std error	p value		odds ratio	central	extreme	(odds ratio - 1) * (extreme - central)
(intercept)	-2.83E+00	2.55E-01	1.74E-28	****	5.91E-02			
MS4 Phase 1	2.32E+00	1.19E-01	2.30E-85	****	1.02E+01	0	1	9.198
% white	2.07E+00	2.03E-01	1.64E-24	****	7.93E+00	0.50	0.95	3.118
% developed (2011)	1.65E+00	2.13E-01	9.97E-15	****	5.18E+00	0.25	0.85	2.509
MS4 Phase 2	1.23E+00	6.77E-02	7.86E-74	****	3.42E+00	0	1	2.423
% urbanized (2010)	9.25E-01	1.16E-01	1.88E-15	****	2.52E+00	0.05	0.95	1.371
housing units newness index	1.03E+00	1.25E-01	3.00E-16	****	2.79E+00	-0.25	0.25	0.894
housing units % valued over $100,000	8.42E-01	1.52E-01	2.75E-08	****	2.32E+00	0.50	0.95	0.595
# CSO discharges	6.50E-03	2.75E-03	1.83E-02	***	1.01E+00	0	50	0.326
border complexity	1.27E-01	2.09E-02	1.25E-09	****	1.14E+00	1.5	3.5	0.271
perimeter	2.10E-03	6.38E-04	9.80E-04	****	1.00E+00	30	100	0.147
% agriculture (2011)	1.53E-01	1.62E-01	3.46E-01		1.16E+00	0.30	0.85	0.091
population	1.18E-07	1.31E-07	3.70E-01		1.00E+00	2,500	50,000	0.006
Δ % developed (2011-1992)	-3.49E-01	2.36E-01	1.40E-01	*	7.05E-01	0.08	0.33	-0.074
housing units % owner-occupied	-1.54E+00	2.42E-01	1.82E-10	****	2.14E-01	0.75	0.95	-0.157
housing units median value	-1.54E-06	2.56E-07	1.96E-09	****	1.00E+00	125,000	333,333	-0.320
population density	-1.36E-04	2.48E-05	3.91E-08	****	1.00E+00	500	3,000	-0.341
median age	-3.59E-02	5.13E-03	2.55E-12	****	9.65E-01	42	52	-0.353
land use diversity (2011)	-7.24E+00	1.03E+00	2.39E-12	****	7.20E-04	0.25	0.85	-0.600
MS4 Phase 2 waiver	-9.02E+00	1.02E+02	9.29E-01		1.21E-04	0	1	-1.000

AIC = 12,357

Table 3.6. Summary of regression model #2.

Logistic regression on binary dependent variable indicating if each local government enacted a stormwater fee or not. Table sorted on rightmost column. Comparison bases are Florida for states and city for local government type

variable	coefficient	std error	p value		odds ratio	observed values		(odds ratio - 1) * (extreme - central)
						central	extreme	
(intercept)	0.00E+00	0.00E+00	0.00E+00		0.00E+00			
DC	1.71E+01	1.08E+04	9.99E-01		2.72E+07	0	1	2.72E+07
MS4 Phase 1	2.24E+00	1.61E-01	3.11E-44	****	9.42E+00	0	1	8.422
city-county	1.60E+00	7.99E-01	4.57E-02	***	4.94E+00	0	1	3.941
OH	1.54E+00	1.86E-01	1.16E-16	****	4.67E+00	0	1	3.669
MS4 Phase 2	1.53E+00	8.14E-02	9.00E-79	****	4.62E+00	0	1	3.616
MS4 Phase 2 waiver	9.46E-01	3.44E+03	1.00E+00		2.58E+00	0	1	1.575
housing units % valued over $100,000	1.31E+00	1.93E-01	1.08E-11	****	3.71E+00	0.5	0.95	1.221
IA	5.78E-01	2.09E-01	5.63E-03	****	1.78E+00	0	1	0.782
% urbanized (2010)	5.38E-01	1.39E-01	1.08E-04	****	1.71E+00	0.05	0.95	0.641
perimeter	7.40E-03	9.86E-04	6.29E-14	****	1.01E+00	30	100	0.520
% developed (2011)	4.75E-01	2.90E-01	1.01E-01	*	1.61E+00	0.25	0.85	0.365
% white	5.51E-01	2.61E-01	3.43E-02	***	1.74E+00	0.5	0.95	0.331
WA	2.04E-01	2.19E-01	3.51E-01		1.23E+00	0	1	0.227
housing units newness index	3.20E-01	1.72E-01	6.25E-02	**	1.38E+00	-0.25	0.25	0.189
housing units median value	5.49E-07	2.71E-07	4.30E-02	***	1.00E+00	125,000	333,333	0.114
population density	2.29E-05	3.20E-05	4.74E-01		1.00E+00	500	3000	0.057
population	1.13E-07	1.51E-07	4.55E-01		1.00E+00	2,500	50,000	0.005
border complexity	-3.02E-03	3.14E-02	9.23E-01		9.97E-01	1.5	3.5	-0.006
MN	-1.65E-02	1.84E-01	9.29E-01		9.84E-01	0	1	-0.016
# CSO discharges	-7.78E-04	4.12E-03	8.50E-01		9.99E-01	0	50	-0.039
Δ % developed (2011-1992)	-2.08E-01	2.98E-01	4.86E-01		8.12E-01	0.08	0.33	-0.047
NC	-6.09E-02	2.21E-01	7.83E-01		9.41E-01	0	1	-0.059
land use diversity	-1.05E+01	1.27E+00	1.00E-16	****	2.65E-05	0.125	0.2	-0.075
WI	-9.49E-02	1.96E-01	6.28E-01		9.09E-01	0	1	-0.091
housing units % owner-occupied	-1.14E+00	3.06E-01	1.99E-04	****	3.20E-01	0.75	0.95	-0.136
IN	-2.24E-01	2.14E-01	2.94E-01		7.99E-01	0	1	-0.201
OR	-4.13E-01	2.37E-01	8.09E-02	**	6.62E-01	0	1	-0.338
% agriculture (2011)	-1.11E+00	1.96E-01	1.46E-08	****	3.29E-01	0.3	0.85	-0.369
SC	-4.72E-01	2.68E-01	7.88E-02	**	6.24E-01	0	1	-0.376
township	-5.71E-01	1.33E-01	1.73E-05	****	5.65E-01	0	1	-0.435
VA	-6.35E-01	2.93E-01	3.03E-02	***	5.30E-01	0	1	-0.470
median age	-5.16E-02	6.12E-03	3.18E-17	****	9.50E-01	42	52	-0.503
village	-7.19E-01	1.23E-01	5.17E-09	****	4.87E-01	0	1	-0.513
CO	-7.27E-01	2.70E-01	7.12E-03	****	4.83E-01	0	1	-0.517
KY	-8.90E-01	2.39E-01	1.95E-04	****	4.11E-01	0	1	-0.589
parish	-9.12E-01	1.35E+03	9.99E-01		4.02E-01	0	1	-0.598
borough	-1.01E+00	6.05E-01	9.65E-02	**	3.66E-01	0	1	-0.634
KS	-1.06E+00	2.48E-01	1.90E-05	****	3.46E-01	0	1	-0.654
OK	-1.25E+00	2.99E-01	2.89E-05	****	2.86E-01	0	1	-0.714
MD	-1.32E+00	3.43E-01	1.19E-04	****	2.67E-01	0	1	-0.733
WV	-1.33E+00	4.10E-01	1.13E-03	****	2.63E-01	0	1	-0.737
TN	-1.34E+00	2.83E-01	2.01E-06	****	2.61E-01	0	1	-0.739
town	-1.35E+00	1.24E-01	1.22E-27	****	2.58E-01	0	1	-0.742
TX	-1.36E+00	1.90E-01	8.67E-13	****	2.57E-01	0	1	-0.743
UT	-1.44E+00	2.75E-01	1.57E-07	****	2.37E-01	0	1	-0.763
MT	-1.57E+00	4.76E-01	9.95E-04	****	2.09E-01	0	1	-0.791
GA	-1.61E+00	2.22E-01	3.80E-13	****	2.00E-01	0	1	-0.800
county	-1.67E+00	2.03E-01	1.61E-16	****	1.88E-01	0	1	-0.812
ME	-1.78E+00	4.48E-01	7.37E-05	****	1.69E-01	0	1	-0.831
VT	-1.96E+00	5.80E-01	7.15E-04	****	1.41E-01	0	1	-0.859
DE	-2.21E+00	8.21E-01	7.20E-03	****	1.10E-01	0	1	-0.890
ND	-2.51E+00	5.52E-01	5.44E-06	****	8.13E-02	0	1	-0.919
SD	-2.54E+00	5.57E-01	5.02E-06	****	7.86E-02	0	1	-0.921

variable	coefficient	std error	p value		odds ratio	observed values		(odds ratio - 1) * (extreme - central)
						central	extreme	
ID	-2.78E+00	5.57E-01	6.09E-07	****	6.21E-02	0	1	-0.938
NV	-2.78E+00	7.47E-01	1.98E-04	****	6.21E-02	0	1	-0.938
IL	-2.85E+00	2.67E-01	1.30E-26	****	5.79E-02	0	1	-0.942
AZ	-2.92E+00	5.41E-01	6.88E-08	****	5.39E-02	0	1	-0.946
MA	-3.22E+00	3.96E-01	4.36E-16	****	4.00E-02	0	1	-0.960
MI	-3.46E+00	3.77E-01	4.82E-20	****	3.15E-02	0	1	-0.969
CA	-3.52E+00	2.27E-01	4.56E-54	****	2.97E-02	0	1	-0.970
NM	-3.54E+00	1.12E+00	1.57E-03	****	2.91E-02	0	1	-0.971
PA	-3.58E+00	4.32E-01	1.11E-16	****	2.77E-02	0	1	-0.972
MO	-4.00E+00	4.82E-01	1.02E-16	****	1.83E-02	0	1	-0.982
AL	-4.57E+00	5.97E-01	1.91E-14	****	1.03E-02	0	1	-0.990
AR	-4.62E+00	1.02E+00	6.43E-06	****	9.87E-03	0	1	-0.990
NY	-6.09E+00	1.04E+00	5.28E-09	****	2.26E-03	0	1	-0.998
plantation	-1.52E+01	2.03E+03	9.94E-01		2.60E-07	0	1	-1.000
charter township	-1.53E+01	9.14E+02	9.87E-01		2.20E-07	0	1	-1.000
municipality	-1.58E+01	6.16E+03	9.98E-01		1.43E-07	0	1	-1.000
NE	-1.70E+01	3.14E+02	9.57E-01		4.27E-08	0	1	-1.000
NH	-1.77E+01	6.23E+02	9.77E-01		2.10E-08	0	1	-1.000
WY	-1.78E+01	8.78E+02	9.84E-01		1.95E-08	0	1	-1.000
MS	-1.78E+01	4.83E+02	9.71E-01		1.94E-08	0	1	-1.000
LA	-1.82E+01	5.31E+02	9.73E-01		1.20E-08	0	1	-1.000
CT	-1.85E+01	7.14E+02	9.79E-01		8.85E-09	0	1	-1.000
NJ	-1.93E+01	4.30E+02	9.64E-01		4.36E-09	0	1	-1.000
RI	-1.93E+01	1.62E+03	9.90E-01		4.15E-09	0	1	-1.000

AIC = 8,944

The two preceding regression models suggest two major conclusions. First, in both models, being regulated as an MS4 – either Phase 1 or Phase 2 – exhibits very strong, significant, positive effects on the likelihood of a local government having enacted a stormwater fee (Table 3.5, Table 3.6). More specifically, the models suggest that MS4 regulation increases the likelihood of a local government having enacted a stormwater fee by eight to nine times for Phase 1 MS4s and two to four times for Phase 2 MS4s (Table 3.5, Table 3.6). The second major takeaway suggested by the preceding regression models is that the effects of certain states and certain local government types are by far the strongest significant negative factors on the likelihood of a local government having enacted a stormwater fee (Table 3.6). In fact, compared with Florida,[51] the likelihood of a local government having enacted a stormwater fee drops to nearly zero in certain states, including New York, Arkansas, Alabama, Missouri, Pennsylvania, New Mexico, California, California, Michigan, Massachusetts, Arizona, Illinois, Nevada, Idaho, South Dakota, and North Dakota (Table 3.6). Compared with Florida, the likelihood of a local government having enacted a stormwater fee actually does drop to zero in the eight states with

[51] Florida has the highest percentage of local governments that have enacted a stormwater fee and also is one of eight states where four types of local governments have enacted a stormwater fees (Table 3.2).

no stormwater fees (i.e., Rhode Island, New Jersey, Connecticut, Louisiana, Mississippi, Wyoming, New Hampshire, Nebraska), although the high standard errors due to the absence of enacted fee observations caused these effects to be statistically insignificant (Table 3.6). On the other hand, local governments in two states – Ohio and, to a lesser extent, Iowa – were significantly more likely to have enacted a stormwater fee compared with Florida (Table 3.6).

In addition to state effects, some local government types also exhibited fairly strong, significant effects on the likelihood of a local government having enacted a stormwater fee (Table 3.6). Counties, towns, villages, and townships were all significantly less likely than cities[52] to have enacted a stormwater fee, whereas city-county governments were significantly more likely than cities to have enacted a stormwater fee (Table 3.6). Boroughs were also less likely than cities to have enacted a stormwater fee, but the borough effect was only marginally significant when controlling for state factors (Table 3.6), reflecting the facts that boroughs only exist in three states (i.e., Connecticut, New Jersey, Pennsylvania) and that the only boroughs that have enacted stormwater fees so far are in Pennsylvania (Table 3.6). As with states that have zero stormwater fees, some local government types with no enacted stormwater fees exhibited strong but statistically insignificant negative effects on the likelihood of stormwater fee enactment, namely: charter townships, which only exist in Michigan; plantations, which only exist in Maine; municipalities, which only exist in Pennsylvania; and parishes, which only exist in Louisiana (Table 3.6).

In addition to MS4 regulation, three other variables also exhibited significant, positive effects on the likelihood of a local government having enacted a stormwater fee consistently in both models: perimeter; percent urbanized area in 2010; and percent owner-occupied housing units valued at $100,000 or more (Table 3.5, Table 3.6). The consistently positive, significant effects of the percent urbanized area in 2010 variable – which exhibits moderately strong correlation with percent developed land use in 2011 and population density (Table B.4, Figure B.12) – and the percent owner-occupied housing units valued at $100,000 or more variable suggest that local governments in more urbanized areas and with larger proportions of owner-occupied housing units valued at $100,000 or more have been more likely to enact stormwater fees. Interpreting the consistently positive, significant effect of the perimeter variable is less

[52] I chose city as the comparison local government type for the regression analyses because cities are located in every state and are second only to townships in number across the lower 48 states (Table 3.2).

obvious. Perimeter is often correlated with land area, which suggests that local governments with larger areal jurisdictions have been more likely to enact stormwater fees. However, some local governments with fairly small areal jurisdictions also have surprisingly large perimeters. This phenomenon of areally smaller local governments with relatively large perimeters is often associated with location in a jurisdictionally fragmented metropolitan region and/or proximity to waterways and other drainage features, phenomena which are explored in greater detail in the border complexity section of Appendix B.

Three other variables exhibit consistently positive effects in both models, but decrease substantially in effect size and significance in the second model: percent white population; percent developed land use in 2011; and the housing unit newness index (Table 3.5, Table 3.6). The substantially decreased effect size and significance of these three variables in the model with local government type and state effects primarily reflects the fact that the distributions of these variables differs markedly between local governments that have and have not enacted a stormwater fee in most states, but that these distributions vary much less markedly in certain states with relatively large numbers of stormwater fees. For instance, while local governments that have enacted stormwater fees tend to have substantially higher percentages of developed land use in most states, this pattern is not as pronounced in California, Iowa, and Ohio (Figure B.15). The positive effect of the percent white population variable was unexpected because local governments that have enacted a stormwater fee tend to have lower percentages of white population than local governments that have not enacted a stormwater fee (Figure B.11). However, the difference in percentage white population between local governments that have and have not enacted stormwater fees is attenuated and even reversed when controlling for other factors, such as MS4 regulation phase (Figure B.16) or state (Figure B.17).

In both of the preceding regression models, three factors consistently exhibit significant negative effects on the likelihood of a local government having enacted a stormwater fee: percent owner-occupied housing units; median age; and land use diversity (Table 3.5, Table 3.6). The consistent, significant negative effects of these variables suggest that local governments with higher percentages of owner-occupied housing units, higher median ages, and higher land use diversity have been less likely to enact a stormwater fee. That said, the effect sizes of the percent owner-occupied housing units variable and the land use diversity variable were fairly small, especially in the model with local government type and state factors (Table 3.5, Table 3.6).

Several variables also exhibited inconsistent effects between the two preceding regression models. Three variables with significant effects in the first model had insignificant effects in the model with state and local government type factors: number of CSO discharges; border complexity; and population density (Table 3.5, Table 3.6). The distributions of these variables differ substantially among local governments that have and have not enacted stormwater fees in most states and when looking at the nation as a whole, but the effect of these variables on stormwater fee enactment becomes insignificant when controlling for local government type and state effects for a couple main reasons. While local governments that have enacted a stormwater fee tend to have higher population densities (Figure B.11), this tendency is much less pronounced in certain states, such as Ohio and California (Figure B.18). Moreover, densely populated local governments that have not enacted a stormwater fee are quite numerous in some states, such as New Jersey, New York, and Connecticut (Figure B.18). In contrast to the previously mentioned variables with inconsistent effects, the percent agricultural land use in 2011 variable had an insignificant effect in the first model, but a highly significant – albeit moderately sized – negative effect in the model with state and local government type factors (Table 3.5, Table 3.6). The significance of the percent agricultural land use variable in the model with state and local government type effects is largely attributable to the fact that local governments with lower percentages of agricultural land use were less likely to enact stormwater fees in many states (e.g., Georgia, Indiana, Kansas, Minnesota, Ohio, Wisconsin), but that this pattern was less pronounced or not apparent in other states (e.g., California, Colorado, Florida, Iowa) (Figure B.19). Finally, one variable – median value of owner-occupied housing units – exhibited significant effects in both models, but switched in the effect direction (Table 3.5, Table 3.6), reflecting the fact that local governments regulated as Phase 1 and Phase 2 MS4s with lower median values of owner-occupied housing units were more likely to have enacted a stormwater fee (Figure B.20), but that local governments with higher median owner-occupied housing unit values were more likely to have enacted a stormwater fee for most local government types in most states (Figure B.21).

Finally, two variables exhibited statistically insignificant effects in both preceding regression models: population and change in percent developed land use from 1992 to 2011 (Table 3.5, Table 3.6).

3.4.3.2 When

To further investigate the timing of stormwater fee enactment by local governments in the United States, I implemented a multinominal logistic regression model[53] on a categorical variable of stormwater fee enactment by decade[54,55] (Table 3.7).

[53] I utilized a multinomial regression model rather than an ordinal model primarily because the multinomial model allows for more flexible comparison among time periods.

[54] Decades defined as: 1970-1979, 1980-1989, 1990-1999, 2000-2009, and 2010-2017.

[55] I chose to use decade rather than year as the dependent variable for the "when" analyses for two main reasons: (1) to increase the number of observations for each value of the dependent variable; and (2) because the regulations posited to be most relevant to stormwater fee diffusion (i.e., the Phase 1 and Phase 2 MS4 regulations) were implemented roughly a decade apart.

Table 3.7. Summary of regression model #3.
Multinomial regression on categorical dependent variable indicating in which time period (1970-1989, 1990-1999, 2000-2009, 2010-2017) local governments enacted a stormwater fee. Comparison period is 1990-1999.

variable	p value							odds ratio				observed values		(odds ratio - 1) * (extreme - central)			
	before 1990		1990-1999	2000-2009		after 2009		before 1990	1990-1999	2000-2009	after 2009	central	extreme	before 1990	1990-1999	2000-2009	after 2009
(intercept)	0.157			0.612		0.201											
MS4 Phase 1	0.417			0.592		0.023	****	1.61		0.86	0.46	0	1	0.61		-0.14	-0.54
MS4 Phase 2	0.013	***		0.000	****	0.100	*	3.61		2.30	1.43	0	1	2.61		1.30	0.43
# CSO discharges	0.005	****		0.396		0.951		1.03		1.01	1.00	0	50	1.47		0.42	0.04
population	0.098	**		0.638		0.445		1.00		1.00	1.00	25,000	250,000	0.17		-0.04	0.08
% urbanized (2010)	0.645			0.310		0.197		1.57		0.64	0.54	0.75	1	0.14		-0.09	-0.12
% developed (2011)	0.560			0.094	**	0.737		1.88		0.37	0.79	0.45	0.8	0.31		-0.22	-0.08
% deciduous (2011)	0.006	****		0.057	**	0.066	**	0.00		0.19	5.35	0.05	0.25	-0.20		-0.16	0.87
% agriculture (2011)	0.005	****		0.005	****	0.244		38.28		7.31	2.60	0.1	0.5	14.91		2.53	0.64
Δ % agriculture (2011-1992)	0.524			0.001	****	0.004	****	2.37		0.09	0.09	-0.1	-0.33	-0.31		0.21	0.21
population % not white and not black	0.233			0.925		0.499		0.31		0.95	0.62	0.15	0.5	-0.24		-0.02	-0.13
housing units % owner-occupied	0.108	*		0.778		0.310		0.18		1.19	2.08	0.666	0.9	-0.19		0.04	0.25
housing units % built before 1950	0.208			0.446		0.017	***	0.25		1.54	4.50	0.125	0.5	-0.28		0.20	1.31
housing units % valued over $300,000 - % valued under $150,000	0.111	*		0.000	****	0.037	***	1.57		0.55	0.66	-0.25	0.25	0.28		-0.23	-0.17

AIC = 2,936

The two phases of MS4 regulation exhibited significant effects on the timing of stormwater fee enactment by local governments across the United States (Table 3.7). Local governments regulated under the Phase 1 MS4 regulations were almost twice as likely to enact a stormwater fee in the 1990s[56] – the decade immediately after the Phase 1 MS4 regulations were promulgated – compared with the period since 2010 (Table 3.7). Similarly, local governments regulated under the Phase 2 MS4 regulations were 130% more likely to enact a stomwater fee in the 2000s – the decade when the Phase 2 MS4 regulations took effect – compared with the 1990s (Table 3.7). Curiously, local governments regulated under the Phase 2 MS4 regulations were also significantly and substantially more likely to have enacted a stormwater fee prior to 1990[57] compared with the 1990s (Table 3.7).

Local governments with higher numbers of CSO discharges were also significantly and substantially more likely to enact a stormwater fee prior to 1990 compared with the 1990-1999 timeframe (Table 3.7). Local governments that enacted stormwater fees prior to 1990 that had relatively large number of CSO discharges were mainly larger cities, including: Portland and Corvallis in Oregon; Detroit, Michigan; Cincinnati, Ohio; St. Paul, Minnesota; Seattle, Washington; Zanesville, Ohio; and Louisville, Kentucky. Compared with the 1990s, local governments with large populations were also more likely to enact a stormwater fee prior to 1990, although this effect was only marginally significant and fairly small in most cases (Table 3.7).

Some land use variables also exhibited significant effects on the timing of stormwater fee enactment. Compared with the 1990s, local governments with higher percentages of agricultural land use were significantly more likely to enact a stormwater fee prior to 1990 and during the 2000s, with a large effect size in extreme cases (Table 3.7). Local governments that experienced greater losses of agricultural land use from 1992 to 2011 were also significantly, if slightly, more likely to enact a stormwater fee since 2000 compared with the 1990-1999 timeframe (Table 3.7).

[56] I used 1990-1999 as the comparison period because this period had a substantial number of observations and was the first decade of MS4 regulation.

[57] In the "when" regression model, I grouped together the 1970-1979 and 1980-1989 decades due to small number observations in the 1970-1979 period.

Local governments with larger percentages of deciduous[58] forested land use were also more likely to enact a stormwater fee after 2009 compared with the 1990s, although this effect was marginally significant (Table 3.7). Taken together, the land use effects generally indicate that local governments with higher pecentages of agricultural and forested land use – and those that lost more agricultural land use between 1992 and 2011 – were more likely to enact stormwater fees in more recent years compared with earlier years.

Two housing stock variables also exhibited significant effects on the timing of stormwater fee enactment. First, local governments with larger percentages of housing units built prior to 1950 were significantly more likely to enact stormwater fees since 2010 compared with the 1990s (Table 3.7). Second, local governments with smaller or negative differences in the percentage of housing units valued more than $300,000 and the percentage of housing units valued less than $150,000 were more likely to enact a stormwater fee since 2000 compared with the 1990s (Table 3.7). The effects of these housing stock variables suggest that local governments with older and less highly valued housing stock were more likely to enact stormwater fees in recent years compared with earlier years.

Some of the observed effects in the multinomial regression model on the timing of stormwater fee enactment would likely change with the inclusion of other potentially salient variables, such as government type and state factors. For example, while the percentage of agricultural land use varied substantially across decades and MS4 regulation phases in states like Minnesota, Texas, and Iowa, this was less the case in states like Florida, Colorado, and California (Figure B.25). However, there were not enough observations across time periods to add government type or state factors to the multinomial regression model on the timing of stormwater fee enactment.

[58] The National Land Cover Dataset delineates three categories of forested land use: deciduous, coniferous, and mixed. The distribution of deciduous forest land use exhibited greater separation between decades of stormwater fee enactment than any other forested land use variable, included total forested land use (i.e., the sum of deciduous, coniferous, and mixed forested land use). In the lower 48 states, very little deciduous forest is located west of roughly 100 degrees west longitude (i.e., from roughly Oklahoma City westward), excepting some areas of national forest in western Colorado and central Utah. The areas with the greatest concentration of deciduous forest in the lower 48 states include: the Appalachian Mountains regions of West Virginia, Pennsylvania, Kentucky, Tennessee, and North Carolina; the Ozark Mountain regions of Missouri, Arkansas, and Oklahoma; New York and most New England states; the Great Lakes regions of Wisconsin, Minnesota, and Michigan; as well as parts of the Ohio River valley in Ohio and Indiana.

3.4.3.3 In what order within states

To investigate the order in which local governments enacted stormwater fees in each state, I created a variable indicating the sequence in which local governments enacted stormwater fees in each state. For this state-specific enactment sequence variable, the first local government to enact a stormwater fee in each state was assigned a value of one, and the twentieth local government to enact a stormwater fee in each state was assigned a value of 20. The same value was assigned in instances where multiple local governments in the same state enacted a stormwater fee in the same year. For example, in Georgia, the first local governments to enact a stormwater fee were: the City of Griffin in 1988; Columbia County and the City of Decatur in 1999; and the City of Conyers in 2002. For the state-specific enactment sequence variable, Griffin was assigned a value of one, Columbia County and Decatur were both assigned values of two, and Conyers was assigned a value of four, skipping the value three.

Using a binned version of this state-specific enactment sequence variable,[59] I implemented an ordinal regression model to investigate potentially explanatory effects on patterns of stormwater fee enactment sequence in each state (Table 3.8).

[59] For the ordinal regression analysis, I grouped the state-specific enactment sequence variable into eight bins: 1-3; 4-9; 10-19; 20-39; 40-49; 50-74; 75-99; and ≥ 100.

Table 3.8. Summary of regression model #4.
Multinomial regression on categorical dependent variable indicating in what order (1-3, 4-9, 10-19, 20-39, 40-49, 50-74, 75-99, ≥ 100) local governments enacted a stormwater fee in each state. Table sorted on rightmost column. Comparison bases are 1-3 for state-specific enactment order group and city for local government type.

variable	coefficient	std error	p value		odds ratio	observed values		(odds ratio - 1) * (extreme - central)
						central	extreme	
intercept(4 to 9)	-7.83E-01	5.34E-01	1.43E-01	*				
intercept(10 to 19)	3.04E-01	5.32E-01	5.67E-01					
intercept(20 to 39)	1.04E+00	5.32E-01	5.13E-02	**				
intercept(40 to 49)	1.95E+00	5.34E-01	2.56E-04	****				
intercept(50 to 74)	2.26E+00	5.35E-01	2.33E-05	****				
intercept(75 to 99)	2.83E+00	5.37E-01	1.36E-07	****				
intercept(≥ 100)	3.96E+00	5.43E-01	3.20E-13	****				
% forest (2011)	2.35E+00	4.76E-01	8.32E-07	****	10.4644252	0.1	0.5	3.786
borough	1.27E+00	8.25E-01	1.24E-01	*	3.5555860	0	1	2.556
CSOs	5.59E-01	2.22E-01	1.17E-02	***	1.7484863	0	1	0.748
town	5.01E-01	2.09E-01	1.63E-02	***	1.6505229	0	1	0.651
% urbanized (2010)	1.15E+00	2.67E-01	1.85E-05	****	3.1434910	0.75	1	0.536
housing units % built before 1950	5.80E-01	3.75E-01	1.22E-01	*	1.7853084	0.1	0.5	0.314
% agriculture (2011)	4.05E-01	4.80E-01	4.00E-01		1.4986156	0.05	0.5	0.224
population	6.14E-07	2.94E-07	3.68E-02	***	1.0000006	25,000	250,000	0.138
county	9.45E-02	2.95E-01	7.49E-01		1.0991162	0	1	0.099
Δ % forest (2011-1992)	-4.66E-01	5.52E-01	3.99E-01		0.6275210	-0.05	-0.3	0.093
land area	1.77E-04	2.37E-04	4.56E-01		1.0001769	25	500	0.084
city-county	-5.29E-02	7.47E-01	9.43E-01		0.9484475	0	1	-0.052
racial diversity	-1.97E+00	1.23E+00	1.08E-01	*	0.1389672	0.3	0.37	-0.060
MS4 Phase 2	-2.31E-01	1.36E-01	9.02E-02	**	0.7938406	0	1	-0.206
housing units tenancy diversity	-9.13E-01	3.70E-01	1.36E-02	***	0.4011721	0.2	0.55	-0.210
MS4 Phase 1	-2.85E-01	1.96E-01	1.46E-01	*	0.7516507	0	1	-0.248
village	-5.94E-01	2.02E-01	3.21E-03	****	0.5520155	0	1	-0.448
township	-9.72E-01	4.91E-01	4.79E-02	***	0.3782148	0	1	-0.622
median age	-4.98E-02	9.54E-03	1.81E-07	****	0.9514372	35	50	-0.728

AIC = 5,206

The regression model on state-specific stormwater fee enactment sequence suggests that the earliest-enacting local governments in each state had the following characteristics: higher percent forested land use in 2011; CSO discharges; lower median age; higher percent urbanized area in 2010; lower diversity of housing unit tenancy type; and larger population (Table 3.8). Additionally, compared with cities, the earliest-enacting local governments tended to be towns, whereas townships and villages tended to be later enactors (Table 3.8). Although the Phase 1 and Phase 2 MS4 regulation variables are associated with earlier stormwater fee enactment within a state, these effects are marginally insignificant (Table 3.8). However, closer analysis

shows that all but one of the first-enacting local governments in each state was regulated as either a Phase 1 or Phase 2 MS4 community.[60] Similarly, most of the local governments in the earliest-enacting bin (i.e., the first, second, or third local governments to enact a stormwater fee in each state) were also regulated under either the Phase 1 or Phase 2 MS4 regulations. Furthermore, most of the local governments in the earliest-enacting bin that were not regulated under the Phase 1 or Phase 2 MS4 regulations were part of the special-district stormwater fee enacted by Sanitation District 1 of Northern Kentucky. These additional analyses suggest that implementing MS4 regulation as a single binary variable indicating if a local government was regulated under either the Phase 1 or Phase 2 MS4 regulations in the previous regression model would result in a more significant effect compared with implementing MS4 regulation effects in two distinct phases. Local governments regulated under the Phase 1 MS4 regulations also tended to be cities with large land areas and populations (Figure B.27, Figure B.28), so the effect of the MS4 regulations is somewhat interrelated with the effects of other variables.

To specifically assess the two hypothesized characteristics of the earliest-enacting local governments within states, I further examined the earliest-enacting local governments in each state with respect to size – both population and land area – and median household income.[61] Fairly large cities and counties – in terms of both 2010 population (i.e., more than 75,000) and land area (i.e., larger than 24 square miles) – were the earliest or among the earliest adopters[62] of stormwater fees in some states, including: Mobile, Alabama; Peoria, Arizona; San Jose, California; Boulder and Denver[63] in Colorado; Tallahassee, Florida; Columbia County, Georgia; Sioux City, Iowa; Aurora, Illinois; Louisville, Kentucky;[64] Montgomery County, Maryland;

[60] The only local government that was first to enact a stormwater fee in its state that was not regulated under either the Phase 1 or Phase 2 MS regulations was the Village of Lake Delton in Sauk County, Wisconsin.

[61] Note that population exhibited a significant effect in the state-specific stormwater fee enactment sequence regression model (Table 3.8). I did not include median household income in the regression model because my initial screening of this variable showed minimal covariation with the state-specific enactment sequence variable.

[62] While I use the term "early adopters" here, Rogers (2003) refers to the very earliest adopters of an innovation as "innovators."

[63] The city and county of Denver, Colorado have been consolidated since 1902.

[64] Campbell et al. (2017) record the enactment year for the Louisville/Jefferson County Metro Government stormwater fee as 1987. The City of Louisville was a distinct jurisdiction from Jefferson County until the metro government was formed in 2003.

Detroit, Ann Arbor, and Lansing in Michigan; Kansas City, Missouri; Charlotte and Greensboro in North Carolina; Cincinnati, Ohio; Tulsa, Oklahoma; Portland, Oregon; Sioux Falls, South Dakota; Chattanooga, Tennessee; Dallas and Garland in Texas; Salt Lake City, Utah; Chesapeake, Newport News, and Virginia Beach in Virginia; and Clark County and Bellevue in Washington (Figure 3.5, Table 3.9). However, fairly small local governments (i.e., populations less than 45,000 and land areas less than 22 square miles) were the first to enact stormwater fees in many states, such as: the City of Pinole, California; the City of Hallandale Beach, Florida; the City of Griffin, Georgia; the City of Coeur d'Alene, Idaho; the towns of Dyer and North Manchester in Indiana; the City of Winfield, Kansas; the City of Takoma Park, Maryland; the cities of Fridley, Richfield, Robbinsdale, and Roseville in Minnesota; the Village of Clemmons in North Carolina; the City of Ithaca, New York; the Municipality of Mt. Lebanon and the Borough of Jonestown in Pennsylvania; the cities of Florence and Georgetown in South Carolina; the City of North Ogden in Utah; the City of South Burlington, Vermont; the Village of Lake Delton, Wisconsin; and the cities of Oak Hill and Hurricane in West Virginia (Figure 3.5, Table 3.10).

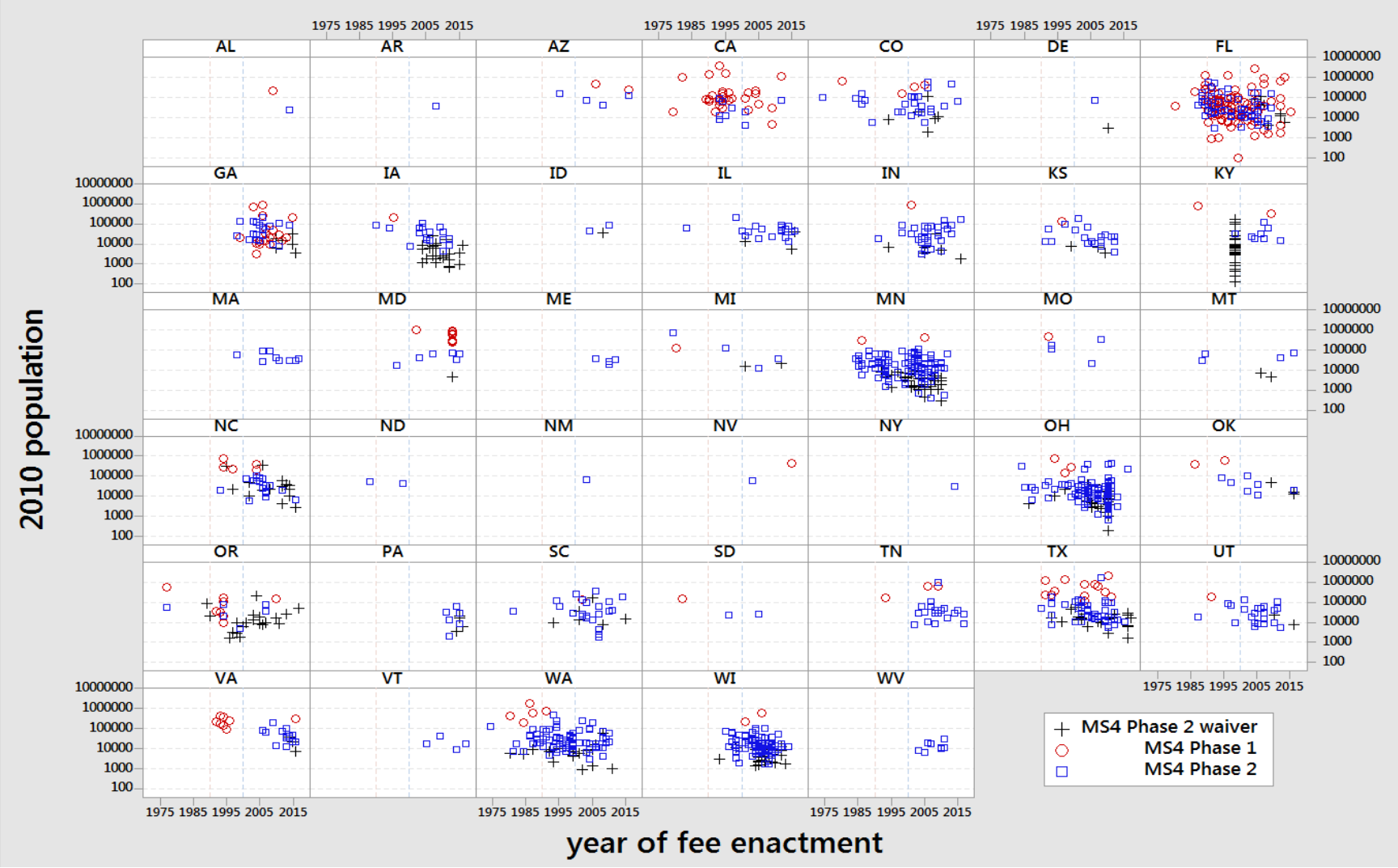

Figure 3.5. Scatterplot of population vs. year of stormwater fee enactment by state.
Population axis on logarithmic scale. Year reference lines at 1990 and 2000. Symbol shapes and colors indicate MS4 regulation status.

Similarly, some local governments with relatively high 2016 median household incomes (i.e., more than $66,666) were the earliest or among the earliest adopters of stormwater fees in some states, such as: the cities Pinole and San Jose in California; the City of Decatur and Columbia County in Georgia; the Village of Tinley Park, Illinois; the Town of Dyer, Indiana; the City of Newton and the Town of Reading in Massachusetts; Montgomery County and the cities of Takoma Park and Annapolis in Maryland; the cities of Edina and Shakopee in Minnesota; the Village of Clemmons, North Carolina; the City of Edmond, Oklahoma; the Municipality of Mt. Lebanon, Pennsylvania; the City of North Ogden, Utah; the cities of Chesapeake and Virginia Beach in Virginia; the City of South Burlington, Vermont; and the City of Bellevue, Washington (Figure 3.6, Table 3.9). However, local governments with relatively low 2016 median household incomes (i.e., less than $45,000) were the first to enact stormwater fees in some states, such as: the cities of Mobile and Anniston in Alabama; the City of Hot Springs, Arkansas; the cities of Hallandale Beach and Tallahassee in Florida; the City of Griffin, Georgia; the City of Coeur d'Alene, Idaho; the City of Winfield, Kansas; the City of Lewiston, Maine; the City of Detroit, Michigan; the City of Ithaca, New York; the cities of Cincinnati and Wooster and the Village of Montpelier in Ohio; the City of Tulsa, Oklahoma; the City of Corvallis, Oregon; the cities of Florence and Georgetown in South Carolina; the City of Chattanooga, Tennessee; the Village of Lake Delton, Wisconsin; and the City of Oak Hill, West Virginia (Figure 3.6, Table 3.10).

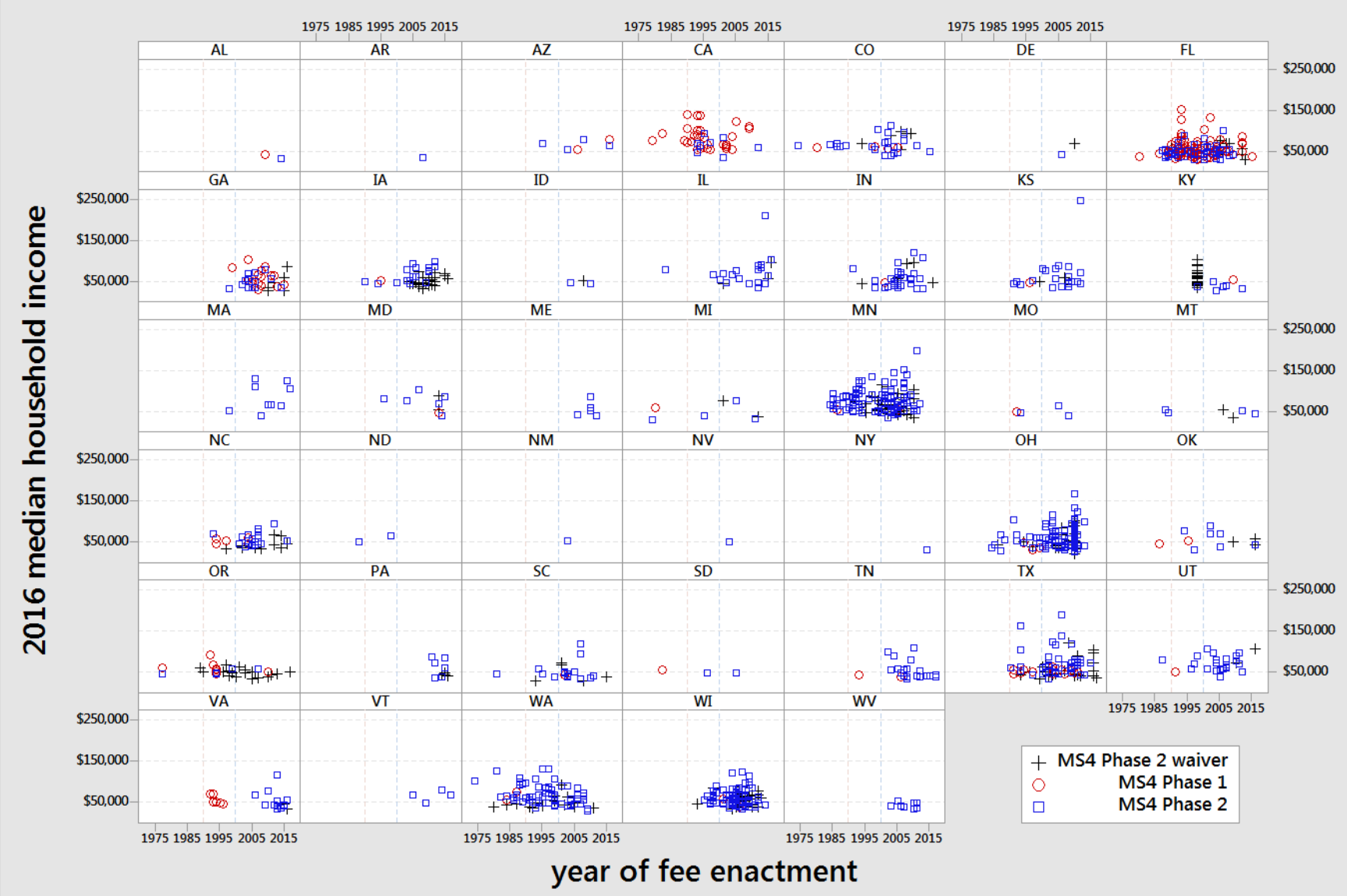

Figure 3.6. Scatterplot of median household income vs. year of stormwater fee enactment by state. Year reference lines at 1990 and 2000. Symbol shapes and colors indicate MS4 regulation status.

The only states where the first local government to enact a stormwater fee had *both* a 2010 population over 75,000 *and* a 2016 median household income over $66,666 were Virginia (the City of Chesapeake) and Washington (the City of Bellevue) (Table 3.9). In 19 other states, however, the first local government to enact a stormwater fee had *either* a 2010 population over 75,000 *or* a 2016 median household income over $66,666 (Table 3.9).

Table 3.9. Relatively populous or affluent early enactors.
Relatively populous (2010 population > 75,000) or relatively affluent (2016 median household income > $66,666) local governments that were the first in their respective states to enact a stormwater fee.

state	name	type	year fee enacted	population (2010)	area (mi^2)	median household income (2016)	counties
AL	Mobile	city	2009	195,111	179.8	$38,759	Mobile
AZ	Peoria	city	1995	154,065	179.0	$66,163	Maricopa, Yavapai
CA	Pinole	city	1979	18,390	11.8	$74,124	Contra Costa
CO	Boulder	city	1974	97,385	25.9	$60,569	Boulder
IA	Sioux City	city	1990	82,684	59.2	$46,028	Plymouth, Woodbury
IL	Tinley Park	village	1983	56,703	16.0	$76,022	Cook, Will
IN	Dyer	town	1991	16,390	6.1	$78,043	Lake
MD	Takoma Park	city	1996	16,715	2.1	$78,921	Montgomery
MI	Detroit	city	1979	713,777	142.9	$26,249	Wayne
MO	Kansas City	city	1992	459,787	319.0	$47,489	Cass, Clay, Jackson, Platte
NC	Clemmons	village	1993	18,627	12.1	$67,783	Forsyth
OH	Cincinnati	city	1984	296,943	79.5	$34,629	Hamilton
OK	Tulsa	city	1986	391,906	201.1	$43,045	Osage, Rogers, Tulsa, Wagoner
OR	Portland	city	1977	583,776	145.1	$58,423	Clackamas, Multnomah, Washington
PA	Mt. Lebanon	township	2011	33,137	6.1	$86,422	Allegheny
SD	Sioux Falls	city	1982	153,888	73.8	$54,110	Lincoln, Minnehaha
TN	Chattanooga	city	1993	167,674	149.7	$41,278	Hamilton
UT	North Ogden	city	1987	17,357	7.2	$78,598	Weber
VA	Chesapeake	city	1992	222,209	350.9	$69,978	Chesapeake city
VT	South Burlington	city	2005	17,904	29.6	$66,728	Chittenden
WA	Bellevue	city	1974	122,363	33.7	$100,703	King

Conversely, in ten states, the first local government to enact a stormwater fee had both a 2010 population under 45,000 and a 2016 median household income lower than $45,000 (Table 3.10).

Table 3.10. Relatively unpopulous and poor early enactors.
Relatively unpopulous (2010 population < 45,000) and relatively poor (2016 median household income < $45,000) local governments that were the first in their respective states to enact a stormwater fee.

state	name	type	year fee enacted	population (2010)	area (mi^2)	median household income (2016)	county
AR	Hot Springs	city	2008	35,193	35.1	$30,736	Garland
FL	Hallandale Beach	city	1980	37,113	4.6	$34,400	Broward
GA	Griffin	city	1998	23,643	14.1	$30,692	Spalding
ID	Coeur d'Alene	city	2004	44,137	16.1	$43,770	Kootenai
KS	Winfield	city	1991	12,301	12.5	$41,297	Cowley
ME	Lewiston	city	2006	36,592	35.5	$38,199	Androscoggin
NY	Ithaca	city	2014	30,014	6.1	$30,291	Tompkins
SC	Florence	city	1981	37,056	21.2	$44,989	Florence
WI	Lake Delton	village	1993	2,914	7.6	$43,384	Sauk
WV	Oak Hill	city	2003	7,730	5.7	$38,291	Fayette

3.4.4 Geospatial considerations

Although a formal analysis of geographic factors influencing stormwater fee diffusion among local governments in the United States is presently beyond the scope of this research,[65] a geospatial perspective on the subject suggests some compelling patterns.

In Minnesota, for example, the pattern of stormwater fee diffusion suggests a strong geospatial element, particularly concentrated in and around the Minneapolis / St. Paul metropolitan area (Figure 3.7). The first local government in Minnesota to enact a stormwater fee was Roseville, a 14-square mile city of roughly 33,000 people located just east of Minneapolis and just north of St. Paul, in 1984. In 1985, five more cities (i.e., Edina, Fridley, Richfield, Robbinsdale, Shakopee) within 25 miles of downtown Minneapolis enacted stormwater fees. By 1990, eight other cities in the region had enacted stormwater fees, including St. Paul in 1986. By 1999, 54 of the 57 local governments with stormwater fees in Minnesota were located within roughly 50 miles of downtown Minneapolis. By 2017, 113 of the 136 local governments with stormwater fees in Minnesota – as well as a few cities across the St. Croix

[65] I plan to extend this research by incorporating explicitly geospatial models of stormwater fee diffusion among local governments in the United States.

River in western Wisconsin – were located within roughly 50 miles of downtown Minneapolis (Figure 3.7).

Campbell et al. (2014) previously noted a geospatially clustered pattern of stormwater fee diffusion in the Twin Cities region, as well as in other metropolitan regions: Dallas / Fort Worth, Texas; Indianapolis, Indiana; and Atlanta, Georgia (Figure 3.2). Clusters of stormwater fees are also located in and around the Seattle / Tacoma region in Washington, the Portland region in Oregon, the Indianapolis region in Indiana, the Kansas City region in Kansas and Missouri, the Charlotte region in North Carolina and South Carolina, the Columbus region in Ohio, the Milwaukee region in Wisconsin, the Oklahoma City and Tulsa regions in Oklahoma, along the Interstate 35 corridor north of San Antonio in Texas, along the Front Range / Interstate 25 corridor in Colorado, along the Wasatch Front / Interstate 15 corridor in Utah, in several regions along the coast of South Carolina, and in several regions in Florida and California (Figure 3.2).[66] Some plausible mechanisms driving geospatial clustering of stormwater fees include diffusion through regional governing institutions (e.g., the Metropolitan Council in the Minneapolis / St. Paul region) and – as discussed below – consulting firms with multiple local government clients.

[66] As noted by Campbell (2013), stormwater fees tend to cluster along major road (e.g., interstate) corridors in many parts of the United States. However, more developed and more populous localities also tend to cluster along major road corridors. By explicitly modeling geospatial patterns, future research into stormwater fee diffusion may be better able to assess the relative influence of land use, population, proximity to major road corridors, and other interrelated factors.

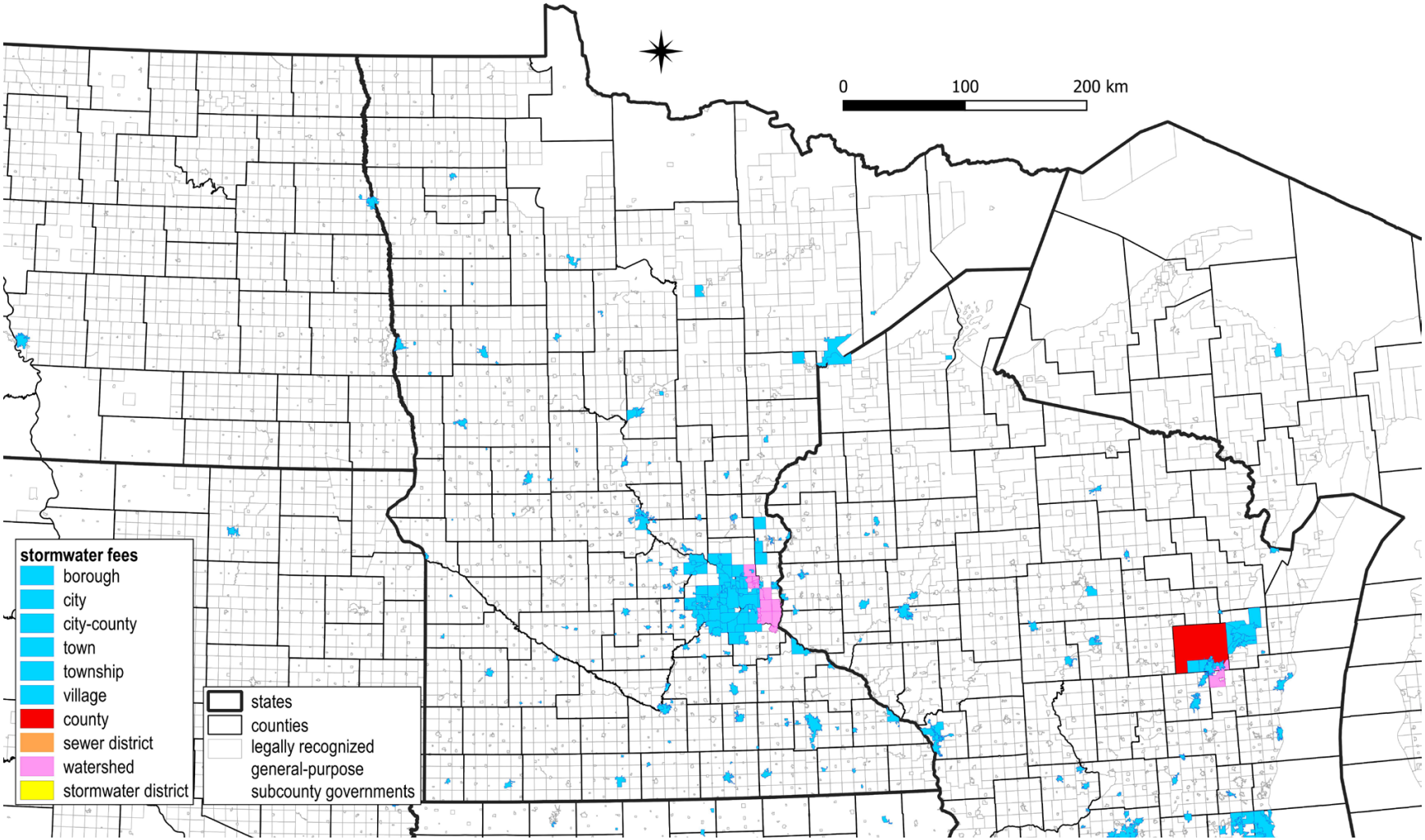

Figure 3.7. Map of stormwater fees in Minnesota.
[Stormwater fee data from Campbell et al. (2017). Jurisdiction boundaries from United States Census Bureau 2014 TIGER/Line shapefiles.]
Animated version available at http://youtu.be/r-IHzb2-_uc.

In addition to the spatially concentrated diffusion of stormwater fees among subcounty governments observed in the Twin Cities region and other areas of the contiguous United States, a stormwater fee enacted by a subcounty government can precede enactment of a stormwater fee by the encompassing county government. For example, Volusia County in northeastern Florida enacted a stormwater fee 1992, not long after two cities in the county enacted stormwater fees: Ormond Beach in 1987 and South Daytona in 1989. This ostensible "seeding" dynamic can also operate in a county-to-subcounty direction, such as in Cumberland County, North Carolina where the county enacted a stormwater fee in 1995 followed later by two subcounty governments in the county: the City of Fayetteville in 2004 and the Town of Hope Mills in 2007.[67]

Another geospatial diffusion pattern indicated in my analyses is that stormwater fees enacted by counties are mostly in counties with large proportions of unincorporated land in southern and western states, including Florida, Washington, Georgia, South Carolina, Kentucky, Maryland, North Carolina, Colorado, Oregon, and California (Figure 3.1, Figure 3.2, Figure B.29). That said, there are also several county stormwater fees in counties with very little unincorporated land in other states, such as Indiana and Ohio (Figure 3.1, Figure 3.2, Figure B.29).

These and other geospatial patterns of stormwater fee diffusion can be observed in many other areas of the United States, suggesting that models explicitly accounting for geospatial relationships among local governments will generate new insights into the mechanisms driving stormwater fee diffusion.

3.4.5 State-specific factors

Although a thorough, nationwide investigation of state-specific factors influencing stormwater fee diffusion among local governments in the United States is beyond the scope of this

[67] In situations where a subcounty government assesses a stormwater fee within a county that also assesses a stormwater fee, the county stormwater fee often only applies to unincorporated areas of the county. This situation is especially common in southern and western states where large areas of land are not incorporated into subcounty governments (Figure 3.2, Table B.3). Jurisdictional overlap of stormwater fees is discussed further in Appendix B.

dissertation, my research and existing literature suggest two major factors influencing the diffusion of stormwater fees among and within states: statutory law and case law.[68]

3.4.5.1 Statutory law

A brief exploration of statutory law in a couple of states will illustrate some of the reasons stormwater fees are more prevalent among local governments in some states versus others.

As previously noted, Pennsylvania passed a series of laws in 2016 explicitly authorizing certain types of local governments (i.e., boroughs and townships) to enact stormwater fees. Prior to passage of these laws the legal authority of these forms of local government in Pennsylvania to independently assess stormwater fees was unclear. The state passed a law in 2013 explicitly empowering municipal authorities – legally distinct entities from the municipalities themselves – to assess fees for stormwater management. As expressed by one of the people I interviewed as part of my inquiry into stormwater fee form, the legal uncertainty about the powers granted to certain forms of local government under state laws created hesitancy among many local governments to be an early mover in enacting a stormwater fee:

> "The Municipal Code was amended to include that I think in 2011 or 2012. A lot of the areas – Dormont, Mt. Lebanon, a couple of the other areas – they did not implement theirs [stormwater fees] until that language was changed because they were worried about running afoul of the Municipal Code. It says you can charge for water and wastewater, and there were some questions and vagaries around, 'Is stormwater wastewater? Or are they referring only to sanitary waste?' A lot of municipalities were like, 'Well, we'll just wait and see.' And they finally did clarify, 'Yes, you can also charge for stormwater.'
>
> I think that's what a lot of municipalities were waiting for, was just to see, number one, 'Can we actually do this within the structure of the legal agreements we have?' and two, 'Is it worth the effort to go through all of that only to have it maybe challenged or backed off?'"
>
> Pittsburgh Water and Sewer Authority
> Sustainability Manager

[68] Existing literature explores various state-specific factors, including statutory law and case law, influencing stormwater fee diffusion among local governments in Alabama (Campbell et al., 2014), Florida (Lienhart et al., 2013), Georgia (J. Smith, 2006; Whalen, III, 2000), Illinois (Chicago Metropolitan Agency for Planning, 2013; Hoskins, 2006; Keehner & Trivedi, 2013), Indiana (L. Wilson & Lindsey, 1995), Maryland (Maryland Department of the Environment, 2008), Massachusetts (Anantapadmanabhan, 2016), Michigan (Cooperwasser, 2012), Pennsylvania (Bowen, 2013; Chiaruttini, 2014; Glass, 2014; Horstmann & Bakare, 2017; PennFuture, 2017), Rhode Island (Marsello, 2011), Texas (Palmer, 1993), Vermont (Ali et al., 2013), and Washington (Diessner, 1993).

Now that state law clearly empowers local governments in Pennsylvania to directly assess stormwater fees, and now that several municipalities in the state have enacted stormwater fees, Pennsylvania is experiencing a surge in stormwater fee enactment by local governments.

Local governments in New Jersey appear to be in a similar situation to where many local governments in Pennsylvania were until recent years. Although several efforts to enact legislation explicitly empowering local governments to establish stormwater fees have emerged in the New Jersey state legislature – one of which made it all the way to a gubernatorial veto – none of these bills have yet been enacted into law (McKillop, 2018).

3.4.5.2 Case law

In addition to – and often based on – state statutory laws, case law developed by courts in many states is another important influence on the diffusion of stormwater fees in the United States. The salience of state-specific case law on stormwater fee enactment by local governments in the United States is well established in existing literature and extended by my research. Here, I provide a brief review of stormwater fee case law in the United States. This compilation of stormwater fee case law draws on my own research as well as existing literature (Burchmore et al., 2006; Kumar, Gaffney, Grantham, Gregory, & Millonzi, 2013; National Association of Clean Water Agencies, 2014, 2016; Obropta et al., 2007).[69]

Most stormwater fee case law in the United States has been developed in state courts, with federal court cases largely limited to cases involving sovereign immunity claims on federally or tribally owned properties (Table 3.11). In several states with predominately supportive case law, stormwater fees are relatively prevalent: Colorado, Florida, Indiana, Kentucky, Ohio, South Carolina, Tennessee, Virginia, and Washington (Table 3.11, Table 3.12, Figure 3.2, Table 3.2). Likewise, some states with generally unsupportive case law have relatively few stormwater fees: Idaho, Michigan, and Missouri (Table 3.11, Table 3.12, Figure 3.2, Table 3.2). Although these patterns support the hypothesis that supportive case law in a state is necessary for – or at least contributory to – the diffusion of stormwater fees, contradictory patterns appear in other states. More specifically, in some states with supportive

[69] My compilation of stormwater fee case law focuses on cases specifically concerning stormwater fees. My analysis does not extend to the precedential cases concerning other kinds of fees, principles of taxation, and intergovernmental relations on which stormwater fee cases often build. Such precedential cases are included in some of the existing literature on stormwater fees (e.g., Burchmore et al. 2006; Whalen, III 2000).

case law, stormwater fees are not widespread: Alabama, Arkansas, and Kansas (Table 3.11, Table 3.12, Figure 3.2, Table 3.2). Similarly, stormwater fees are fairly prevalent in some states with generally unsupportive case law: California and North Carolina (Table 3.11, Table 3.12, Figure 3.2, Table 3.2).

While suggestive, this analysis of the influence of state case law on stormwater fee prevalence does not account for several salient factors. First, the timing and accumulation of key judicial decisions likely influence enactment of stormwater fees by local governments. For example, although a handful of local governments in Missouri have enacted stormwater fees, no local government in the state has enacted a stormwater fee since 2013 when the Missouri Supreme Court ruled that the stormwater fee assessed by the St. Louis Metropolitan Sewer District was actually a tax, which – since it was established without voter approval – violated the state's constitution (Table 3.11). Although stormwater fee case law is pretty solidly established in some states, the case law landscape in other states is less deeply rooted. For instance, in Pennsylvania, ongoing lawsuits represent the first litigation in the state to explicitly deal with stormwater fees (Table 3.11). In Maryland, fairly recent and somewhat conflicting judicial decisions (Table 3.11) – along with changing positions on stormwater fees in other branches of state government – have also created a somewhat unsettled legal landscape. Even in Colorado, a state with more than three decades of case law supporting stormwater fees, a special-district stormwater fee was found to be an illegal tax in one recent case (Table 3.11).

Second, this analysis of state case law on stormwater fees does not account for several potentially relevant details of each case, including: the type and size of local government involved; the level of the deciding court; and the specific aspects of the stormwater fee disputed and analyzed in each case.[70] A case in which a state supreme court upheld the authority of a large, populous city to assess a stormwater fee based on statutory and/or constitutional provisions may have a larger impact on stormwater fee enactment by other local governments in the state

[70] Existing literature identifies two main aspects of stormwater fees that have been analyzed in stormwater fee cases: the authority of a local government to assess a stormwater fee, including on property held by other levels of government (e.g., federal, state, tribal, county); and whether a stormwater fee constitutes a tax. In evaluating whether stormwater fees are actually taxes, as opposed to service fees, courts have considered several interrelated factors, including: the purpose of the fee; whether collected revenues are dedicated solely to providing stormwater services; the extent to which people paying the fee benefit from services financed by the fee; the extent to which people paying the fee can take actions to reduce or eliminate their assessments; the extent to which the fees paid are proportional to the costs of the service or benefits provided; and the extent to which fees are uniform across individual ratepayers or groups of ratepayers (Burchmore et al., 2006; Kumar et al., 2013; National Association of Clean Water Agencies, 2014, 2016; Obropta et al., 2007).

compared with a case considering more limited jurisdictional or fee structure details decided by a county or district court. My present analysis does not deeply investigate these nuances of stormwater fee case law, but does indicate some support for these conjectures. For example, the two cases that did not support stormwater fees in Florida were both cases involving whether cities had jurisdiction to assess stormwater fees on properties owned by state or county educational institutions (Table 3.11). Moreover, these two cases were also decided after Florida courts had established fairly robust case law supporting stormwater fees over the preceding two decades (Table 3.11). Similarly, the one negative-precedent stormwater fee case in Indiana (Table 3.11) was negative only in the sense that the court found that the town did not have the authority to assess stormwater fees outside the jurisdiction of the town.

The effect of court decisions on stormwater fee enactment by local governments in a state also depends on the specific provisions in relevant statutory law. For example, in a 2001 decision, the Supreme Court of Alabama upheld a stormwater fee enacted by Jefferson County (Table 3.11), but this decision did not catalyze enactment of stormwater fees by other local governments in the state in large part because – as noted by Campbell (2013) – the state statute authorizing local governments to enact stormwater fees effectively only applied to Jefferson County and the City of Birmingham.[71] As such, until Alabama enacted a law in 2014 extending the authority to enact stormwater fees to a larger population of local governments,[72] only one city and one county in the state were explicitly authorized by state statutes to enact stormwater fees.

[71] Act 95-775 only applies to Class 1 municipalities in Alabama, and to counties where Class 1 municipalities are located. The Alabama Code defines Class 1 municipalities as cities with a population of 300,000 or more. Curiously, no cities in Alabama have a population of 300,000 or more. The largest city in the state is Birmingham, which had a population of 242,820 as of the 2000 Census. Birmingham is located in Jefferson County. In the 2001 decision upholding the Jefferson County stormwater fee, the issue of whether Birmingham was a Class 1 municipality was a key point of dissention, but was an issue largely sidestepped in the majority opinion.

[72] Act 2014-439 amended the Alabama Code to authorize all counties and municipalities in the state subject to MS4 regulation by USEPA to enact stormwater fees.

Table 3.11. Summary of stormwater fee case law in the United States.
Party assessing the stormwater fee in bolded text. Precedent symbolized as either positive (+), negative (-), or neutral (o) for stormwater fees.

plaintiff	v.	defendant	state	year	precedent	court
Densmore	*v.*	***Jefferson County***	AL	2001	+	Supreme Court of Alabama
Bradford & Little	*v.*	***City of Anniston***	AL	2016	+	Circuit Court of Calhoun County
Morningstar & Shirley	*v.*	***City of Hot Springs***	AR	2011	+	Supreme Court of Arkansas
Howard Jarvis Taxpayers Association	*v.*	***City of Salinas***	CA	2002	-	6th District Court of Appeals of California
Zelinger	*v.*	***City and County of Denver***	CO	1986	+	Supreme Court of Colorado
City of Littleton	*v.*	*State of Colorado*	CO	1993	+	Supreme Court of Colorado
Stop Stormwater Utility Association	*v.*	***Adams County***	CO	2015	+	17th District Court of Colorado
Grand Junction Area Chamber of Commerce	*v.*	***Grand Valley Drainage District***	CO	2018	-	Mesa County District Court
City of Wilmington	*v.*	*Diamond State Port Corporation*	DE	2014	+/o	Superior Court of Delaware
City of Boca Raton	*v.*	*State of Florida*	FL	1992	+	Supreme Court of Florida
Sarasota County	*v.*	*Sarasota Church of Christ*	FL	1995	+	Supreme Court of Florida
City of Cocoa	*v.*	*School Board of Brevard County*	FL	1998	+/o	5th District Court of Appeal of Florida
City of Gainesville	*v.*	*State of Florida*	FL	2001	+	1st District Court of Appeal of Florida
City of Gainesville	*v.*	*State of Florida*	FL	2003	+	Supreme Court of Florida
City of Clearwater	*v.*	*School Board of Pinellas County*	FL	2005	+	2nd District Court of Appeal of Florida
City of Key West	*v.*	*Florida Keys Community College*	FL	2012	-	3rd District Court of Appeal of Florida
City of Fort Pierce	*v.*	*Australian Properties*	FL	2015	+	4th District Court of Appeal of Florida
City of Key West	*v.*	*Key West Golf Club Homeowners' Association*	FL	2017	+	3rd District Court of Appeal of Florida
School Board of Palm Beach County	*v.*	***City of West Palm Beach***	FL	2017	-	15th Circuit Court of Palm Beach County
Fulton County Taxpayers Association	*v.*	***City of Atlanta***	GA	1999	-	Georgia Superior Court
McLeod	*v.*	***Columbia County***	GA	2004	+	Supreme Court of Georgia
DeKalb County	*v.*	*United States of America*	GA	2013	-	United States Court of Federal Claims
Homewood Village	*v.*	***Unified Government of Athens-Clarke County***	GA	2013	+	Supreme Court of Georgia
Lewiston Independent School District #1	*v.*	***City of Lewiston***	ID	2011	-	Supreme Court of Idaho
Church of Peace	*v.*	***City of Rock Island***	IL	2005	+	Appellate Court of Illinois, 3rd District
Green	*v.*	***Village of Winnetka***	IL	2016	o	Appellate Court of Illinois, 1st District
Brockmann Enterprises	*v.*	***City of New Haven***	IN	2007	+	Court of Appeals of Indiana
Daum	*v.*	***Town of Plainfield***	IN	2009	-	Court of Appeals of Indiana
Mint Management & J&MW Holdings	*v.*	***City of Richmond***	IN	2017	+	Court of Appeals of Indiana
City of Wichita	*v.*	*Kansas Taxpayers Network*	KS	1994	+	Supreme Court of Kansas
Long Run Baptist Association	*v.*	***Louisville and Jefferson County Metropolitan Sewer District***	KY	1989	+	Court of Appeals of Kentucky

plaintiff	v.	defendant	state	year	precedent	court
Wessels Company	*v.*	*Sanitation District #1*	KY	2007	+	Court of Appeals of Kentucky
Chod	*v.*	*Board of Appeals for Montgomery County*	MD	2015	-	Circuit Court for Montgomery County
Shaarei Tfiloh Congregation	*v.*	*City of Baltimore*	MD	2018	+	Maryland Court of Special Appeals
City of Lewiston	*v.*	*Gladu*	ME	2012	+	Supreme Judicial Court of Maine
City of Hallowell	*v.*	*Greater Augusta Utility District*	ME	2013	+	Maine Superior Court
Bolt	*v.*	*City of Lansing*	MI	1998	-	Supreme Court of Michigan
Jackson County	*v.*	*City of Jackson*	MI	2013	-	Court of Appeals of Michigan
Zweig	*v.*	*Metropolitan St. Louis Sewer District*	MO	2013	-	Supreme Court of Missouri
City of Billings	*v.*	*Nore*	MT	1966	+	Supreme Court of Montana
Smith Chapel Baptist Church	*v.*	*City of Durham*	NC	1999	-	Supreme Court of North Carolina
City of Wooster	*v.*	*Graines*	OH	1990	+	Supreme Court of Ohio
City of Cincinnati	*v.*	*United States of America*	OH	1998	-/o	United States Court of Appeals, Federal Circuit
Northeast Ohio Regional Sewer District	*v.*	*Bath Township*	OH	2015	+	Supreme Court of Ohio
Dennehy	*v.*	*City of Gresham*	OR	1992	-	Supreme Court of Oregon
Roseburg School District	*v.*	*City of Roseburg*	OR	1993	+	Supreme Court of Oregon
Papa	*v.*	*City of New Castle*	PA	2018	?	Lawrence County Court of Common Pleas
Lehigh-Northampton Airport Authority	*v.*	*City of Allentown*	PA	2018	?	???
South Carolina	*v.*	*City of Charleston*	SC	1999	+	Supreme Court of South Carolina
Vandergriff	*v.*	*City of Chattanooga*	TN	1998	+	United States District Court, Eastern District
Greater New Braunfels Home Builders Association	*v.*	*City of New Braunfels*	TX	2007	-	Texas Court of Appeals
El Paso Apartment Association	*v.*	*City of El Paso*	TX	2011	+	United States Court of Appeals, 5th Circuit
Beck	*v.*	*City of Lubbock*	TX	2018	+	237th District Court of Texas
Twietmeyer	*v.*	*City of Hampton*	VA	1998	+	Supreme Court of Virginia
Norfolk Southern Railway Company	*v.*	*City of Roanoke*	VA	2017	+	United States District Court, Western District
Teter	*v.*	*Clark County*	WA	1985	+	Supreme Court of Washington
Smith	*v.*	*Spokane County*	WA	1997	+	Court of Appeals of Washington, Division 3
Tukwila School District #406	*v.*	*City of Tukwila*	WA	2007	+	Washington Court of Appeals, Division 1
Storedahl Properties	*v.*	*Clark County*	WA	2008	+	Court of Appeals of Washington, Division 2
United States of America	*v.*	*City of Renton and City of Vancouver*	WA	2012	+	United States District Court, Western District
Oneida Tribe of Indians of Wisconsin	*v.*	*Village of Hobart*	WI	2012	-	United States District Court, Eastern District

Table 3.12. Status of case law and stormwater fee prevalence by state.

		case law			
		supportive	unsupportive	mixed	unknown
stormwater fee prevalence	high	CO, FL, GA, IN, KY, OH, SC, TN, VA, WA	CA, NC	MD, OR, TX	UT, IA, MN, NY
	low	AL, AR, KS	ID, MI, MO	IL	PA, ND, SD, NE

3.4.6 Consultants

In addition to geospatial and state-specific factors, my research also suggests another potentially salient influence on stormwater fee diffusion among local governments in the United States: consultants. One of the people I interviewed as part of my inquiry into stormwater fee forms indicated that the engineering firm contracted with the borough as its municipal engineer actively promoted stormwater fees among its network of clients:

> "Gateway Engineers was also the engineer for Mt. Lebanon. They actually represent, I think, 24-25 municipal clients in this general area, Whitehall being one. So, when Mt. Lebanon enacted it [a stormwater fee], she approached us about enacting something similar because we were facing some of the same challenges. I'm going to guess that every single Gateway client at least has had the idea broached to them. Where they all stand on it, I don't know, but I'm sure that every Gateway client has at least at some point in time had the idea of a stormwater fee mentioned."
>
> Borough of Whitehall, Pennsylvania
> Borough Manager

Some preliminary research I conducted into consulting firms as a potentially salient means by which stormwater fees diffuse shows several instances of multiple local governments – sometimes in different states – that have contracted with the same consulting firms to conduct stormwater fee feasibility studies and/or to design a stormwater fee (Table 3.13).

Table 3.13. Consulting firms with multiple stormwater fee clients.

firm	stormwater fee clients			
	name	type	state	county
Gateway Engineers	Mt. Lebanon	municipality	PA	Allegheny
	Whitehall	borough	PA	Allegheny
Herbert, Rowland, and Grubic	Derry	township	PA	Dauphin
	Blooming Grove	township	PA	Pike
	State College	borough	PA	Centre
	West Goshen	township	PA	Chester
	Wyoming Valley Sanitary Authority	special	PA	Luzerne
ARCADIS	Williamsport	city	PA	Lycoming
	Hampden	township	PA	Cumberland
	Scranton	city	PA	Lackawanna
AMEC Foster Wheeler	Easton	city	PA	Northampton
	Bradford	city	PA	McKean
	York	county	PA	
Hawksley Consulting / Baxter & Woodman	Downers Grove	village	IL	DuPage
	Wheaton	city	IL	DuPage
	Geneva	city	IL	Kane
	South Elgin	village	IL	Kane
Freese and Nichols	Cedar Park	city	TX	Travis / Williamson
	Frisco	city	TX	Collin / Denton
Hazen Sawyer	Deerfield Beach	city	FL	Broward
	Dormont	borough	PA	Allegheny

Taken together with my interviews into stormwater fee form and my preliminary research into consulting firms, my case study of Billings, Montana further suggests the salience of engineering firms contracted with local governments as a diffusion mechanism for stormwater fees. The existing literature on stormwater fees also strongly indicates the importance of consultants as drivers of stormwater fee diffusion in the United States. For example, several publications emphasize the key role that Hector Cyre played in popularizing stormwater utilities and stormwater fees through his firm, Water Resource Associates, based in Bellevue, Washington (B. D. Keller, 2002; Woolson, 2004). Consultants also helped to popularize stormwater fees and stormwater utilities by conducting and publishing national surveys (Benson, 2002; Kumar et al., 2016; Raftelis Environmental Consulting Group, 1998). Some consulting firms have also published guides for local governments considering implementing stormwater fees (e.g., McIntosh and Vicari 2016).

3.4.7 Industry associations and publications

The existing literature on stormwater fees also reflects the key role that professional industry associations have played in promoting stormwater fees in the United States. In particular, the American Public Works Association (APWA) exhibited a concerted focus on stormwater fees – especially throughout the 1980s – in its publications (American Public Works Association, 1991; Cyre, 1983, 1987; Damico & Curtis, 2003; Honchell, 1986; B. Keller & Reese, 1999; Poertner, 1981; Spray & Hoag, 2004; Stitt, 1986; Treadway & Reese, 2000) and conferences (Cyre, 1982, 1986). In discussing the formation of a stormwater utlity in Cincinnati, Ohio, Stitt (1986) explicitly noted that, "APWA's Special Report No. 49, *Urban Stormwater Management*, was helpful in developing our concept for the utility." The existing literature on stormwater fees also indicates that other professional industry associations – such as the Water Pollution Control Federation (Cyre et al., 1990), the Water Environment Federation (Garner et al., 1994; Matichich et al., 2013), and the American Society of Civil Engineers (Hon, 1993) – and industry publications and publishers – such as *Public Works* (Grimes & Schumacher, 1992; Null, 1995) and Forester Media (Busco & Lindsey, 2001; Chandler, 2015; Kaspersen, 2000, 2011, 2014, 2016a, 2016b; B. D. Keller, 2002; Reese, 2007a, 2007b; Szalay, 2011; van der Tak et al., 2012; Veal & Mullins, 2003; Woolson, 2004) – have played a role in publicizing and popularizing stormwater fees. In addition to the aforementioned mostly national-scale associations, stormwater fees have also been promoted through the publications, conferences, and workshops of professional industry associations with more regional, state, or local foci[73] (Deiseroth, 2016; R. F. McIntosh, 2014; Norcini & Merritt, 2013; Schutz, Callahan, & Vicari, 2016; VanAuken, 2016; A. Vicari, 2015; A. M. Vicari & Stinnett, II, 2016; Wyland & Stinnett, II, 2016). The people publishing in and presenting at these professional industry association publications,

[73] Organizations dedicated to stormwater management – some of which specifically serve the needs of regulated MS4s – exist in many states, including the Arizona Stormwater Outreach for Regional Municipalities, the California Stormwater Quality Association, the Indiana Association for Floodplain and Stormwater Management, the Iowa Stormwater Education Partnership, the Kentucky Stormwater Association, the Louisiana Urban Stormwater Coalition, the Minnesota Cities Stormwater Coalition, the Nebraska Floodplain and Stormwater Managers Association, the Ohio Stormwater Association, the Tennessee Stormwater Association, the Utah Storm Water Advisory Committee, and the Virginia Municipal Stormwater Association. Many of these state stormwater organizations are members of the National Municipal Stormwater Alliance. Numerous regional and local scale stormwater organizations also exist across the country, such as the Central Massachusetts Regional Stormwater Coalition and the Western New York Stormwater Coalition.

conferences, and workshops often are individuals who have helped implement stormwater fees, either as direct employees of local governments or consultants.

3.4.8 Model ordinances

Various organizations – including industry associations and partnerships, consultants, and universities – have also promoted the enactment of stormwater fees by local governments through the development and distribution of model stormwater utility ordinances in certain states, including Florida (University of Florida - Levin College of Law, 2006), Iowa (Iowa Association of Municipal Utilities, 2010), Maine (Horsley Witten Group, 2005), and Tennessee (Chlarson & Hemsley, 2002).

3.5 DISCUSSION

The primary conclusion from the preceding analyses of stormwater fee diffusion is that although both phases of MS4 regulation appear to have been major drivers of stormwater fee diffusion among local governments in the United States, state-specific factors can completely or largely negate the effect of MS4 regulation on local government stormwater fee enactment. For instance, despite fairly widespread regulation of MS4s, stormwater fees have been enacted by very few local governments in some states, including New Jersey, New York, Connecticut, and Pennsylvania. This finding on the salience of MS4 regulation as a driver of stormwater fee enactment is consistent with and expands on previous research, such as Anantapadmanabhan (2016).

My analyses also strongly suggest that the timing of stormwater fee enactment for many local governments across the United States was related to when the MS4 Phase 1 and Phase 2 regulations took effect. While local governments regulated under the MS4 Phase 1 regulations were significantly more likely to have enacted stormwater fees in the decade after those regulations took effect (i.e., the 1990s) compared with the 2010-2017 period, local governments regulated under the MS4 Phase 2 regulations were significantly more likely to have enacted stormwater fees in the decade after those regulations became final (i.e., the 2000s) compared with the 1990s. These results on the timing of stormwater fee enactment relative to the two phases of MS4 regulation are consistent with and further specify the findings of Kea, Dymond, and Campbell (2016).

The form of local governments also appears to have strongly influenced the diffusion of stormwater fees in the United States, with cities and city-county governments being significantly more likely to have enacted a stormwater fee than boroughs, villages, towns, townships, or counties. My analyses also suggest significant effects on stormwater fee enactment of several other local government characteristics, including land use, housing stock, and demographic characteristics.

From the perspective of policy diffusion theory, my analyses indicate strong support for the coercive diffusion of stormwater fees among local government in the United States,

specifically as pertains to federal regulation of MS4s. However, my analyses of stormwater fee diffusion also point to several internal determinants of stormwater fee diffusion, including land use, housing stock, and demographic characteristics as well as local government type. Furthermore, this research also strongly suggests that consulting firms and industry associations have acted as important go-betweens in promoting the diffusion of stormwater fees among local governments in the United States over the past five decades. These and other key go-betweens (e.g., regional governing organizations) have likely facilitated learning diffusion of stormwater fees among local governments in the United States.

The influence of state-specific factors (e.g., statutes and case law) in modulating the federal coercion of local governments to enact stormwater fees (i.e., through MS4 permits) does not find clear expression in policy diffusion theory. This lack of theoretical focus on state factors modulating federal influences on local governments likely stems from the relative dearth of research analyzing policy diffusion among local governments and the insignificance of state factors in the limited set of research investigating policy diffusion among local governments (e.g., Krause 2011). In this respect, my research suggests policy diffusion theory may need to be amended for application to contexts where local governments are situated within states in a federal system.

Although this research did not directly assess how the attributes of the stormwater fee policy have influenced diffusion of stormwater fees, I posit that local governments often perceive a relative advantage of a stormwater fee compared with other mechanisms for financing stormwater management, as discussed in Chapter 1. I also suggest that stormwater fees are seen as highly compatible with the needs of local governments looking for a dedicated, reliable source of revenue to finance stormwater management functions, especially those local governments facing increasing costs associated with more stringent MS4 and CSO regulations. Furthermore, as stormwater fees have become more widespread, I contend these policies have become more observable and increasingly perceived as relatively easy to understand and implement by local governments across the country, thanks in no small part to consulting firms and industry associations that have diligently promoted stormwater fees over the past three to five decades. Technological developments – particularly in aerial and satellite imaging as well as associated geospatial information system software (e.g., Correa, Adhityawarma, and Storvick 2003) – in

recent decades have also likely lowered implementation costs of stormwater fee policies for local governments.

3.5.1 Hypotheses on stormwater fee diffusion

The results from my analyses are consistent with some aspects of my hypotheses about stormwater fee diffusion among local governments in the United States, but are inconsistent with other aspects of my hypotheses.

> diffusion hypothesis 1:
> Stormwater fees were more likely to be enacted by local governments: (a) located in states with clear, unambiguous state legislation empowering local governments to enact stormwater fees; (b) that were regulated under the Phase 1 or Phase 2 MS4 regulations; (c) with CSO permits; (d) with relatively high proportions of developed land use; and (e) with relatively homogenous polities.

My analyses clearly show the importance of state-specific factors – including statutory law and case law – on the diffusion of stormwater fees among local governments across the United States. While this research did not delve deeply into specific statutory laws in each state, my diffusion research – together with my inquiries into stormwater fee emergence and form – strongly supports the hypothesis that state legislation enabling local governments to implement stormwater fees has been and continues to be a necessary condition for local governments to enact stormwater fees.

As previously discussed, this research also offers strong support for the hypothesis that local governments regulated under Phase 1 or Phase 2 MS4 regulations were more likely to enact stormwater fees. My analyses offer more qualified support for the hypothesis about local governments with permitted CSOs being more likely to enact stormwater fees. While my initial regression model supports this hypothesis, the model with state and local government type effects does not support the CSO hypothesis. However, my analyses of the timing of stormwater fee enactment do suggest that local governments with permitted CSOs were more likely to enact stormwater fees sooner than local governments without permitted CSOs.

My analyses also support the hypotheses that local governments with relatively high proportions of developed land use and relatively homogeneous polities were more likely to enact stormwater fees.

> diffusion hypothesis 2:
> Significant acceleration in stormwater fee enactment across the country followed announcement of the Phase I and Phase II MS4 regulations by USEPA in larger and smaller MS4 communities, respectively.

As discussed previously, my analyses offer fairly strong support – albeit qualified by state-specific factors – for this hypothesis about the timing stormwater fee diffusion among local government in the United States.

> diffusion hypothesis 3:
> Large, rich cities were the first local governments to enact stormwater fees in each state.

Fairly large *and* relatively affluent cities were the first local governments to enact a stormwater fee in two states (i.e., Virginia and Washington), but larger *or* more affluent local governments were the first entities to enact stormwater fees in 21 states. However, smaller and less affluent local governments were the first to enact a stormwater fee in ten states, suggesting mixed support for my third diffusion hypothesis. My analyses also indicate that local governments regulated under the Phase 1 MS4 regulations – which tended to be relatively populous cities – were more likely to have enacted stormwater fees earlier than other local governments that enacted stormwater fees.

3.6 FUTURE RESEARCH

My research on stormwater fee diffusion among local governments in the United States suggests several potential extensions for future research. First, fortifying my cross-sectional diffusion dataset with variables measuring other potentially salient internal characteristics of each local government (e.g., physiographic and political characteristics), as well as shared characteristics among local governments (e.g., shared metropolitan regions and media markets) may illuminate

additional factors influencing stormwater fee diffusion in the United States. Second, reconfiguring my diffusion dataset into a network dataset would allow for more rigorous analyses of variables accounting for relationships among local governments.[74] One particular area where analyses of a network dataset may prove illuminating is in more rigorously analyzing the geospatial patterns of stormwater fee diffusion among local governments in the United States. A third potentially fruitful extension of this research would be expanding my cross-sectional dataset into a longitudinal dataset to allow for more powerful analyses (e.g., event history analyses, dynamic network analyses) of stormwater fee diffusion. Creating a robust longitudinal dataset for analyzing stormwater fee diffusion will require overcoming a couple key data challenges: (1) populating dates of incorporation[75] – as well as disincorporation, consolidation, annexation, or de-annexation, where relevant – for each local government;[76] and (2) compiling more time-varying data on each local government.[77] As previously discussed, other ways to build on my research into stormwater fee diffusion among local governments in the United States would be to more thoroughly investigate the influence of regional governing institutions, drainage/irrigation districts, consulting firms, industry associations and publications, as well as potentially germane state-specific factors, particularly statutory law and case law. With respect to consultants, future research might assess the extent to which the influence of consultants on stormwater fee diffusion varies with local government structures. For instance, future research could test the hypothesis that consultants are more likely to influence stormwater fee enactment by local governments of council-manager forms versus mayor-council forms.

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[74] Network models of diffusion have long histories (e.g., Bhola 1965; Coleman, Katz, and Menzel 1957), can be implemented in a variety of forms (Valente, 1995), and have been applied to analyses of various policies (Boehmke, 2009; Gilardi & Füglister, 2008; Mintrom & Vergari, 1998; Volden, 2006).

[75] Census Bureau data document date of incorporation for many local governments in the United States, but these data include a substantial number of missing values.

[76] Census Bureau data from the 2012 Census of Governments documents 371 more general-purpose, subcounty governments nationwide in 2012 compared with 1972, with great state-to-state variation. For instance, the number of general-purpose, subcounty governments in Texas gradually rose from 981 in 1972 to 1,214 in 2012 while the number of general-purpose, subcounty governments in Kansas shrank from 2,143 to 1,894 over the same period.

[77] The only time-varying data in my diffusion dataset were derived from national land use datasets, which are currently available in 1992, 2001, 2006, and 2011 editions, and will soon be available in a 2016 edition. My diffusion dataset incorporated data from the 1992 and 2011 editions of the national land use datasets.

These suggested avenues of future research into stormwater fee diffusion among local governments in the United States should allow for improved ability to discern among theoretically posited diffusion mechanisms. For instance, the suggested extensions of my diffusion data and research may help better discern between coercive and learning diffusion of stormwater fees among local governments in the United States.

4.0 FORM

While the vast majority of stormwater fees in the United States have been independently enacted by individual local governments, some stormwater fees have taken forms involving multiple local governments (Table 3.1). Stormwater fees involving multiple local governments have been enacted by special-purpose districts, such as metropolitan sewer districts and organizations with jurisdiction over specific watersheds (Table 3.1). Some county governments have also enacted stormwater fees involving all or some of the subcounty governments in the county. This chapter investigates why most stormwater fees in the United States have been independently enacted by individual local governments rather than by institutions involving multiple local governments (e.g., all or some of the subcounty governments within a county or special-purpose district).

4.1 THEORY

To inquire into variations in stormwater fee form, I apply the institutional collective action framework (Feiock, 2013). I chose this framework to apply to the form branch of this research because the institutional collective action framework deals centrally with issues of institutional fragmentation across jurisdictions and associated collective action problems. Furthermore, the institutional collective action framework seems particularly relevant to my research questions regarding stormwater fee form because the framework was developed in large part out of empirical analyses of the organization – or disorganization – of metropolitan regions in the United States.

4.1.1 Institutional collective action

The institutional collective action framework aims to investigate collective action dilemmas among local governments and authorities in metropolitan areas where jurisdictional fragmentation creates opportunities for externalities, diseconomies of scale, and common property resource problems (Feiock, 2013). As such, the institutional collective action framework supports structured analysis of the interdependent decisions of local governments in a federal system (Feiock & Scholz, 2010). Drawing insights and inspiration from a rich array of research traditions and theoretical approaches, the institutional collective action framework stands firmly on the foundation of individual collective action theory expressed by Olson (1971), which explains how individuals acting according to their own personal preferences and incentives can create collective outcomes not preferred by any of the individuals involved. The institutional collective action framework extends individual collective action theory to "composite actors" (Feiock 2013, p. 399), such as local polities and governments, comprised of multiple individuals.[78] Whereas individual collective action theory focuses on collective action among individuals comprising a group (e.g., the citizens of a local government), institutional collection action theory focuses on collective action among groups of groups (e.g., multiple local governments in a metropolitan region), where position and authority rules empower certain individuals (e.g., elected officials) to represent group preferences (Feiock, 2013). As such, institutional collective action depends on the capacity of group decision-makers to integrate and resolve conflicts of individual members of the group (Feiock, 2013).

To mitigate institutional collective action dilemmas, the institutional collective action framework posits a spectrum of governance mechanisms, which can be arrayed along two dimensions: means of enforcement and scope (Feiock, 2013). Means of enforcing governance mechanisms to mitigate institutional collective action dilemmas range from "social embeddedness," where participation is completely voluntary, to coercively imposed political authority, with mutually binding contractual and legal arrangements comprising the middle ground between the two extremes (Feiock, 2013). The scope of governance mechanisms to mitigate an institutional collective action dilemma can range from agreements between two

[78] Scholz and Stiftel (2005, p. 1) refer to this collective kind of collective action as "second-order" collective action. Ostrom (1998) uses the term "second-order social dilemma" to describe similar phenomena.

institutions on a single policy issue to multilateral solutions for more complex policy problems (Feiock, 2013). An example of a contractual, bilateral, single-issue arrangement would be where one local government contracts with another for certain police services. An example of a mitigating mechanism enforced by a legal arrangement wherein participating parties delegate authority for a more complex, encompassing set of policy issues would be where a group of local governments agree to form and abide by a regional authority to handle water and sewer services.

The goal of the institutional collective action framework is to explain why certain mitigating mechanisms emerge for certain institutional collective action dilemmas, or – in other words – how mitigating mechanisms are matched to institutional collective action dilemmas (Feiock, 2013). The institutional collective action framework posits two primary factors that influence which mitigating mechanisms manifest for which institutional collective action dilemmas: collaboration risk and transaction costs (Feiock, 2013). Collaboration risk refers to the risk that a collective action will fail to hold together or fail to adequately resolve the intended collective dilemma (Feiock, 2013). The institutional collective action framework posits three types of collaboration risk: incoordination risk, unfair division risk, and defection risk (Feiock, 2013). These three types of collaboration risk are discussed further in the next paragraph. The institutional collective action framework evaluates how well governance mechanisms mitigate the underlying collective action dilemma as well as the magnitude of the transaction costs the mechanisms impose on participants (Feiock, 2013). The transaction costs theorized in the institutional collective action framework include information, bargaining, and enforcement costs of coordinating the collective action, as well as the loss of autonomy to individual actors involved in the collective action (Feiock, 2013).[79] The institutional collective action framework focuses sharply on the effects of choice externalities arising from fragmentation of authority (Feiock & Scholz, 2010).

Depending on the particular institutional collective action problem, the characteristics of the particular jurisdictions involved, and the particular institutional contexts – all factors which can influence the risk of participating or collaborating in a given mitigating mechanism – the institutional collective action framework theorizes that participation incentives will tend to favor mitigating mechanisms that yield the greatest gain for the least cost, including transaction costs

[79] The autonomy loss costs posited in the institutional collective action framework equate to what Buchanan and Tullock (1962) refer to as the imposition of external decision costs.

(Feiock, 2013).[80] While more expansive and authoritative mechanisms are more effective for addressing difficult institutional collective action dilemmas, these mechanisms often impose higher transaction costs on participants (Feiock, 2013). Where the collective action problem is one of simple coordination (e.g., arranging for joint purchasing or sequencing traffic signals) with no division or defection risk, voluntary or contractual enforcement will likely suffice to mitigate the dilemma, so long as transaction costs are low. Division risks enter in when participants agree on general goals and when collective action produces mutual net gains (Steinacker, 2004), but disagreements over how to distribute the gains arise. If severe enough, division risks may preclude or sink a collaborative arrangement (Feiock, 2013). Defection risks emerge in collective action when the defection of one participant from the collective arrangement can result in a worse condition for other non-defecting participants (Feiock, 2013), similar to the prisoner's dilemma in game theory (Poundstone, 1992; Rapoport & Chammah, 1965). Dilemmas with significant defection risks may require third-party (i.e., imposed) enforcement to ensure participating parties make credible commitments to stay engaged in the collaboration (Feiock, 2013). The institutional collective action framework identifies three sources of collaboration risk: the nature of the relevant collective action dilemma; the distribution of preferences within and across the relevant institutions; and the characteristics of any relevant higher-level rules, local political institutions, and mechanisms in place to resolve other institutional collective action dilemmas (Feiock, 2013). Regarding preference distribution, Feiock (2013, p. 412) maintains that "community homophily in terms of the racial, economic, partisan, and ideological composition of citizens in a jurisdiction reduces decision costs in aggregating preferences" and can also "safeguard against political and economic power asymmetries that would advantage one of the parties and create problems for negotiating fair divisions of benefits." As with transactional hazards (Williamson, 1996), hazards or risks to collaboration in the institutional collective action framework arise from three main factors: bounded rationality (Simon, 1997) or limited information; the potential for opportunistic behavior; and uncertainty (Feiock, 2013).

[80] In this respect, the intuition and expectation of the institutional collective action framework mirrors that of transaction cost economics: simple governance arrangements should mediate simple transactions, with complex governance arrangements reserved for complex transactions (Williamson, 1996).

The framework also posits four types of benefits that can be derived through institutional collective action: coordination gains from coordinating service delivery across jurisdictions; economies of scale in the production of goods or services; minimization of common pool resource problems; and the internalization of jurisdictional externalities (Feiock, 2013). Particularly relevant to stormwater and sewer management among hydrologically interconnected entitles, Feiock (2013, p. 411) notes that "negative externality problems create the hardest case because incentives of local authorities are directly opposed."

My case studies of stormwater fee form aim to contribute to development of the institutional collective action framework in at least three ways. First, by conducting detailed case studies of institutional collective action in three metropolitan regions, I follow the advice Feiock (2013) and directly examine the dynamics that generate solutions to problems of institutional fragmentation and centralization. Secondly, although scholars have applied the institutional collective action framework in a variety of metropolitan policy arenas including water resource management (Berardo, 2009), economic development (Minkoff, 2013), regional planning (Gerber, Henry, & Lubell, 2013), and public safety (Andrew, 2010), no one has yet applied the institutional collective action framework to stormwater governance. Stormwater governance in metropolitan regions presents an extreme test of the scope of the institutional collective action framework because hydrologically interconnected and politically fragmented metropolitan areas are rife with opportunities for upslope jurisdictions to externalize stormwater flows and associated costs onto neighboring jurisdictions downslope. In this respect, this research meets the call of Feiock (2013) for institutional collective action researchers to analyze if and how various governance mechanisms can effectively mitigate institutional collective action dilemmas in new policy areas and in different local and state contexts. Finally, in addition to breaking new ground in terms of the policy arena of application, my research also contributes to the growing body of work (e.g., Lubell, Henry, and McCoy 2010; Shrestha and Feiock 2011) using the institutional collective action framework to analyze interactions among various service arrangements and governance mechanisms in the interlocal, metropolitan institutional ecosystem.

4.1.2 Hypotheses on stormwater fee form

Informed by the institutional collective action framework, my inquiry into the form of stormwater fees in the United States aims to test the following hypotheses.

> form hypothesis 1:
> Collective stormwater fees in the United States formed and endured only by coercion from a higher level of government.

> form hypothesis 2:
> General-purpose, subcounty governments typically enact stormwater fees independently because the transaction costs – particularly negotiation costs associated with a larger number of more diverse actors – and defection risks preclude collective action to enact a collective stormwater fee, and because stormwater provides the opportunity for easy downstream cost externalization.

4.2 METHODS

For my inquiry into stormwater fee form, I conducted a set of nested case studies, where the units of analysis were general-purpose, subcounty governments embedded (Yin, 2018) or nested – geographically and institutionally – within metropolitan sewer districts. The case study method complements my selected theoretical framework for inquiring into stormwater fee form because the institutional collective action framework emphasizes the importance of understanding the particular institutional ecology of a metropolitan region. I chose a nested approach because the sewer district has an institutional scope sufficient to internalize most – if not all – of the hydrologic and hydraulic interdependencies associated with stormwater and sewer system flows in many metropolitan regions. As such, the metropolitan sewer district appears a potentially well-suited institution to manage stormwater and sewer systems. By embedding local government cases in their respective metropolitan sewer districts, I intended to gain better insight into the pertinent physiographic and political dynamics influencing each local government. In other words, I utilized this nested case study structure to examine the conditions under which stormwater fees are enacted by individual local governments despite the existing

institutional and administrative infrastructure of the metropolitan sewer district or other similarly scaled institutions (e.g., county governments).

4.2.1 Case selection

Since this branch of my research seeks to explain variation in stormwater fee form (i.e., why stormwater fees involving multiple local governments are enacted in some places and not others), I selected three metropolitan sewer districts that exhibit stormwater fees of different forms: (1) the Metropolitan Sewer District of Greater Cincinnati (MSDGC) in southwestern Ohio, where stormwater fees were implemented by a combination of the county government and individual subcounty governments; (2) the Northeast Ohio Regional Sewer District (NEORSD), which serves the greater Cleveland region, where a stormwater fee was implemented by the metropolitan sewer district; and (3) the Allegheny County Sanitary Authority (ALCOSAN), which serves the greater Pittsburgh region in southwestern Pennsylvania, where the only stormwater fees to date have been implemented by individual subcounty governments.

Many other possible choices of county-level stormwater fees exist in the United States besides the county-based fee in the MSDGC service area. However – as noted previously – most county stormwater fees encompass substantial amounts of unincorporated land in southern and western states (e.g., Florida, Washington, Georgia, South Carolina, North Carolina, Virginia, Maryland). While county stormwater fees in largely unincorporated counties may be interesting cases in their own right, these cases do not involve the same institutional complexity as county stormwater fees in counties with multiple incorporated subcounty governments. As such, I chose to focus selection of a county stormwater fee on the few states with county fees in counites with predominately incorporated land: Indiana, Ohio, and Wisconsin. Of these three states, only Ohio and Wisconsin had stormwater fees enacted by special-purpose governments. As noted in the Chapter 3, the only special-district stormwater fee in Wisconsin involves just two general-purpose, subcounty governments, while the special-district stormwater fees in Ohio involve many more general-purpose, subcounty governments (Table 3.1). For these reasons, I focused selection of county and special-district stormwater fee cases on Ohio. Studying cases of two different stormwater fee forms in the same state also offers the possibility of providing greater insight into some of the state-level factors influencing stormwater fee form. In Ohio, there are

two special-district stormwater fees (i.e., the Muskingum Watershed Conservancy District and NEORSD) and six unconsolidated county stormwater fees (i.e., Butler, Hamilton, Lake, Lorain, Lucas, Trumbull counties). I chose NEORSD and Hamilton County (MSDGC) as cases primarily because they are both regionally large metropolitan centers, with the idea that at least some of the sociopolitical dynamics exhibited in these metropolitan cases with respect to stormwater fee form should exhibit some external validity for less densely populated areas, whereas the reverse may not be true. Moreover, these two cases are particularly interesting because of the relatively high level of municipal fragmentation in each. The two Ohio cases also make for interesting cases for this research because these cases involve instances of stormwater fee defection and disputation, as discussed below. Finally, while I chose the ALCOSAN case partly due to personal familiarity, the main reasons I selected this case were: (1) the only existing stormwater fees in the ALCOSAN service area have been independently enacted by individual subcounty governments, providing contrast with the stormwater fee forms in the MSDGC and NEORSD cases; and (2) recent changes in state legislation seem to have set off a flurry of stormwater fee enactment in Pennsylvania, making a case study of stormwater fee forms in the state particularly timely.[81]

In addition to their diversity with respect to stormwater fee forms, I chose MSDGC, NEORSD, and ALCOSAN as case studies for a few other reasons. First and foremost, although stormwater fees of different forms were enacted in these metropolitan sewer districts, the three districts are fairly similar in size (i.e., land area, population, sewer system size) and in broad economic, social, and political trajectory.[82] Furthermore, the sewer and stormwater infrastructure systems in each of these three regions exhibit a configuration and history very similar to one another and to many older cities throughout the Northeast, Great Lakes, and mid-Atlantic regions of the United States: a network of combined sewer systems centered in the older, typically lowland urban cores with newer, separated systems connected in from suburban, often upland communities. In these infrastructure systems, the smaller "collector" systems are often owned and operated by local governments, either individually or in groups, whereas the

[81] The ALCOSAN case study may provide insights into stormwater fee formation not only for other communities in Pennsylvania, but also for communities in other states like Pennsylvania where stormwater fees are not yet established or widespread.

[82] All three are metropolitan regions in the "Rust Belt" of the United States.

largest "interceptor" pipes, pump stations, and treatment plant(s) positioned in the lower reaches of the system are typically owned by a regional entity (e.g., a metropolitan sewer district). To the extent they are shared with other regions, these similarities in infrastructural configuration and history among my cases may bolster the external validity of my evidence and analyses.

Within each of these three metropolitan sewer districts, I targeted five general-purpose, subcounty governments for detailed inquiry. These targeted local governments represent subcases nested within each of the three broader metropolitan sewer district cases. Within each sewer district, I targeted specific subcounty governments with the goal of capturing diverse perspectives on stormwater management and financing.[83] More specifically, in each metropolitan sewer district, I targeted the central city (i.e., Cincinnati in MSDGC, Cleveland in NEORSD, Pittsburgh in ALCOSAN) along with four other subcounty governments by considering a few principal dimensions: size, in terms of land area and population; wealth, as measured by median household income; and relative landscape position (i.e., relatively upland or low-lying). In each sewer district, I also targeted subcounty governments to reflect diversity with respect to stormwater fees: those that do or do not participate in the stormwater fee administered by the county in the MSDGC case; those that supported or opposed the sewer district stormwater fee in the NEORSD case; and those with or without individual stormwater fees in the ALCOSAN case. In combination with the aforementioned factors, I also took into account some geospatial and hydrological relationships in targeting certain local governments. For instance, in the NEORSD case, I targeted the City of Independence and the Village of Valley View because – despite sharing Mill Creek as a common border, and despite being fairly similar size, demographics, and wealth – Valley View supported the NEORSD stormwater fee while Independence vigorously opposed the NEORSD stormwater fee. In the ALCOSAN case, I targeted Shaler Township and the Borough of Etna because these two localities exhibit marked differences in size, demographics, and wealth, but share very strong hydrologic and hydraulic interconnections, with Shaler situated directly upstream of Etna. In addition to the targeted subcounty governments, I also targeted other relevant local government institutions in each

[83] While my primary criteria for selecting local governments in each metropolitan sewer district were related to encompassing a diversity of characteristics hypothesized to influence preferences for stormwater fee form, selecting diverse local governments within each region also should have helped attenuate any "convergent sensemaking" (Eisenhardt & Graebner, 2007).

region for detailed inquiry, namely the Hamilton County Storm Water District in the MSDGC case and NEORSD itself in the NEORSD case.

In summary, my case selection strategy for inquiring into stormwater fee form intended to maximize differences in the outcome, or dependent variable, (i.e., stormwater fee form) while minimizing differences in the factors hypothesized to influence that outcome, or independent variables, across cases. Insofar as I targeted a range of stormwater fee forms (i.e., special-district, county, individual subcounty), my case selection strategy for inquiring into stormwater fee form corresponds to "diverse" (Gerring & Seawright, 2007) or "polar types" (Eisenhardt, 1989; Eisenhardt & Graebner, 2007) case selection, where the selected cases illuminate the full range of variation on the dependent variable. At the same time, I aimed to facilitate comparisons across cases and support the external validity of my inquiries by selecting three metropolitan regions that exhibit broad similarities in size, infrastructural configuration, and other aforementioned characteristics (i.e., independent variables) that may influence stormwater fee form. Nested within each metropolitan sewer district, I targeted local governments with diverse characteristics likely to influence their perspectives of stormwater fee form. However, by targeting a similarly diverse range of local governments in each metropolitan sewer district, my case selection strategy also facilitated direct comparison of how local government diversity influenced stormwater fee forms across the three regions. Applying similar evidence collection methods and a single theoretical framework across three cases selected to maximize differences in stormwater fee form while minimizing differences in factors hypothesized to influence stormwater fee form enabled my research to hone in on key reasons why and how different stormwater fee forms evolved in each case. In these respects, my case studies of stormwater fee form employ explanatory typological analysis (Elman, 2005), using existing theory to explain variations across three cases representing diverse types of stormwater fee forms.

4.2.2 Sources of evidence

As noted in the introduction, for the stormwater fee form cases, I generated, extracted, and collected evidence from archival and documentary sources in addition to a series of in-person, semi-structured interviews with representatives of targeted local governments. Interview excerpts quoted in the text have been lightly edited for readability. Further methodological

details – including interview scripts, information about interviewees, and characteristics of targeted local governments – are provided in Appendix C.

4.2.3 Evidence coding

I coded interview transcripts[84] using a coding framework comprised of key concepts and processes identified in the institutional collective action framework (Figure C.1) including concepts shared with other related theoretical frameworks (Figure C.2).[85,86]

4.3 RESULTS

4.3.1 MSDGC (Cincinnati)

Centered on the Cincinnati metropolitan region in southwestern Ohio, the MSDGC service area includes all or parts of 43 of the 49 general-purpose subcounty governments in Hamilton County along with very small parts of a handful of general-purpose subcounty governments in neighboring Butler, Warren, and Clermont counties (Figure 4.1). Six subcounty governments in the MSDGC service area (i.e., the Village of Amberley plus the cities of Cincinnati, Forest Park, Harrison, Loveland, and Milford)[87] have each independently established stormwater fees for

[84] Transcriptions of interview audio recordings was performed by staff of the Qualitative Data Analysis Program at the University of Pittsburgh Center for Social and Urban Research.

[85] Coding performed using NVivo 11 software.

[86] In addition to the institutional collective action framework, I considered applying two other theoretical frameworks – the ecology of games framework (Lubell, 2013) and the local public economy framework (Oakerson & Parks, 2011) – to my case studies of stormwater fee form. Although I opted to present results using only the institutional collective action framework, I coded the interview transcripts using coding frameworks derived from each of these three theoretical frameworks, including concepts shared among all three frameworks.

[87] Campbell et al. (2017) record enactment years for these independent, subcounty stormwater fees as: Cincinnati in 1984; Forest Park in 1988; Amberley and Loveland in 2003; Milford in 2004; and Harrison in 2007.

their respective jurisdictions (Figure 4.2).[88] Another 30 subcounty governments in the MSDGC service area – along with four subcounty governments in Hamilton County outside the MSDGC service area[89] – currently participate in the Hamilton County Storm Water District (HCSWD), which administers a stormwater fee (Figure 4.2). The Village of Amberley is the only jurisdiction in the MSDGC service area to participate in HCSWD and to charge its own stormwater fee (Figure 4.2).[90,91] Designed and administered as "level of service" program, cities and villages in Hamilton County can choose whether and at what level they want to participate in HCSWD. Under Ohio state law, townships without home-rule status have fairly limited sovereignty from their respective county government. As such, townships without home-rule status in Hamilton County are effectively required by state law to participate in HCSWD. Currently, all 12 townships, 16 of the 19 villages, and 7 of the 18 cities in Hamilton County participate at some level in HCSWD (Figure 4.2).

[88] Despite being recorded by Campbell et al. (2017), the City of Wyoming does not have a stormwater fee. Wyoming did participate in HCSWD until 2010, but has since funded stormwater activities out of the city's general fund. Interestingly, Wyoming is the only record where Campbell et al. (2017) record "general fund" rather than a dollar amount in the monthly fee field.

[89] The four general-purpose, subcounty governments in Hamilton County not served by MSDGC are the Village of Terrace Park, Harrison Township, along with the cities of Harrison and Milford.

[90] Amberley uses part of the revenues generated by the village-specific stormwater fee to pay for services offered by HCSWD.

[91] The map of stormwater fees in the MSDGC service area (Figure 4.2) appears to show that the City of Harrison in the northwestern part of Hamilton County also has its own stormwater fee and participates in HCSWD. The City of Harrison does have its own stormwater fee, but does not participate in HCSWD. The issue with the map is caused by the fact that the jurisdiction boundary data has the City of Harrison overlapping with Harrison Township and Crosby Township, both of which participate in HCSWD.

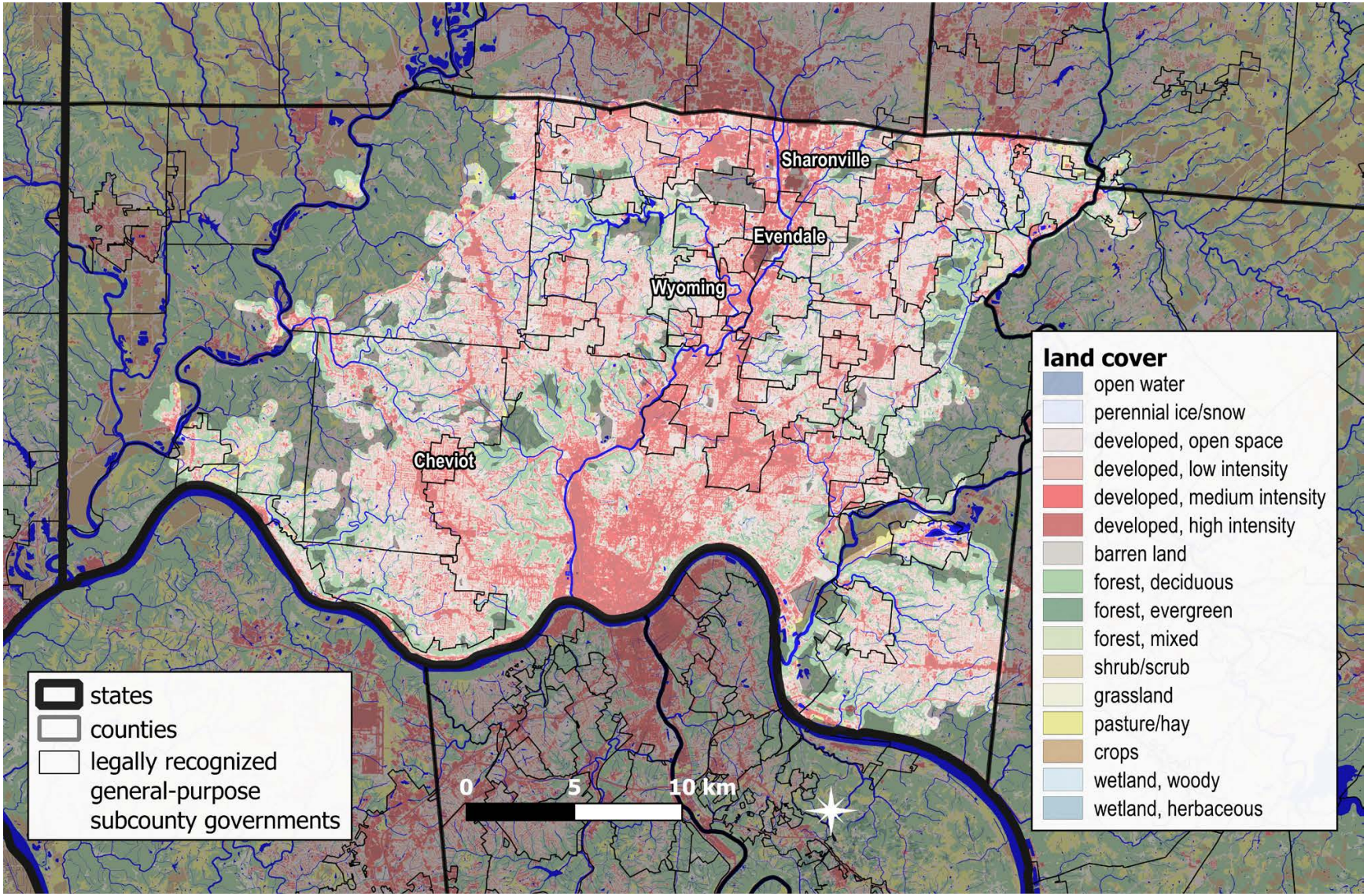

Figure 4.1. Map of the MSDGC service area.
MSDGC service area (inverted silhouette) with interview targets labeled. Also shows waterways and waterbodies [National Hydrography Dataset] and land use [2011 National Land Cover Dataset]. [Jurisdiction boundary source is United States Census Bureau 2014 TIGER/Line shapefiles.]

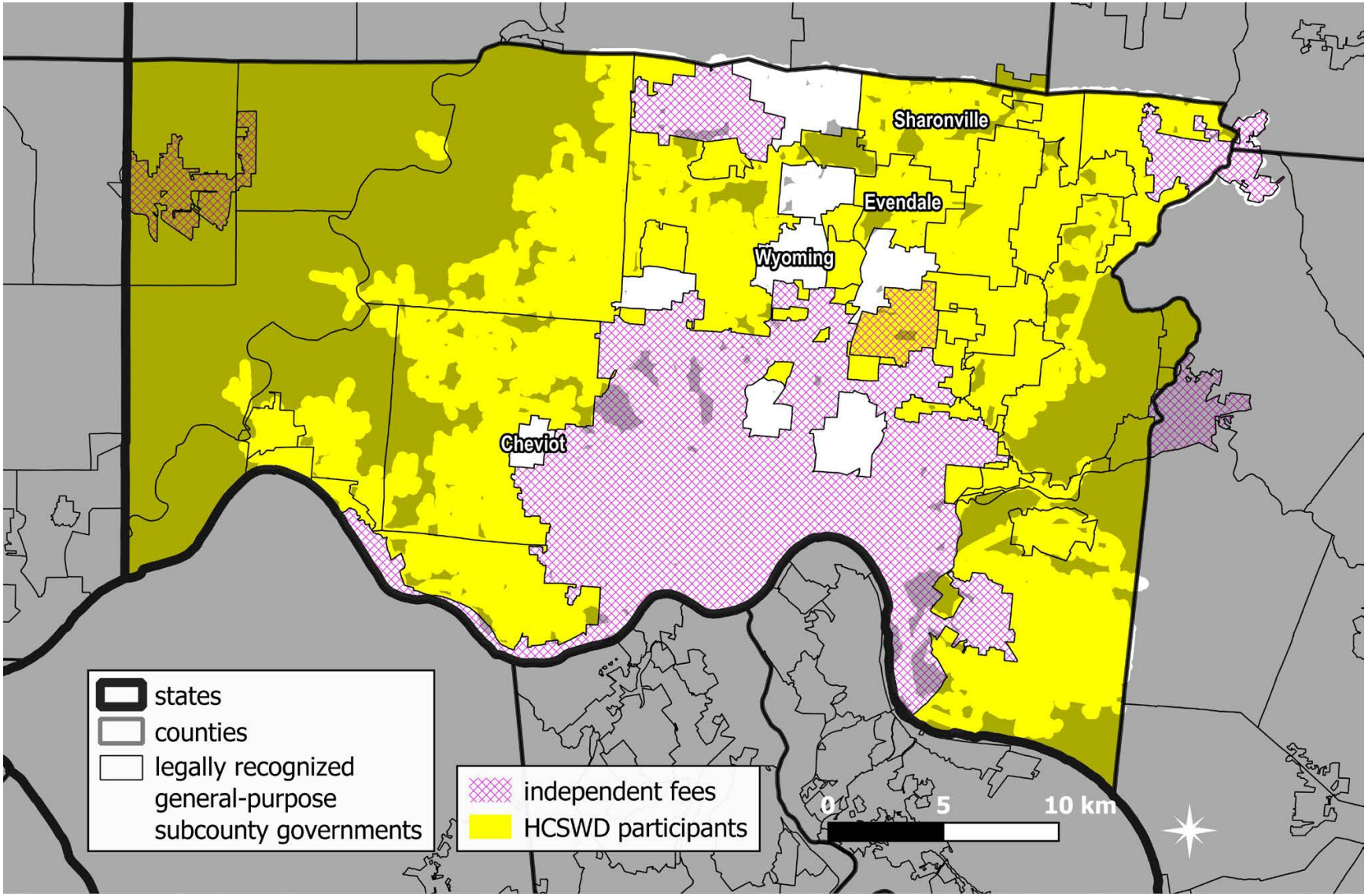

Figure 4.2. Map of stormwater fees in the MSDGC service area.
MSDGC service area (inverted silhouette) with interview targets labeled.
[Jurisdiction boundary source is United States Census Bureau 2014 TIGER/Line shapefiles.]

Administered by the Hamilton County Engineer's Office, HCSWD is formally governed by the Hamilton County Board of Commissioners (Figure 4.3). The HCSWD organizational structure also includes an Oversight Board (Figure 4.3) comprised of representatives from the county and member subcounty governments.[92] Although the Oversight Board was originally intended to be the decision-making body for HCSWD, state law actually places formal control over HCSWD exclusively with the Board of County Commissioners:

> "When we were starting this up, we formed a stormwater Oversight Board that was going to be the decision-making body for the district. What we learned after the fact was that board is actually only – under the statutes – given recommendation authority. The embodied power of legislative body is actually the Board of County Commissioners, exclusively."
>
> HCSWD
> Program Director

Finalization of the Phase II MS4 regulations was the primary and direct motivation for the formation of HCSWD, which was incorporated in 2003 following two to three years of meetings between representatives of the county, subcounty governments in the county, and other stakeholders (e.g., local watershed organizations):

> "It was about 2000 when we first started studying it, and then it rolled out officially in 2003. Each municipality within Hamilton County was named as an MS4, so people were trying to gather, 'What does this mean? Where are we going to go?' We were looking at it, saying, 'Well, we kind of have a similar problem' – if you will, if the permit was considered a problem – 'How are we going to solve this issue?' We put together this large study to determine, were we all gonna go it alone, or was there some greater good that could be accomplished by forming a district?"
>
> HCSWD
> Program Director

[92] The HCSWD Oversight Board consists of six elected officials in Hamilton County, including: one representative from the Hamilton County Board of Commissioners; one representative of the Hamilton County Engineer's Office; two representatives from the Hamilton County Township Association; and two representatives from the Hamilton County Municipal League, which represents the interests of villages and cities in the county. The HCSWD Oversight Board also formerly included one representative from the City of Cincinnati.

While the Phase II MS4 regulations spurred some cities and villages to enact their own independent stormwater fees,[93] many localities chose to partner with the county:

> "... we didn't really consider a stormwater fee. We just partnered with the county."
>
> City of Sharonville
> Community Development Director

A primary reason the county was selected to coordinate MS4 permit obligations was that many of the required activities were already being performed by county agencies:

> "So, we had this permit. We looked at it, started reading through all the things we were going to have to do, and we realized that, 'Gosh, here in Hamilton County, we have a number of different departments that are already doing pieces of each of the things that this is requiring. We've got the County General Health District doing certain portions of our program. We've got the Planning and Development Department, the County Engineer's Office, the Soil and Water Conservation District, certain aspects of the Metropolitan Sewer District...' We decided, rather than form this brand-new district, let's just augment the services that each department might be providing and – from the county's perspective – then, we can offer those services to the locals, the municipalities, the cities and villages... If they don't have the wherewithal to do it themselves, we can do it."
>
> HCSWD
> Program Director

This coordination with other entities on MS4 permit requirements helps HCSWD keep its stormwater fee modest:

> "The reason we're able to keep our fees so low, primarily, is because the person who is out there doing education with [the] Soil and Water [Conservation District], is already in the school, already doing it. So, we're giving that institution a little bit more for the stormwater program."
>
> HCSWD
> Program Director

[93] As noted above, the cities of Amberley and Loveland each independently enacted a stormwater fee in 2003, the year Phase II MS4 permit coverage was first required. The City of Milford also independently enacted a stormwater fee the following year, in 2004.

Reflecting the fact that the program evolved in direct response to the Phase II MS4 regulations, the organizational structure of HCSWD corresponds to the six minimum control measures (MCMs) required by MS4 permits (Figure 4.3). The annual budgeting process for HCSWD is also directly related to MS4 permit requirements:

> "... year over year, we create the budget based exclusively on what the [MS4] permit requires us to do. So, each of the six Minimum Control Measures get broken down into tasks, sub-tasks..."
>
> HCSWD
> Program Director

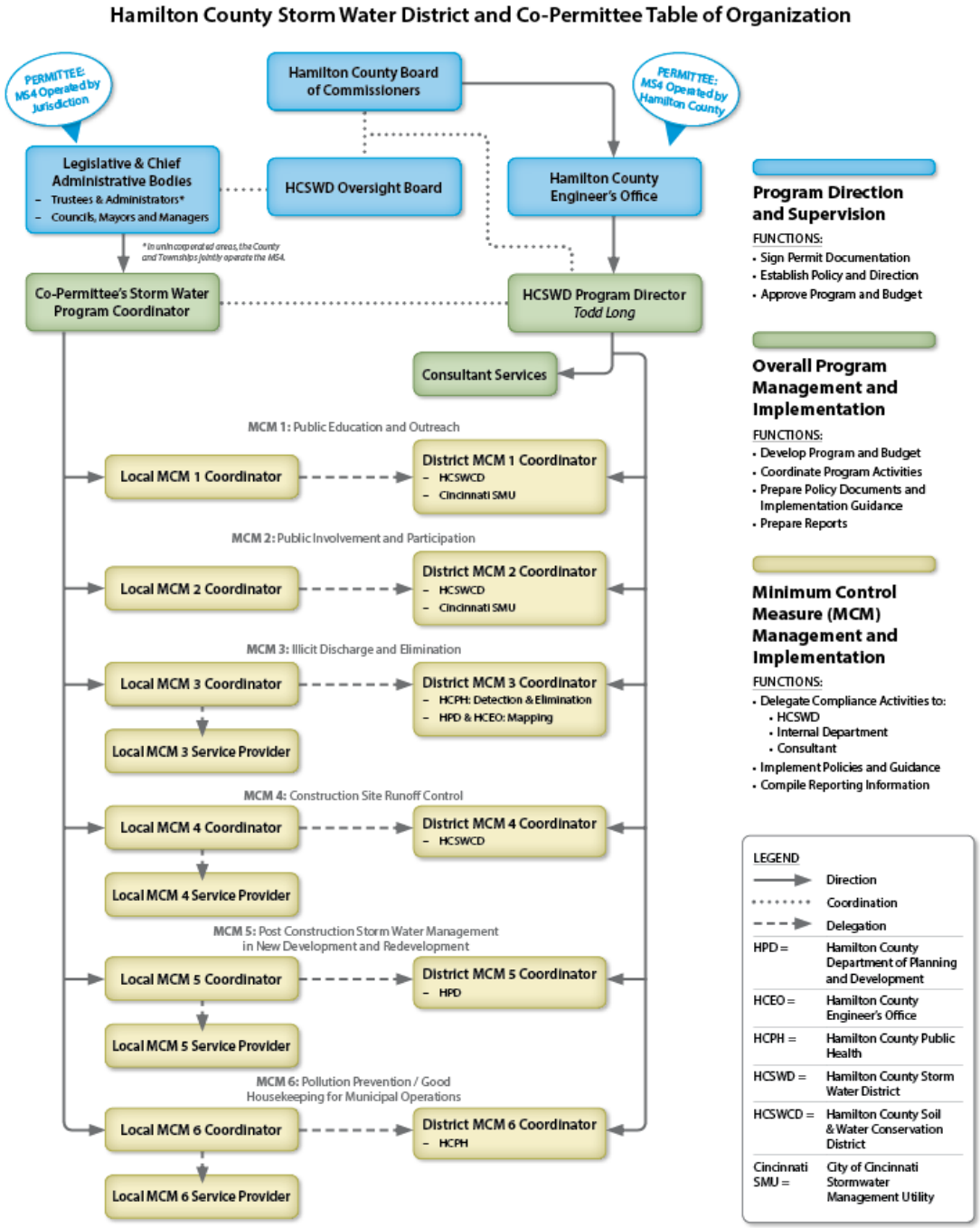

Figure 4.3. HCSWD organizational chart.

The various services offered by HCSWD to member communities also map either directly or indirectly to the MCMs required under MS4 permits (Figure 4.4). In addition to a required base level of service for "district-wide permit activities" – which includes activities related to public education and outreach (MCM1) and public participation/involvement (MCM2) – each HCSWD member can choose any or all of three additional services: illicit discharge detection and elimination (MCM3); development review and inspection (MCM4/5); and GIS map development (Figure 4.4). The institutional design of HCSWD thus offers its participating members flexibility in selecting their desired level of service:

> "... we could say, 'County, you do it all.' Or, we could say, 'We're just gonna do it all.'"
>
> City of Sharonville
> Community Development Director

The flexible, level-of-service, MCM-menu design of HCSWD was at least partly a result of the fact that local governments in the county had varying levels of need with respect to the MS4 permit requirements:

> "You had larger communities, such as the City of Cincinnati... when it came to mapping, for instance, the City of Cincinnati had already done it so why would they want to pay us to do it again? So, functionally, to get this moving, we really had to provide a level-of-service, an á la carte menu, if you will. That brought a lot of people on board."
>
> HCSWD
> Program Director

For 2019, if a member community elects to receive all the services offered by HCSWD, the estimated HCSWD annual stormwater fee would be $8.13 per single-family unit (Figure 4.4), with a single-family unit defined as 3,300 square feet of impervious surface. The 2019 estimated base annual stormwater fee for a member community participating in HCSWD is $3.68 per single-family unit (Figure 4.4).

In addition to choosing which services to receive, HCSWD member communities can choose a billing method for those services: a "direct bill" option where HCSWD bills the member community government or a "tax bill" where HCSWD bills individual property owners as part of the county property tax bill (Figure 4.4).

Hamilton County Storm Water District

Administered by the Hamilton County Engineer's Office – Theodore B. Hubbard, County Engineer
in partnership with the Hamilton County Soil and Water Conservation District
the Hamilton County Department of Planning & Development,
and the Hamilton County Public Health Department

Website: http://www.hcswd.org

Storm Water District Level of Service (LOS) and Service Fees for 2019
Response Required by Monday, April 30, 2018

The Hamilton County Storm Water District (District) is offering the same levels of service and fees in the 2019 program year as were offered to Co-Permittee Jurisdictions in the 2018 program year. This form identifies District services and related activities which are associated with Ohio EPA permit compliance.

Actions Required by Monday, April 30, 2018:

Please follow the four steps below to identify your billing preference and District service elections for 2019.

Step 1: Billing Method Selection. For services selected to be performed by the District, your community's service fee can be collected through property owner tax bills or a direct bill. Please select your preferred billing method for 2019 by circling either Direct Bill or Tax Bill in the table below.

Billing Method	CIRCLE ONE >	Direct Bill	Tax Bill

Step 2: Service Selection. Please identify your preference for provision of District services in 2019 by circling YES or NO for each service in the 2019 Election of Services table below.

- Circle "YES" for each of the services you wish to have the District perform on your community's behalf.
- Circle "NO" if your community is electing to perform any or all of these services in 2019. Note: Services elected to be performed by your community in 2019 will require tracking, documentation and reporting by your community to the District.

Jurisdiction Name: Village of Amberley **Estimated SFU's:** 2,800	**Estimated Service Fee ($/SFU)**	**Estimated Cost to Jurisdiction**	**Election of Service for 2019 (Circle YES or NO)**	
Storm Water Phase II Permit Services			**2018 Selection**	**2019 Selection**
District-wide Permit Activities	$3.68	$ 10,304	**YES**	
Local Illicit Discharge Detection & Elimination Services	$2.37	$ 6,636	YES	**YES or NO**
Local Development Review & Inspection Services	$1.16	$ 3,248	NO	**YES or NO**
Local Input to District-wide System GIS Map Development	$0.92	$2,576	YES	**YES or NO**
Estimated Total	**$8.13**		**$19,516**	

Step 3: Signature. Obtain the signature of an *authorized representative* of your community and date the form.

Scott F. Lahrmer — **Print Name**

Signature

4/9/18 — **Date**

Step 4: Submittal. Mail the completed and signed form to the District's support staff at:

CDM Smith Inc., 8845 Governor's Hill Drive, Suite 430, Cincinnati, Ohio 45249

A representative from the District will be contacting you shortly to answer any questions you may have and obtain an initial verbal confirmation of your LOS selection for 2019.

If you have any questions or concerns while completing this form, please contact Todd Long, Program Director, by phone at (513) 946-4254 or email at Todd.Long@hamilton-co.org.

Figure 4.4. HCSWD level of service agreement.

At least partly in response to the formation of HCSWD, the Ohio Environmental Protection Agency (OHEPA) – the designated NPDES permitting authority in Ohio – has formally allowed MS4 permits in the state to be administered to a set of "co-permittees" rather than requiring individual permits for regulated MS4s participating in a collective program to meet permit requirements, like HCSWD:[94]

> "Initially, there was no co-permittee; there was an MS4 permit. We banded together and said, 'We're all in it together.' We put together our program and said, 'Here, the 44 of us are together, [OH]EPA. Here's our plan.' They accepted it, and, I think, thereafter – the second permit cycle around – they came up with this co-permittee thing, which was, 'Well, we want to kind of codify this.' I think they looked at us as kind of the model and said, 'Well, we've got to find some way to capture this.'"
>
> HCSWD
> Program Director

According to the HCSWD Program Director, OHEPA allowing regulated MS4s participating in a collective permit management effort like HCSWD as co-permittees on a shared MS4 permit has been a crucial factor in HCSWD helping member communities realize the benefits of collective action:

> "I've advocated quite loudly at storm conventions and the like with the [OH]EPA that this [co-permittee status] is a really important element for what we can do in southwest Ohio. These communities really want and need us to provide the district because, otherwise, they'd have to put together a whole staff of people. And we're talking about some communities that are disadvantaged enough where they're struggling to keep fire and EMS and all this together. And now they're gonna deal with a stormwater problem?"
>
> HCSWD
> Program Director

Coordination on MS4 permit obligations with OHEPA is one of the most appealing functions of HCSWD for at least one of the people I interviewed:

> "... just so that I don't have to go deal with the [OH]EPA."
>
> Village of Evendale
> Service Department Director

[94] Currently, all HCSWD participating member communities are co-permittees on the OHEPA Small MS4 General Permit 1GQ00046*CG.

As a voluntary program except for townships, participation of villages and cities in HCSWD has fluctuated over time. Initially, 44 of the 49 subcounty governments in Hamilton County participated in HCSWD, as opposed to the current 35 members.[95] Significantly, the City of Cincinnati participated in HCSWD until May 2016,[96] when the city opted to leave HCSWD and administer its own independent stormwater utility, the Cincinnati Stormwater Management Utility.[97] As the largest and most populous general-purpose subcounty jurisdiction in Hamilton County by far, the departure of Cincinnati was a substantial shock to HCSWD:

> "Cincinnati is pulling out of the district, so that's a big loss to the district. So, the district is having to evaluate what it's going to do going forward. One of the options is raise the rates: no one wants to see that. Another option is to eliminate this menu system, to basically say, 'You're either in or out.' If that happens, then Sharonville will likely be out. It'd be more cost-effective for us to hire a full-time administrator, probably a planner that could also help with some other work in here. But some of it, they would just administer that [MS4] permit in-house. We may almost wanna do that anyway."
>
> City of Sharonville
> Community Development Director

> "... you're asking about the fee structure: this number kind of floats back and forth over the years, depending on... sometimes, they have the [MS4 permit] renewals, every five or ten years... sometimes, it'll be a little heavier in one area and then a little lighter in another area... constantly adjusting. Obviously, the big change is gonna be next year with the City of Cincinnati being out of it."
>
> Village of Evendale
> Service Department Director

[95] Although my research only directly confirms that the cities of Cincinnati and Wyoming both formerly participated in HCSWD – until 2016 and 2010, respectively – MS4 permit cycle records from OHEPA suggest that the other former HCSWD participants include the cities of Norwood, Cheviot, and North College Hill, along with the villages of St. Bernard and Woodlawn.

[96] I conducted interviews for the MSDGC case in May 2016, approximately the same time as the City of Cincinnati officially ended its participation in HCSWD.

[97] The City of Cincinnati has had its own stormwater fee and utility since the mid-1980s. The Cincinnati Stormwater Management Utility was formerly part of MSDGC, but – since July 2016 – is now a division of the Greater Cincinnati Water Works.

Cities and villages have opted not to participate in HCSWD for a variety of reasons, some of which boil down to simple economics:

> "... 44 is the most we've ever had. Subsequently, we've had a little bit of dwindle. A lot of it is economic decisions. We send out a bill, communities feel they can find a better price somewhere else. They might have a consultant who comes in and says, 'Now that you've done all this lifting to create all these rates, do all this work, map all this stuff out, we think we could do it cheaper.'"
>
> HCSWD
> Program Director

The person I interviewed representing the City of Wyoming – which participated in HCSWD until 2010 – related that the city council felt that the land use and development patterns in Wyoming were different enough from the rest of the participating communities[98] that continued participation in HCSWD would little benefit Wyoming:

> "Council made the decision. The council was concerned that: we were a small community; we're built out; there's no development, essentially, here. So, we looked at some of the other communities and they were just starting to get more development and more industrial, and it's like, 'Well, we have almost nothing in common with these other communities. If there's any kind of projects, they're not gonna be doing anything for us.'
>
> ... all our development since we've gone on our own, has been in the combined sewer area, so, we've never applied the earthworks or the post construction regulations to anything because everything's been like: a house here; a house there... This is where it seems like Wyoming's so unique: for all the people in that Hamilton County District, there's some that are like us, but it seems like most of them are either more industrial or they are just a lot more developable lots."
>
> City of Wyoming
> Assistant Public Works Director

[98] Wyoming is fairly unique among the general-purpose subcounty governments in Hamilton County in that the city has a relatively high percentage of low density residential land use and among the highest median household income.

The person I spoke with representing the City of Cheviot also emphasized unique local conditions – specifically the fact that almost all the sewers in the city are combined – as a reason for not participating in HCSWD.[99]

In addition to unique local conditions, the person I interviewed representing Wyoming also noted that the city opted out of HCSWD to better coordinate MS4 permit requirements with other city functions:

> "We were supposed to map our storm system. We got some help from an engineer and we did it. But the thing that we did that the county would not have helped us in is we also mapped our drinking water system at the same time. That killed two birds with one stone."
>
> City of Wyoming
> Assistant Public Works Director

A third reason for not participating in HCSWD offered by the person I interviewed representing Wyoming suggested some duplication of responsibilities and efforts between HCSWD and the other co-permittees on the HCSWD MS4 permit:

> "The [OH]EPA, when they audit, people say, 'Oh, I'm part of the district: ask them.' [laughter] Well, Hamilton County, to their credit, was always like, 'Well, you can't say that, you guys. You need to be on the ball. You need to do this stuff.' And I was like, 'Well, if I'm doing all this stuff, why are you guys even involved? What's the point of being in the district?'"
>
> City of Wyoming
> Assistant Public Works Director

[99] Of the four general-purpose, subcounty governments in Hamilton County with a substantial proportion of combined sewers (i.e., the Village of St. Bernard, Delhi Township, the cities of Cheviot and Cincinnati), the only one currently participating in HCSWD is Delhi Township, which – as a township – is compelled to participate.

Finally, the person I interviewed representing Wyoming also indicated that the city has had a sufficient general fund – funded mainly through income and property taxes – and modest enough stormwater-related expenses to not need a stormwater fee, either through HCSWD or independently just for the city:

> "We've had enough money to fund everything we needed."
>
> City of Wyoming
> Assistant Public Works Director

4.3.2 NEORSD (Cleveland)

Centered on the Cleveland metropolitan region in northeastern Ohio, the NEORSD service area for sanitary sewage includes all or parts of 56 of the 59 general-purpose subcounty governments in Cuyahoga County, along with parts of 11 general-purpose subcounty governments in Summit County, and part of Columbia Township in Lorain County (Figure 4.5). The NEORSD stormwater service area is largely the same as the NEORSD sanitary sewer service area, except that six communities in Summit County (i.e., the townships of Bath, Northfield Center, Richfield, and Twinsburg, along with the Village of Boston Heights and the City of Twinsburg) that are partly or entirely within the NEORSD sanitary sewer service area are not included in the NEORSD stormwater service area, and one community (i.e., the City of Willoughby Hills in Lake County) outside the sanitary sewer service area is included in the stormwater service area (Figure 4.6). Subject to some exceptions,[100] NEORSD assesses a stormwater fee on all parcels of real property within the NEORSD stormwater service area. Only one subcounty government in the NEORSD stormwater service area (i.e., the City of Broadview Heights) currently has an independent stormwater fee.[101,102]

[100] Certain parcels are exempt from the NEORSD stormwater fee, including: public roads and highways; public airport runways and taxiways; railroad rights-of-way; public and not-for-profit cemeteries; as well as parcels with less than 400 square feet of impervious surface.

[101] Broadview Heights established a city-specific stormwater fee in 2007.

[102] Campbell et al. (2017) also record a stormwater fee – with no enactment year – for the City of Hudson. However, the codified ordinances of Hudson show that the chapter authorizing the city-specific stormwater fee (i.e., Chapter 1045) was repealed with the enactment of Ordinance 04-67 on 05 May 2004.

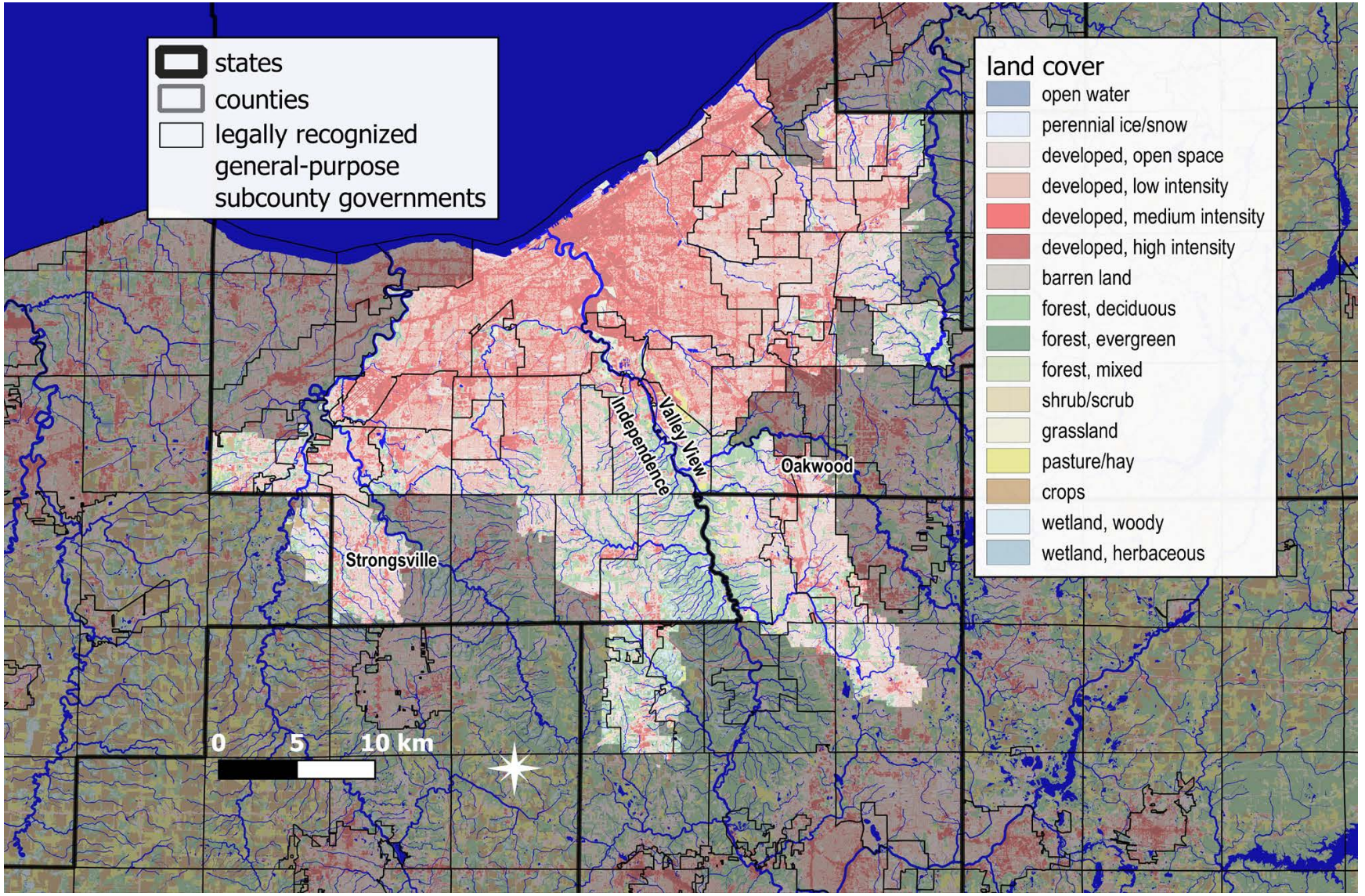

Figure 4.5. Map of the NEORSD sanitary sewer service area.
NEORSD sanitary sewer service area (inverted silhouette) with interview targets labeled. Also shows waterways and waterbodies [National Hydrography Dataset] and land use [2011 National Land Cover Dataset]. [Jurisdiction boundary source is United States Census Bureau 2014 TIGER/Line shapefiles.]

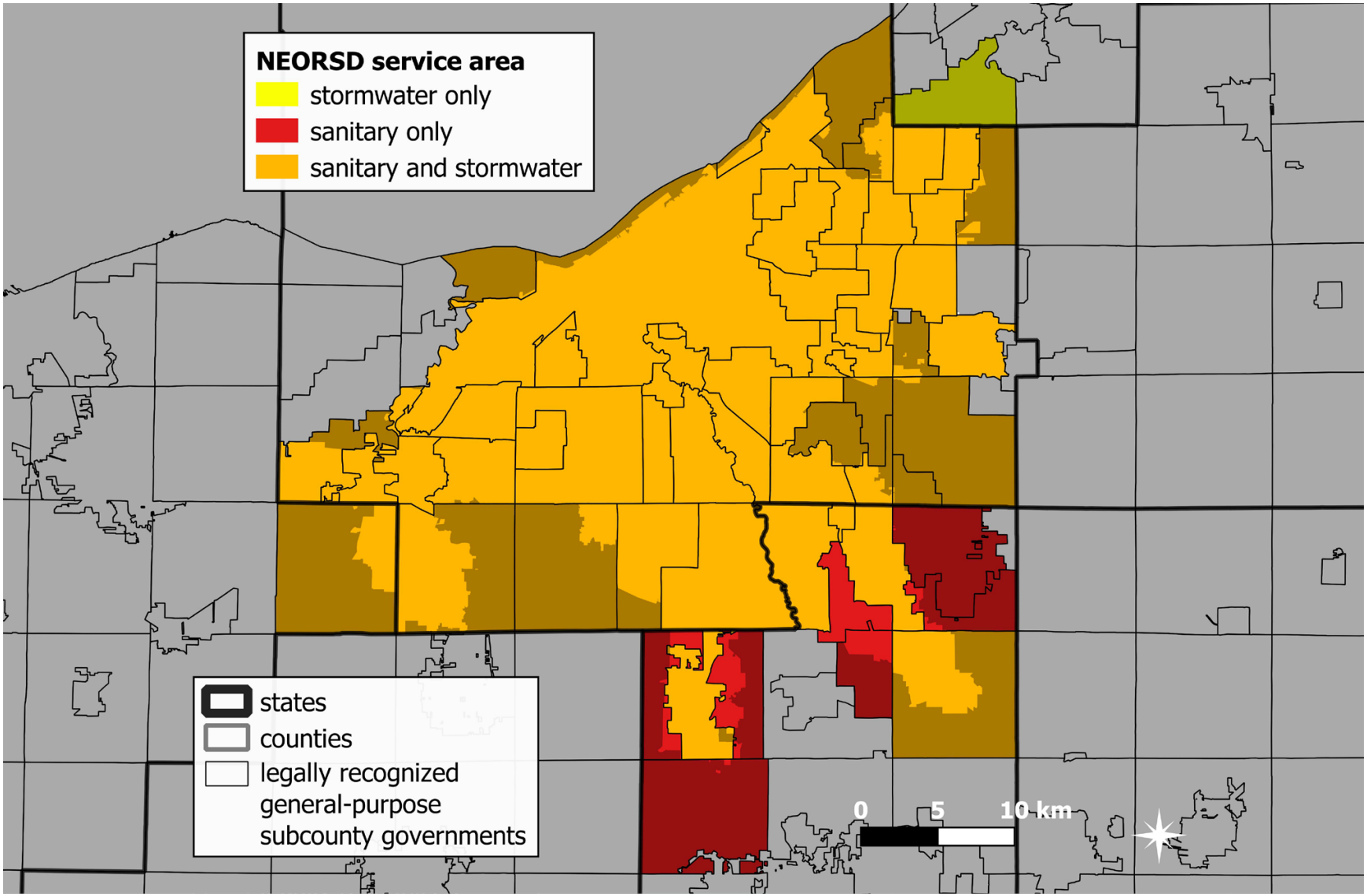

Figure 4.6. Map of NEORSD sanitary sewer and stormwater service areas.
NEORSD sanitary sewer service area (inverted silhouette).
[Jurisdiction boundary source is United States Census Bureau 2014 TIGER/Line shapefiles.]

The NEORSD stormwater fee serves as the primary financing mechanism for the NEORSD Regional Stormwater Management Program (RSMP). The seven-member NEORSD Board of Trustees[103] – the governing body of the district – formally approved the RSMP, including the associated stormwater fee, in 2010. While formal governance and budgetary powers within NEORSD rest with the Board of Trustees, the RSMP includes five Watershed Advisory Committees (WACs).[104,105]

The NEORSD RSMP – including the associated stormwater fee – evolved largely out of the NEORSD Regional Intercommunity Drainage Evaluation (RIDE) Study, which formally began in October 2000, building on a series of earlier studies and surveys of sanitary and storm sewer issues in the NEORSD service area. Although the Phase II MS4 regulations were finalized and negotiations over CSO regulations were going on around the same time as the RIDE Study, the RIDE Study was not entirely initiated in response to either of these federally driven regulatory initiatives. While the intensifying regulatory focus on MS4s and CSOs were certainly important factors accounted for in the RIDE Study, the study represented the continuation of decades-long efforts within NEORSD to regionally integrate the management of sanitary sewers and stormwater.[106]

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[103] Members of the NEORSD Board of Trustees are appointed by: the Mayor of the City of Cleveland (two members); the Suburban Council of Governments (two members); the Cuyahoga County Executive (one member); an appointed representative of the subdistrict in the service area with the most sewage flow (one member), currently the Mayor of the City of Cleveland; and an appointed representative of the subdistrict in the service area with the largest population (one member), which is currently the Suburban Council of Governments.

[104] The five WAC watersheds are: Cuyahoga River North; Cuyahoga River South; Chagrin River; Lake Erie direct tributaries; and Rocky River. The two smallest WACs (i.e., Lake Erie direct tributaries and Rocky River) are administrated jointly.

[105] Each subcounty government has one representative on each applicable WAC. Some other public entities and agencies that own and operate stormwater-related infrastructure within the NEORSD service area are also represented on the WACs. These agencies and entities include: Cuyahoga, Lorain, and Summit counties; the Greater Cleveland Regional Transit Authority; relevant park districts (e.g., Cleveland Metroparks, Summit Metro Parks); the Ohio Department of Transportation; and the Ohio Turnpike Commission. While not formally represented, some watershed organizations (e.g., the Rocky River Watershed Council, the Doan Brook Watershed Partnership) also regularly attend relevant WAC meetings.

[106] The executive summary of the RIDE Study prominently cites a 1975 order from Judge George J. McMonagle of the Cuyahoga County Court of Common Pleas mandating that NEORSD, "... develop a detailed integrated capital improvement plan for regional management of wastewater collection and storm drainage to identify a capital improvement program for the solution of all intercommunity drainage problems (both storm and sanitary) in the District..."

The manner in which the NEORSD RSMP and associated stormwater fee were conceived, designed, and publicized seems to be remembered differently by different people. Beginning in 2009, NEORSD met with representatives of each general-purpose subcounty government in the stormwater service area about the RSMP. While the person I interviewed representing the City of Strongsville[107] characterized these meetings as NEORSD introducing or rolling out a mostly finalized RSMP with little interest in receiving feedback, the person I interviewed representing the City of Independence characterized the meetings as much more collaborative and participatory:

> "The administration from the region's sewer district came out to the mayor's office, sat down and tried to explain the premise behind the fee and the value. It was an opportunity to give some dialogue and some feedback. They really did engage the communities, the engineers, and seemed very willing and wanting to say, 'We know municipalities don't have funding for stormwater-related issues. And we want to be the people that come in here and help you solve these major problems.' They were going and reaching out to all the communities and that was gonna be the list that then, when this big pot of money came in, that they would then be solving all of these projects."
>
> City of Independence
> City Engineer

Reflecting the varied perceptions of these initial meetings between NEORSD and the subcounty governments about the RSMP, some people I interviewed referred to these meetings as collaborative "listening sessions" while others saw them more as "a PR [public relations] campaign," "marketing," and "a rollout."

Soon after the introduction of the RSMP and associated stormwater fee, organized opposition arose, and went to court. In January 2010, NEORSD filed action with the Cuyahoga County Court of Common Pleas seeking a judgment declaring the authority of NEORSD to implement the RSMP and associated stormwater fee.[108] A group of general-purpose subcounty governments in the NEORSD service area soon filed an answer and counterclaims in this suit,

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[107] As discussed in Appendix C, I did not record audio for the interview I conducted with the person representing Strongsville, so I cannot provide direct quotes from that interview.

[108] This action was filed on the same day that the NEORSD Board of Trustees enacted Title V, the amendments to the district's Code of Regulations that created the RSMP.

seeking to permanently enjoin NEORSD from implementing the RSMP.[109] The subcounty governments who opposed the NEORSD RSMP in this initial case became known to some as "the Gang of 12" (Figure 4.7).[110] In April 2011, the common pleas judge presiding over the case issued a ruling finding that – under the Ohio Revised Code[111] – NEORSD had authority to enact the RSMP. During these initial proceedings the issue of the validity and implementation of the stormwater fee was set aside and reserved for a later trial. In February 2012 – following a bench trial – the common pleas court ruled that the NEORSD stormwater fee was valid, although the court found several issues with the implementation of the fee, including that the proposed 7.5% minimum allocation of stormwater fee revenues to the fund for member communities was too low, and should be at least 25%.

On appeal by "the Gang of 12" subcounty governments and other parties, a split[112] panel of appeals court judges issued a ruling in September 2013 that found NEORSD had no authority under relevant state law to enact the RSMP, and enjoined NEORSD from implementing the RSMP and associated stormwater fee. Following nearly two more years of legal proceedings on appeal by NEORSD, the Ohio Supreme Court decided in September 2015 that NEORSD did have authority under state law to implement the RSMP and associated stormwater fee. In the case before the Ohio Supreme Court, all but one member[113] of "the Gang of 12" submitted amicus briefs in opposition to NEORSD, while only five members[114] of this coalition appealed the decision (Figure 4.7).[115] In the case before the Ohio Supreme Court, another 19 subcounty

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[109] A group of property owners including the Bishop of the Diocese of Cleveland and the Cleveland Municipal School District Board of Education also joined this case in opposition to the NEORSD RSMP.

[110] The Gang of 12 were: the cities of Beachwood, Bedford Heights, Brecksville, Cleveland Heights, Independence, Lyndhurst, North Royalton, Olmsted Falls, and Strongsville; the villages of Glenwillow and Oakwood; along with Bath Township.

[111] Specifically, Chapter 6119, the chapter under which NEORSD was originally incorporated.

[112] One of the three judges issued a lengthy, mostly dissenting opinion.

[113] The City of North Royalton took no official action in the case before the Ohio Supreme Court.

[114] The five communities that appealed the decision were the cities of Beachwood, Brecksville, Independence, Lyndhurst, and Strongsville.

[115] The appeal was denied.

governments[116] in the NEORSD service area submitted amicus briefs in support of NEORSD (Figure 4.7). While many issues were debated during the legal proceedings contesting the NEORSD RSMP and stormwater fee, much of the argument in these cases concerned whether or not the purview of NEORSD authorized under the district charter and under state law included only sanitary sewerage or also extended to stormwater.

[116] The 19 subcounty governments that submitted amicus briefs in support of NEORSD in the case before the Ohio Supreme Court were: the cities of Brook Park, Brooklyn, Cleveland, Middleburg Heights, Parma, Parma Heights, Seven Hills, Shaker Heights, South Euclid, and Warrensville Heights; the villages of Brooklyn, Cuyahoga Heights, Highland Hills, Mayfield, Moreland Hills, Newburgh Heights, Orange, and Valley View; along with Olmsted Township.

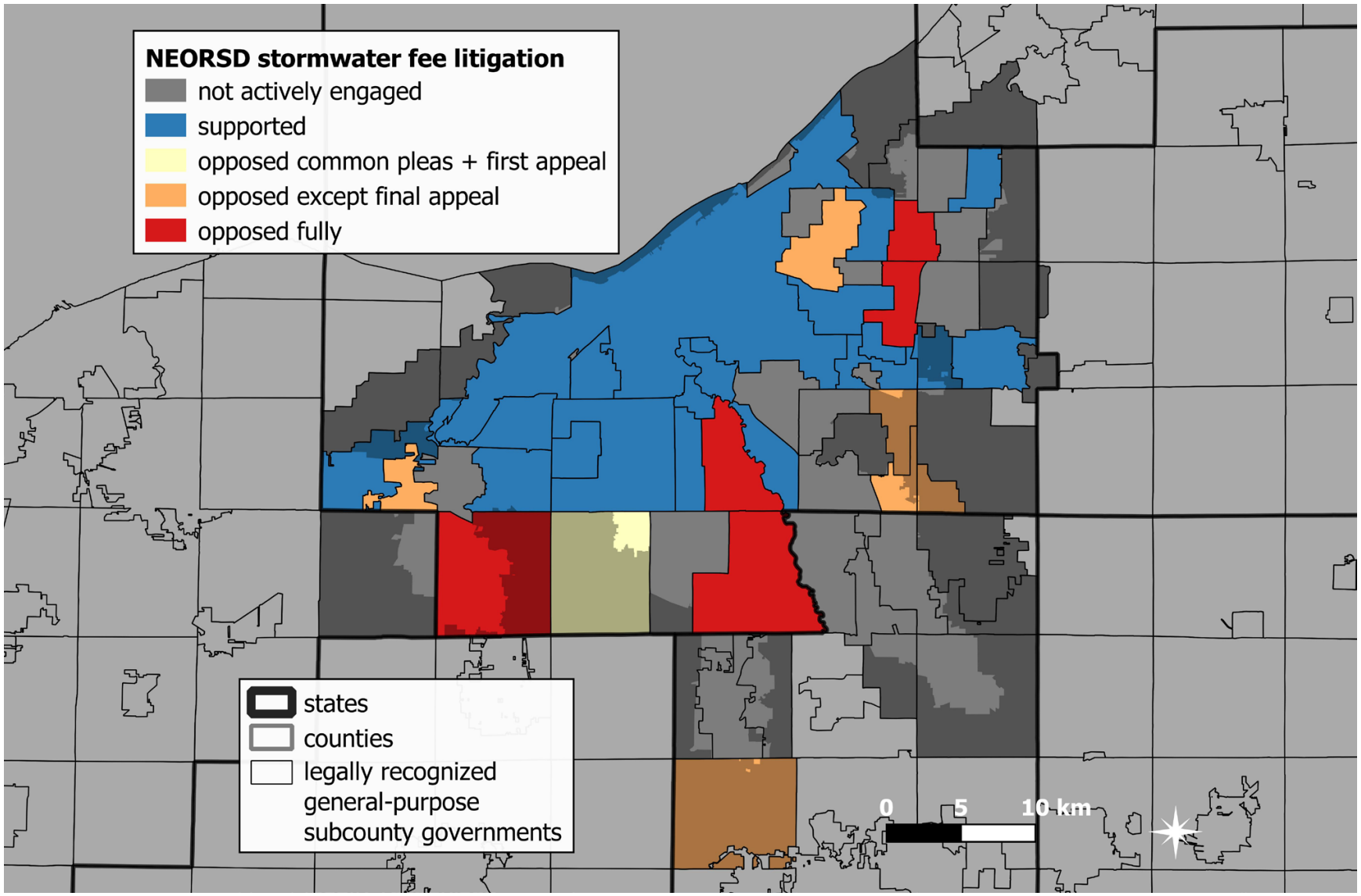


Figure 4.7. Map of NEORSD stormwater fee litigation positions.
NEORSD sanitary sewer service area (inverted silhouette).
[Jurisdiction boundary source is United States Census Bureau 2014 TIGER/Line shapefiles.]

The reasons some communities opposed the NEORSD RSMP were varied, but a common reason was concern about unfair division risks:

> "It was always a concern that: you collect the money here, you spend it here; versus, collect the money and spend it somewhere else. That was always the fear."
>
> City of Independence
> City Engineer

As emphasized by the people I interviewed representing the City of Independence and the City of Strongsville – both members of "the Gang of 12" – this concern about unfair division risks associated with the NEORSD RSMP was particularly acute in communities that had long been adequately funding stormwater costs locally:

> "We're one of probably the few communities that annually we programmed $200,000-$300,000 a year for stormwater management, drainage, excavating for repairs of sewers. And, it was 100% local."
>
> City of Independence
> City Engineer

The person I interviewed from Strongsville tied this issue of local versus regional financing of stormwater management to the issue of accountability: whereas state law requires voter approval of the city's local "drainage levy" every five years, the NEORSD stormwater fee does not require direct voter approval, only approval by the unelected NEORSD Board of Trustees.

Another reason for the organized opposition to the NEORSD RSMP was the belief that the initially proposed allocation of stormwater fee revenues between regional and local purposes was too heavily skewed towards regional purposes. As noted previously, the common pleas court agreed with this argument, and required NEORSD to bump the local allocation from the originally proposed 7.5% to a minimum of 25%. In this respect, the extensive litigation over the NEORSD RSMP can be viewed – at least in part – as negotiating cost:

> "Ultimately, while we lost the suit, I think we still prevailed in that 25 cents on the dollar came back. That made it a little bit worth the while. At least we got something tangible out of the fight, because it was years of litigation."
>
> City of Independence
> City Engineer

Bills for the NEORSD stormwater fee are sent directly to individual property owners, with billing administered in coordination with the Cleveland Water Department. In accordance with court decisions, the NEORSD stormwater fee was not assessed from autumn 2013 through the end of 2015. The NEORSD stormwater fee applies different rates to different types and sizes of properties (Table 4.1).

Table 4.1. Monthly NEORSD stormwater fees for 2018-2019.

property type	impervious surface area (square feet)	monthly fee
Residential		
Tier 1	< 2,000	$3.09
Tier 2/Base	2,000 to 3,999	$5.15
Tier 3	≥ 4,000	$9.27
Homestead	Any size	$2.07
Non-residential	per ERU* (3,000 square feet)	$5.15

* ERU = equivalent residential unit

Of the stormwater fee revenues collected from each member community, NEORSD allocates 75% to the RSMP, with the remaining 25% allocated to each member community's account under the Community Cost-Share Program (CCSP). Member communities must apply to NEORSD for disbursement of CCSP funds, with disbursements subject to certain criteria set by NEORSD. Member communities can also apply for RSMP funds through the Member Community Infrastructure Program, which will fund up to 75% of costs for eligible projects. Eligible costs for CCSP funds include costs related to MS4 permit requirements, and some communities use CCSP funds to pay partner organizations to handle certain MCMs:

> "Minimum Control Measures 1, 2, 4, and 5 are eligible. A lot of them are becoming more eligible for this [CCSP] money to help us meet our [MS4] permit requirements. So, the public education and outreach: we pay like $25,000 to Cuyahoga [Soil and] Water [Conservation] District because they help us do that, because they're good at it. Well, we can submit for reimbursement of those costs. So, now it's positive to say, 'Look, our [OH]EPA MS4 permit requirements, those costs are being funded through this regional sewer program, regional utility.' So, it's kind of positive..."
>
> City of Independence
> City Engineer

Using RSMP funds, NEORSD also contracts directly with partner organizations to handle certain MCMs:

> "We contract with the Cuyahoga County Board of Health and the Summit County Board of Health to do Minimum Control Measure 3: illicit discharge detection. So, all the outfall screening that's required, updates to the outfall mapping... that's all contracted through the boards of health, directly for the member communities."
>
> NEORSD
> Watershed Team Leader

While the general-purpose subcounty governments in the NEORSD stormwater service area do not have a choice regarding the assessment of the NEORSD stormwater fee on properties within their local jurisdictions, one local government has voluntarily chosen to participate in the NEORSD RSMP. A small part of the City of North Royalton is in the NEORSD sanitary sewer service area, and was included in the initial NEORSD stormwater service area.[117] Despite being one of "the Gang of 12" initially opposing the RSMP, North Royalton officials later signed an agreement that brought the entire city into the RSMP:[118]

> "It just goes to show these utilities are useful. It's painful to have to pay fees, but they do serve a greater purpose. You've got communities now coming in that aren't required to be in."
>
> NEORSD
> Watershed Team Leader

[117] The part of North Royalton in the NEORSD sanitary sewer service area is an approximately 2.5-square-mile area – which accounts for roughly 11% of the city's total land area – in the northeastern corner of the city, much of which is in the Big Creek watershed.

[118] Since 2014, the mayor of North Royalton has also served on the NEORSD Board of Trustees as one of the two representatives for the Suburban Council of Governments.

4.3.3 ALCOSAN (Pittsburgh)

Centered on the Pittsburgh metropolitan region in southwestern Pennsylvania, the ALCOSAN service area includes all or part of 81 of the 130 general-purpose subcounty governments in Allegheny County,[119] along with parts of two townships in Westmoreland County, and Peters Township in Washington County (Figure 4.8). To date, the only stormwater fees enacted in the ALCOSAN service area have been enacted by individual subcounty governments: the Municipality of Mt. Lebanon, the Borough of Whitehall, and the Borough of Dormont. Mt. Lebanon enacted the first stormwater fee in the region in 2011,[120] followed by Whitehall in 2014,[121] and Dormont in 2015.[122] Both Mt. Lebanon and Whitehall are governed by home-rule charters, which provide them a greater degree of local autonomy compared with local governments without home-rule charters (Pennsylvania Department of Community and Economic Development, 2017; Vanlandingham, 1968). As such, the stormwater fees in Mt. Lebanon and Whitehall are assessed directly by each local government, whereas the Dormont stormwater fee is assessed by the Dormont Stormwater Authority, an entity that – while legally and fiscally distinct from the borough – has the same geographic jurisdiction as the borough and has board members appointed by the borough council. As noted previously, prior to amendments to state law in 2016, the authority for boroughs and townships in Pennsylvania to directly assess stormwater fees was unclear.

[119] The jurisdictions of two boroughs in the ALCOSAN service area cross county boundaries. Roughly one-third of the land area of McDonald is located in Allegheny County, with the remaining parts of the borough located in Washington County. Over three-quarters of the land area of Trafford is located in Westmoreland County, with the remaining parts of the borough located in Allegheny County.

[120] The stormwater fee in Mt. Lebanon has been in place since August 2011.

[121] Whitehall's stormwater fee – which is not recorded by Campbell et al. (2017) – was enacted in November 2014 and effective January 2015.

[122] Formally incorporated in August 2015 with the approval of an ordinance by borough council, the Dormont Stormwater Authority sent out its first stormwater fee bills in June 2016.

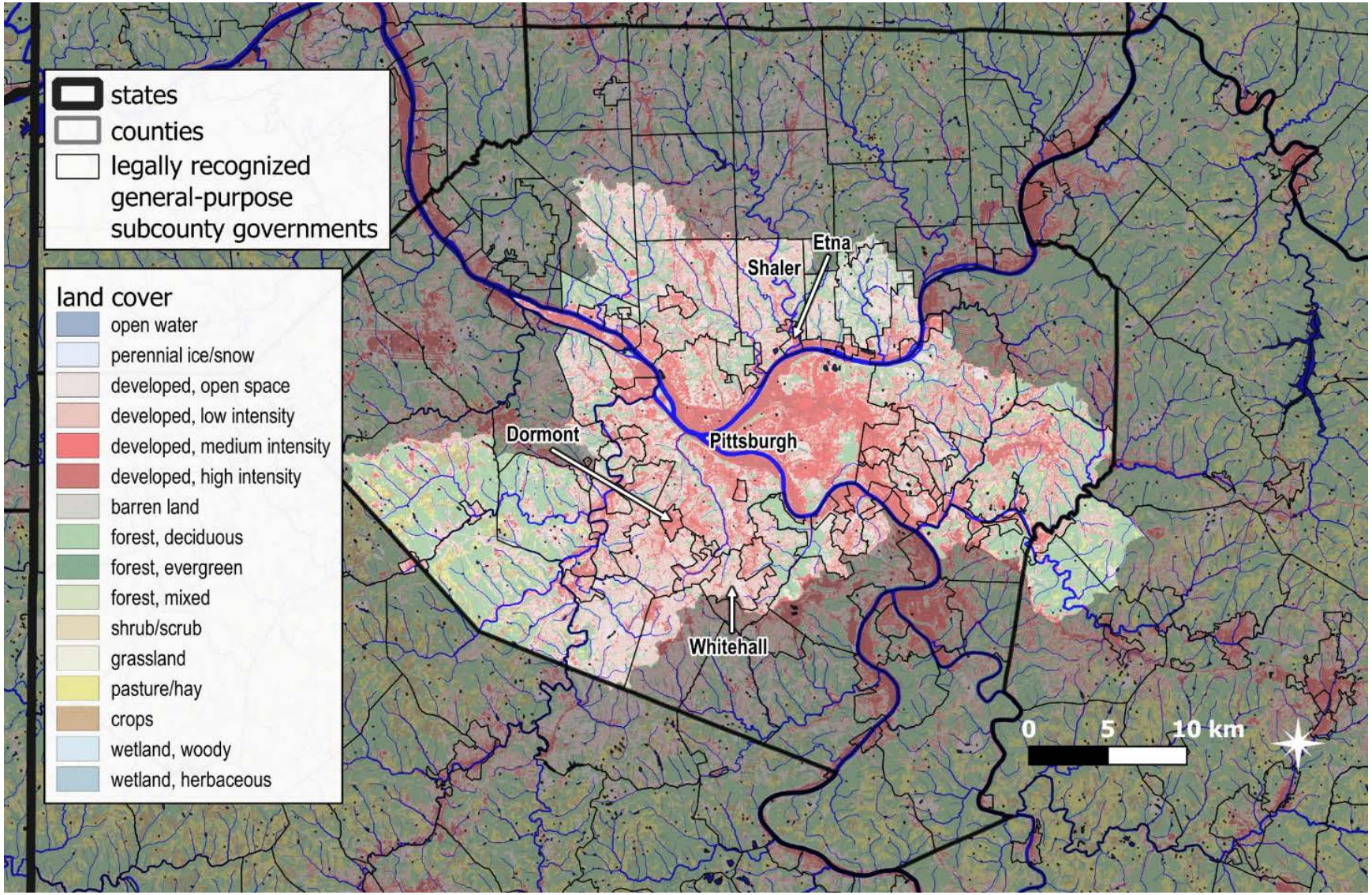


Figure 4.8. Map of The ALCOSAN service area.
ALCOSAN service area (inverted silhouette) with interview targets labeled. Also shows waterways and waterbodies [National Hydrography Dataset] and land use [2011 National Land Cover Dataset]. [Jurisdiction boundary source is United States Census Bureau 2014 TIGER/Line shapefiles.]

All three stormwater fees in the ALCOSAN service area are currently assessed at $8 per equivalent residential unit (ERU) per month, but each varies in the definition of an ERU. In Mt. Lebanon, an ERU equals 2,400 square feet of impervious surface, whereas an ERU in Dormont equals 1,883 square feet of impervious surface. Documentation defining an ERU in Whitehall was not readily available.

The stormwater fees enacted in the ALCOSAN service area have been at least partially motivated by MS4 permit requirements:

> "We had a couple of people come to a meeting and say, 'Is this really necessary?' We explained to them, 'The [flooding] issues that you're having, the MS4 coming... with those issues coming in, having to license your collection system through the state for stormwater, that was going to require certain maintenance, and record keeping, all that.'"
>
> Borough of Whitehall
> Borough Manager

> "Neighborhoods in the state were getting fined, and that was a rude awakening for everybody in the western part of the state because [PADEP] were hitting some people out east. So, along with that, and the [MS4 permit] requirements that need to be met, and just everything that needs to be repaired, the council at the time thought it was best to form the authority."
>
> Dormont Stormwater Authority
> Administrative Manager

As a highly fragmented region with scores of general-purpose subcounty local governments, people I interviewed in the ALCOSAN service area expressed trepidation about each local government – many of which cover very small areas of land – enacting stormwater fees independently:

> "I have great concerns over the fact that we have 130 municipalities in Allegheny County and we'll have 130 different stormwater fees that are all structured differently, have different rates, different values, and are enforced differently."
>
> Pittsburgh Water and Sewer Authority
> Sustainability Manager

> "I'm one of the guys out there that's opposed to stormwater fees, and my opposition is primarily based on my opposition to creating another bureaucracy. There's way, way too many bureaucracies out here: 130 municipalities. To have 130 municipalities and then creating 130 more bureaucracies that control stormwater in what is a one-square-mile town like Etna, Millvale, Sharpsburg, Blawnox, Aspinwall..."
>
> Shaler Township
> Township Manager

Similarly – to prevent further institutional fragmentation, and to account for hydrologic and hydraulic interconnections among local governments – several people I interviewed in the ALCOSAN service area suggested a collective approach to stormwater management and financing in the region:

> "I think if we could have this regional/county-wide effort or larger service-area-wide effort, whatever that may be, to unify this... because it's bad enough that we have so many municipalities and so many different local zoning codes and laws and fees and structure for everything. We don't need another layer of that."
>
> Pittsburgh Water and Sewer Authority
> Sustainability Manager

> "The upstream communities in the watershed are all sanitary only. So, that makes it difficult, because they're like, 'Well, [as a community with combined sewers] you're putting your [storm]water right in there; we're not.' But water runs downhill, and they're not capturing all their stormwater... It's just geography. It's not their fault. It just complicates the issue more and more, which is why we believe it needs to be done on a regional basis. We would be amenable to paying a fee as part of a larger-scale thing."
>
> Borough of Etna
> Borough Manager

> "It is unfair that I'm pushing all of my stuff down to the Borough of Etna, the Borough of Millvale, just saying, 'Hey, I hope you guys can handle this.' Ultimately, it's going to come to a regional solution."
>
> Shaler Township
> Township Manager

> "I think in the future what we should look towards is maybe a watershed-wide authority: you pool all your money, and you're doing these better projects, and you're affecting the watershed in a better way, rather than thinking, 'Okay, my water stops at my line, at my municipal boundary.' That's just not gonna work."
>
> Dormont Stormwater Authority
> Administrative Manager

For at least one community in the region, an independently enacted stormwater fee would be "futile" compared with a collective approach:

> "We're in the bottom of the valley, and the bottom of the watershed. Pine Creek watershed is actually 67 square miles, and we have like 0.6 square miles. So, we couldn't possibly collect enough money or address the issues. The work really needs to be done outside of the community... If we looked at the whole watershed and said, 'Okay, if we put a basin here, it's going to be the most effective for this whole, bigger area,' then we're happy to pay. It would be futile for us – especially with the small population we have – if we instituted a fee. You couldn't collect enough to really do anything of substance. I think there needs to be some overall, regional look at everything."
>
> Borough of Etna
> Borough Manager

On the other hand, the Pittsburgh Water and Sewer Authority has been studying and developing a stormwater fee, and seems poised to implement one in the near future:

> "As we're looking at this greater responsibility within PWSA for stormwater, we want to be able to fund it properly, so we are looking at a stormwater fee to do that. We're at the position now where multiple times we've had this thing teed up and ready to go: we've done the feasibility study; we know how many impervious acres of surface we have; we know what our stormwater costs are for a given year. So, we need some refinement, but, basically, it's just a math exercise to take the total amount of square footage divided by our budget and that's the rate per square foot is gonna be."
>
> Pittsburgh Water and Sewer Authority
> Sustainability Manager

While several people I interviewed expressed support for a collective approach to stormwater management and financing in the region, the person I interviewed representing the Whitehall noted that a collective approach may be complicated by the fact that some local governments have already independently enacted stormwater fees:

> "We were one of the first to do it as a home-rule. Now, we're talking about this multi-municipal approach. The county had talked about doing a county-wide approach. We've already implemented a fee; we're already collecting it; we've already taken a third of it every year for debt service. So, for us to get out of our own and jump into somebody else's, it's going to be way more complicated than if you were just going in from scratch and starting from there."
>
> Borough of Whitehall
> Borough Manager

The people I interviewed in the ALCOSAN service area identified several candidate organizations that could potentially coordinate or help coordinate collective stormwater management and finance, including: Allegheny County, the Allegheny County Conservation District,[123] ALCOSAN, the Pittsburgh Water and Sewer Authority, the Southwest Pennsylvania Commission,[124] the Congress of Neighboring Communities,[125] 3 Rivers Wet Weather,[126] as well as various watershed organizations and councils of government in the region. A couple of people I interviewed seemed to particularly favor a county-level collective effort to stormwater management and finance:

> "I can see something in the county. I'm beginning to develop a stronger trust for the county, and I think a county-wide system would make sense."
>
> Shaler Township
> Township Manager

> "Well, there are some watershed groups. The Northern Area Environmental Council is pretty much Pine Creek, but not all of Pine Creek. So, I think it has to be done on a county level because that's really the arm of everybody, because that's all the watersheds within the county. Some of those watersheds actually go outside of the county, but, I think, on a county level, you're capturing a good portion of it. And then it's not, you know, sanitary versus combined; it's not rich versus poor."
>
> Borough of Etna
> Borough Manager

[123] Despite its name, the Allegheny County Conservation District is governed directly by the state, and is neither affiliated with nor governed by Allegheny County.

[124] The Southwest Pennsylvania Commission is the regional planning agency for a 10-county region including Allegheny and neighboring counties.

[125] The Congress of Neighboring Communities is an organization comprised of representatives from the City of Pittsburgh and the general-purpose subcounty governments that share a border with the City of Pittsburgh, as well as a few general-purpose subcounty governments from other parts of the region.

[126] 3 Rivers Wet Weather is a nonprofit organization created in 1998 to support communities in the ALCOSAN service area in addressing CSO issues.

One of the people I interviewed representing the Pittsburgh Water and Sewer Authority even indicated that the county had looked into a county-wide stormwater fee decades ago:

> "There's a study from the '80s where Allegheny County looked into having a county-wide stormwater fee... 1988 I think it was, they apparently looked into it."[127]
>
> Pittsburgh Water and Sewer Authority
> Green Infrastructure Program and Policy Manager

However, the people I interviewed also expressed concerns about the institutional challenges for many of the candidate regional organizations, including a county-level approach:

> "What concerns me about the county is, if they're taking in this money, where's it gonna go? They're not gonna look at little Dormont. When we have a project that has to be done, when we have some flooding going on, how do we get in line with the county?"
>
> Dormont Stormwater Authority
> Administrative Manager

> "ALCOSAN I don't think would be allowed to, because I don't think the county and the state would allow them to mix storm and sanitary."
>
> Borough of Whitehall
> Borough Manager

> "The two people I don't want to have do this is PWSA, because they're just simply too fucked up, and ALCOSAN. ALCOSAN's strength is in sanitary sewer, and they do a very good job at it, but ALCOSAN has issues with legacy cost and governance issues. So, I'm not too crazy about either one of them jumping in."
>
> Shaler Township
> Township Manager

Along with these institutional challenges, the people I interviewed in the ALCOSAN service area also noted a number of ongoing collaborative efforts and discussions that may help lay the groundwork for a more comprehensive approach to stormwater management and finance in the region, including: a regional grant program administered by ALCOSAN; a variety of

[127] Indeed, the idea of a stormwater fee in Allegheny County was evaluated by Coopers & Lybrand (1988, 1990).

inter-municipal agreements; an effort to transfer inter-municipal trunk sewers to ALCOSAN;[128] various collaborative projects coordinated through councils of governments; and a watershed-based initiative in the Saw Mill Run watershed:

> "We started talking with the rest of the municipalities, and 3 Rivers Wet Weather, and some of the other regional groups like CONNECT [the Congress of Neighboring Communities] and the Southwest Pennsylvania Commission... How we can work with them to do this regionally and approach this from a regional standpoint? We need somebody to look from a watershed perspective. One of our approaches to that has been in Saw Mill Run where we've worked really closely with the communities tributary to Saw Mill Run."
>
> Pittsburgh Water and Sewer Authority
> Sustainability Manager

In addition to the challenges of identifying or forming a coordinating institution, one of the people I interviewed representing the Pittsburgh Water and Sewer Authority also noted challenges – as well as benefits – from a collective regional approach from the perspective of the designated NPDES permitting authority for the state (i.e., the Pennsylvania Department of Environmental Protection):[129]

> "We have had pretty good discussions with the folks over at [PA]DEP. They are supportive of it, and I'm sure they would love to get one Pollution Reduction Plan instead of 12. They would rather have one permit than 12. Their one caveat, though, is the worry that they will have one or two of the municipalities doing all the work, and the other ones will not. And, then, how do we hold them responsible if they're not participating to the level they should?"
>
> Pittsburgh Water and Sewer Authority
> Sustainability Manager

[128] The initiative to transfer inter-municipal trunk sewers to ALCOSAN emerged out the recommendations of a recent sewer regionalization study (Cohon et al., 2013). This study is one in a long line of studies evaluating sewer regionalization options in the region (Barazzone et al., 2014; Burns, Sr., Muller, Blaustein, Volz, & French, 2006; Gilbert et al., 2005; Greeley and Hansen, 2002; McElfish, Jr. & Jacoby, 1999; Roberts & Clark, 2011; Southwestern Pennsylvania Water and Sewer Infrastructure Project Steering Committee, 2002).

[129] The Pennsylvania Department of Environmental Protection has – at least in recent years – actively promoted regional collaborations on meeting MS4 permit requirements, including allowing collaborative regional entities to meet certain permit requirements, similar to the co-permittee status institutionalized by OHEPA.

4.3.4 Comparing fees

A quick comparison of the stormwater fees discussed in each of the case studies will help inform and frame the subsequent discussion. Standardizing the stormwater fees discussed in each of the preceding case studies to an annualized fee per 1,000 square feet of impervious surface shows that the HCSWD stormwater fee rates are substantially (i.e., up to 33 times) lower than the NEORSD stormwater fee rates for various property classes and tiers, which – in turn – are generally about half the stormwater fee rates assessed by the three local governments in the ALCOSAN service area (Table 4.2).

Table 4.2. Comparison of stormwater fees.

entity	fee / property class	impervious square feet*	annualized fee	annualized fee per 1,000 impervious ft^2
HCSWD	base service	3,300	$3.60	$1.09
	full service	3,300	$8.13	$2.46
NEORSD	residential: tier 1	1,000	$37.08	$37.08
	residential: tier 2 / base	3,000	$61.80	$20.60
	residential: tier 3	5,000	$111.24	$22.25
	homestead	3,000	$24.84	$8.28
	non-residential	3,000	$61.80	$20.60
Mt. Lebanon		2,400	$96.00	$40.00
Whitehall		2,000	$96.00	$48.00
Dormont		1,883	$96.00	$50.98

* Where impervious areas are ranges (NEORSD residential tiers) or unknown (Whitehall), central values of the range or best-guess values were used for purposes of comparison.

4.4 DISCUSSION

Most of concepts identified in the institutional collective action framework were reflected in the interviews I conducted on stormwater fee forms (Table 4.3, Figure C.3).

Table 4.3. Coding summary for the form case studies.
Numbers indicate how many times each concept was coded in each interview. Sum and count columns total within each case and across all cases.

concepts	total		ALCOSAN							MSDGC							NEORSD						
	sum	count	Dormont	Etna	PWSA	Shaler	Whitehall	sum	count	Cheviot	Evendale	HCSWD	Sharonville	Wyoming	sum	count	Independence	NEORSD	Oakwood	Strongsville	Valley View	sum	count
INSTITUTIONAL COLLECTIVE ACTION																							
ICA governance mechanisms																							
key dimensions																							
means of enforcement	4	4	1	0	0	1	0	2	2	0	0	1	1	0	2	2	0	0	0	0	0	0	0
coercion by higher level government	51	14	2	5	4	1	3	15	5	0	7	15	3	2	27	4	4	1	1	2	1	9	5
voluntary solutions	31	11	1	2	1	4	0	8	4	1	5	7	5	3	21	5	0	1	0	0	1	2	2
scope	36	10	1	4	10	0	1	16	4	0	4	8	2	4	18	4	0	1	0	0	1	2	2
primary factors																							
collaboration risk	4	2	0	0	0	3	0	3	1	0	0	0	0	1	1	1	0	0	0	0	0	0	0
defection risk	17	5	0	0	0	0	0	0	0	0	6	7	1	1	15	4	0	0	2	0	0	2	1
incoordination risk	3	2	0	0	0	0	0	0	0	0	0	1	0	2	3	2	0	0	0	0	0	0	0
unfair divisions risk	29	11	1	0	6	1	1	9	4	1	3	1	0	3	8	4	9	0	1	2	0	12	3
SHARED CONCEPTS																							
benefits	4	4	0	0	0	0	0	0	0	0	1	1	1	0	3	3	0	1	0	0	0	1	1
coordination gains	30	10	2	3	5	1	0	11	4	0	3	5	0	1	9	3	4	5	1	0	0	10	3
economies of scale	13	6	1	1	0	2	0	4	3	0	0	2	0	0	2	1	5	2	0	0	0	7	2
internalizing externalities	12	4	0	8	0	1	0	9	2	0	0	1	0	0	1	1	2	0	0	0	0	2	1
minimizing common-pool resource problems	3	2	0	0	0	0	0	0	0	0	0	1	0	0	1	1	2	0	0	0	0	2	1
institutional fragmentation	100	14	4	21	16	5	5	51	5	0	4	18	2	2	26	4	7	12	1	2	1	23	5
transaction costs	4	2	0	0	0	0	0	0	0	0	0	0	0	3	3	1	1	0	0	0	0	1	1
bargaining ~ coordination costs	22	10	1	0	1	1	3	6	4	0	1	2	0	2	5	3	8	2	1	0	0	11	3
enforcement costs	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	3	3
external decision costs	19	9	0	0	2	3	1	6	3	0	1	2	0	3	6	3	3	0	2	2	0	7	3
information costs	11	6	0	1	2	1	0	4	3	0	0	2	0	0	2	1	3	2	0	0	0	5	2
trust	1	1	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
trust -	9	4	1	2	0	5	0	8	3	0	1	0	0	0	1	1	0	0	0	0	0	0	0
trust +	6	5	0	1	0	2	0	3	2	0	1	1	1	0	3	3	0	0	0	0	0	0	0

Examining the coding of concepts in my interviews on stormwater fee form reveals several interesting patterns. Institutional fragmentation was by far the most frequently coded concept, and was coded in all but one brief telephone interview, as was the second-most frequently coded concept, coercion by higher level government (Table 4.3). These findings emphasize the fact that challenges of institutional fragmentation in managing stormwater are widely recognized across all three regions, and that vertical relationships among levels of government (i.e., federal, state, regional, county, subcounty) are central to navigating these challenges. Concepts about the benefits of collective action (e.g., coordination gains, economies of scale, internalizing externalities, minimizing common-pool resource problems) were also mostly all coded in interviews across all three cases, especially coordination gains (Table 4.3). In the MSDGC case, however, several concepts about collective action benefits were only coded in the HCSWD interview (Table 4.3). Similarly, most transaction cost concepts – especially bargaining / coordination costs, external decision costs, and information costs – were also coded fairly frequently in multiple interviews across all three cases, as was the concept of unfair divisions risk (Table 4.3). The widespread discussions about coordination gains and transaction costs suggests that individuals and institutions in each region are well aware of both the benefits to collectively managing stormwater as well as the transaction costs that have to be surmounted to realize those benefits.

In contrast to the sets of concepts that were coded fairly evenly across all three cases, other sets of concepts were coded exclusively in only one or two cases. For instance, the collaboration risk concepts of defection risk and incoordination risk were almost exclusively concentrated in the MSDGC case (Table 4.3), reflecting the particular salience of these risks in a voluntary approach to collective stormwater management. Two other distinct sets of concepts were coded mostly or entirely in the ALCOSAN and MSDGC cases: one set of concepts about trust; and another set of concepts about voluntary solutions and institutional scope (Table 4.3). The relative rareness of these concepts in the NEORSD case reflects the fact that the collective approach to stormwater management in the NEORSD service area was effectively required by NEORSD and the courts, and was also largely driven by NEORSD from the outset, with relatively little non-litigious negotiation about the scope of the RSMP.

Viewing my case studies of stormwater fee forms in the MSDGC/HCSWD, NEORSD, and ALCOSAN service areas through the lens of the institutional collective action framework

brings focus to a couple salient features across the cases. First, as mechanisms for mitigating institutional collective action dilemmas associated with stormwater management in institutionally fragmented metropolitan regions, the stormwater fees and associated stormwater management programs administered by HCSWD and NEORSD[130] fit fairly squarely into the array of mitigating mechanisms along dimensions of scope and means of enforcement as a single-purpose special district and an imposed district, respectively (Feiock, 2013). While the NEORSD RSMP is a much larger institution with a broader scope than HCSWD, both institutions are fairly narrowly focused on the single issue of stormwater management. Thus, from the perspective of the institutional collective action framework, the key difference between HCSWD and NEORSD is in the means of enforcement: the delegated authority of HCSWD versus the imposed authority of NEORSD.

So, why did different means of enforcement manifest in HCSWD and NEORSD? The institutional collective action framework posits that participation incentives favor mitigating mechanisms that yield the greatest gains for the least cost. A second feature of my case studies that appears particularly salient through the lens of the institutional collective action framework is that the relative similarity of the three metropolitan regions in terms of sewer and stormwater infrastructure configurations and in terms of abundant jurisdictional fragmentation among diverse local governments makes the potential benefits of mitigating the collective action dilemma (i.e., coordination gains, economies of scale, minimization of common-pool resource problems, and internalization of externalities) at least generally comparable across the cases. If mitigating mechanisms tend to maximize the difference between benefits and costs of institutional collective action, and the potential benefits are relatively comparable across cases, then the institutional collective action framework focuses attention on the differences in relative costs across cases, as well as the other major factor posited by the framework to influence which mitigating mechanisms manifest in which contexts: collaboration risks (Feiock, 2013).

As mitigating mechanisms for institutional collection action dilemmas of stormwater management and financing in fragmented metropolitan regions, the HCSWD and NEORSD stormwater programs and associated stormwater fees differ markedly in the relative transaction costs and coordination risks. With the NEORSD RSMP, mandated participation across the entire

[130] In the ALCOSAN case, a regional institution for mitigating the institutional collective action dilemma of stormwater management and financing has yet to be collectively agreed upon.

service area minimizes defection and incoordination risks, but arguably raises unfair division risks. Member communities cannot defect from the NEORSD RSMP, and the geographic scope of the RSMP enables NEORSD to coordinate activities for the entire service area. However, by requiring member communities to collectively finance regional projects, the NEORSD RSMP raises unfair division risks for at least some member communities. By contrast with the NEORSD RSMP, the more limited scope and voluntary nature of participation in HCSWD result in relatively higher defection and incoordination risks, but also lower unfair division risks. As acutely illustrated by the relatively recent defection of the City of Cincinnati, cities and villages participating in HCSWD can choose to defect at any time. The obligatory participation of townships, however, sets somewhat of an upper bound on the defection risks in HCSWD.

Compared with the broader, more capital-intensive focus of the NEORSD RSMP, the more limited scope of HCSWD – which focuses almost entirely on MS4 permit administration – raises incoordination risks and defection risks, but also lowers transaction costs. However, the more limited scope of HCSWD also likely substantially limits the collective benefits that can be achieved compared with the NEORSD RSMP. A more expansive programmatic scope may enable the NEORSD RSMP to realize greater collective benefits compared with HCSWD, but the NEORSD RSMP has also incurred substantial transaction costs, including the nearly six years of litigation over the program and associated stormwater fee, which can be viewed as manifestations of bargaining and enforcement costs. In these respects, the NEORSD and HCSWD cases suggest that institutional collective action – at least with respect to stormwater management and finance – may involve a district set of tradeoffs between certain collaboration risks and transaction costs: lowering unfair division risks, bargaining costs, and enforcement costs may incur higher defection and incoordination risks.

In addition to making the benefits of institutional collective action largely comparable across the three cases, the cross-case similarities of highly fragmented, diverse metropolitan regions with substantial hydrologic and hydraulic interdependencies also make the cases fairly similar in two key sources of collaboration risk identified by the institutional collective action framework: the specific nature of the underlying institutional collective action dilemma of stormwater management and financing; and the distribution preferences within and across the jurisdictions affected by this dilemma. As such, the institutional collective action framework suggests that the key source of collaboration risk responsible for the different mitigating

mechanisms (i.e., the different stormwater fee forms) in each case must lie in the third source of collaboration risk identified by the framework: the higher-level rules, local political institutions, and existing mitigating mechanisms in place.

Together with my research into stormwater fee diffusion, my case study of the ALCOSAN service area strongly suggests that higher-level rules – namely state laws – largely explain why local governments have only recently started to enact stormwater fees in Pennsylvania. The previous lack of clarity in state law about the power of local governments to assess stormwater fees seems to at least partly explain why no collective stormwater fee has yet emerged in the ALCOSAN service area.[131] Even though HCSWD and NEORSD were incorporated under different chapters of the Ohio Revised Code,[132] state law authorizes both organizations to assess fees. Thus, the different forms of stormwater fees observed in HCSWD and NEORSD seem to have been determined more by differences in the local political institutions and pre-existing mitigating mechanisms between the two regions. Particularly through the RIDE Study, NEORSD – which can be seen as a pre-existing mitigating mechanism for institutional collective action dilemmas related to sanitary sewerage – had been focusing more on stormwater leading up to the formation of the RSMP. In contrast, MSDGC – the pre-existing regional sanitary sewer district in the Cincinnati metropolitan region – did not drive the collective effort to finance stormwater management in southwest Ohio. Rather, the collective efforts in the MSDGC service area were more animated by the Hamilton County government in collaboration with subcounty governments. Much of the initial discussions leading to the formation of HCSWD concerned the appropriate scope of the program. While there was general agreement on the benefits of collectively managing MS4 permit requirements, agreement could not be reached on expanding the collective stormwater effort more broadly to focus on issues like flood abatement and CSOs.

[131] At least one collective stormwater fee has recently been enacted in Pennsylvania: the Wyoming Valley Sanitary Authority recently enacted a stormwater fee involving more than 30 general-purpose subcounty governments in Luzerne County.

[132] Within Title 61 (Water Supply, Sanitation, Ditches) of the Ohio Revised Code, HCSWD was incorporated under Chapter 6117 (Sewer Districts, County Sewers) while NEORSD was incorporated under Chapter 6119 (Regional Water and Sewer Districts).

Further insights into variations in stormwater fee form as seen through the lens of the institutional collective action framework can be gleaned by considering my hypotheses on stormwater fee forms.

4.4.1 Hypotheses on stormwater fee form

My case studies of stormwater fees in the MSDGC, NEORSD, and ALCOSAN service areas offer qualified support for my hypotheses about stormwater fee forms.

> form hypothesis 1:
> Collective stormwater fees in the United States formed and endured only by coercion from a higher level of government.

While higher-level legislation and judicial decisions were certainly critical in the endurance of the NEORSD stormwater fee, the HCSWD stormwater fee illustrates that collective stormwater fees can form and endure on a largely voluntary basis. That said, the fact that Ohio state law effectively compels townships to participate in HCSWD should not be overlooked. The assured participation of townships in HCSWD provides some guard against defection risk reaching a critical threshold for the collective HCSWD enterprise.

> form hypothesis 2:
> General-purpose, subcounty governments typically enact stormwater fees independently because the transaction costs – particularly negotiation costs associated with a larger number of more diverse actors – and defection risks preclude collective action to enact a collective stormwater fee, and because stormwater provides the opportunity for easy downstream cost externalization.

The ALCOSAN case study provides strong evidence that several types of transaction costs – including information costs, bargaining costs, enforcement costs, and external decision costs – present barriers to collective action on stormwater management and financing. Some of the information costs associated with instituting a collective approach to stormwater management and financing in the ALCOSAN service area have already been absorbed by various organizations, including ALCOSAN, that have already taken on a lot of the costs associated with studying and prioritizing cost-effective projects for alleviating wet weather

issues on a regional basis. The group of entities collaborating in the Saw Mill Run watershed have absorbed similar informational costs in identifying and prioritizing projects in that watershed. Other organizations, such as 3 Rivers Wet Weather, have also taken on substantial informational costs towards a collective approach to stormwater management and finance in the Pittsburgh region:

> "One of the things that helped was 3 Rivers Wet Weather, they did some pretty good mapping, and they've divided the county into drainage basins: both stormwater drainage basins and sanitary sewer drain basins. So, that kind of gives you a footprint for where you could have sub-authorities..."
>
> Shaler Township
> Township Manager

For a collective approach to stormwater management and financing to take shape in the ALCOSAN service area, significant negotiation costs and concerns about external decision costs have yet to be resolved:

> "In theory, I think that's probably the way I would like to see it, but – in reality – it's difficult to get them all to agree on a cost share. Should Baldwin pay the same amount or percentage as Castle Shannon when Castle Shannon borders both sides of the stream for a mile and a half and Baldwin is only up here on the hill and just has a small tributary trickle down to it or something? So, it's difficult to get everybody to feel good about their share because everybody has an idea of what their share should be."
>
> Pittsburgh Water and Sewer Authority
> Sustainability Manager

As noted previously, there also seem to be substantial concerns from the Pennsylvania Department of Environmental Protection regarding added enforcement costs that may arise from instituting some sort of collective MS4 permit administration, specifically regarding enforceability of permit conditions on potential free riders within the collective.

With respect to cost externalization, the hydrologically and politically fragmented nature of many metropolitan regions – including my three case studies into stormwater fee form – make them rife with opportunities for individual local governments to externalize stormwater costs onto downstream neighbors. My case studies suggest that a broadly scoped collective action to finance stormwater management (e.g., the NEORSD RSMP) may necessitate coercive mandate

to overcome the significant transaction costs associated with negotiating and enforcing such an institution. My case studies also suggest that a more limited institutional scope (e.g., HCSWD) may enable a more voluntary, self-organized institution, but that such an institution can be subject to higher defection and incoordination risks, and may also be able to realize a lower level of collective benefits.

4.5 FUTURE RESEARCH

Future research into stormwater fee forms can build on my research in at least two ways. First, inquiring into other cases where collective stormwater fees have or have not formed will help test the external validity of my findings. Second, applying other theoretical frameworks – such as the local public economy framework (Oakerson & Parks, 2011) or the ecology of games framework (Lubell, 2013) – to case studies of stormwater fee from may qualify or complement the insights generated using the institutional collective action framework in my case studies.

5.0 CONCLUSION

This dissertation inquired into why local governments in the United States enacted stormwater fees in certain places, at certain times, and in certain forms. My inquiries into the emergence, diffusion, and form of stormwater fees in the United States showed that federal regulation of stormwater and sewer systems may not have been relevant factors in the emergence of the nation's first stormwater fee enacted in Billings, Montana in 1964, but increasingly stringent and widespread regulation of these infrastructure systems has strongly influenced the diffusion and form of stormwater fees across the country over the past 25 years. More specifically, the diffusion and form branches of this research strongly suggest that the Phase 1 and Phase 2 MS4 regulations have been major drivers of stormwater fee enactment by local governments in many parts of the country since 1990. However, my research into the emergence, diffusion, and form of stormwater fees also underscores that state-specific factors (e.g., statutory law, case law, approaches to permit administration) can either promote or preclude the enactment of stormwater fees by individual local governments, and can either enable or enjoin stormwater fees involving multiple local governments. Additionally, all three branches of this research suggest an important role for private actors – particularly consulting firms and professional industry associations – in seeding and spreading the stormwater fee policy among local governments across the United States. Furthermore, my case studies of stormwater fee form suggest that the challenges to broadly scoped collective action characterizing stormwater management and finance in highly fragmented metropolitan regions may present transaction cost barriers too high to be surmounted without coercive intervention from a higher level of government, but that collective action of more limited scope can be achieved in relatively self-organized manner. My research also shows that the concerns about unfair division risks – about who benefits and who pays – that permeated the debate over the appropriate form of the first stormwater fee in the nation more than 50 years ago continue to shape debates about stormwater fee forms today.

5.1 PRAXIS

As noted in Chapter 1, this research advances the existing literature on stormwater fees in the United States in at least four key ways. First, my novel case study of the stormwater fee enacted in Billings, Montana in 1964 clarifies why, how, and under what conditions the first stormwater fee in the United States was enacted. The Billings case identifies several important issues and themes that continue to characterize stormwater fee debates and deliberations today: the importance of state statutory law and case law; arguments about the distribution of costs and benefits; and the influence of private companies. Second, the dataset and analyses in the diffusion branch of this research represent substantial advances in the study of how, why, and under what conditions stormwater fees spread among local governments across the United States over the past half-century. More specifically, by incorporating an array of political, geographic, and demographic data, and by extending to the full population of general-purpose local governments rather than only those that have enacted stormwater fees, my diffusion dataset and analyses significantly extend and advance the scant existing research (i.e., Kea, Dymond, and Campbell 2016) systematically and rigorously analyzing drivers of stormwater fee diffusion in the United States. Third, by contributing structured analyses of factors facilitating or inhibiting the formation and endurance of multi-jurisdictional stormwater fees, the form branch of this dissertation substantially extends the relatively limited subset of existing research into multi-jurisdictional stormwater fees.

The fourth way this research advances existing literature on stormwater fees is by structuring inquiries into stormwater fee phenomena according to various theoretical frameworks of public policy processes. In this respect, my research represents an initial step towards more structured, consistent, and comparable stormwater fee research. This theoretical framing of stormwater fee research is crucial for discerning key causal mechanisms and contextual factors shaping stormwater fee policy outcomes across states, regions, and localities. As such, the theoretically structured research presented in this dissertation complements the extensive inductively derived principles, strategies, best practices, and learned lessons in existing stormwater fee literature.

5.2 THEORY

This dissertation also contributes in several ways to the theoretical frameworks used to structure and frame my inquiries.

The emergence branch of this research indicates strong correspondence between some aspects of the collective learning framework and the multiple streams framework, particularly with respect to the salience of norms and values along with exogenous focusing events on the processes of policy emergence. However, my emergence case study also suggests that the collective learning framework may have limited utility in historical case studies where much of the evidence for the kinds of learning processes at the core of the framework is not readily available. In contrast, my emergence case study further instantiates the versatility of the multiple streams framework, demonstrating the good fit of the framework in a case study of a novel policy (i.e., stormwater fees) at the local level.

By exploring the diffusion of the stormwater fee policy among local governments, the diffusion branch of this research extends the fairly limited body of existing research investigating policy diffusion among local governments (e.g., Krause 2011). My research clearly indicates the importance of coercive diffusion of stormwater fees among local governments in the United States, particularly related to federal regulation of MS4s. However, by demonstrating the salience of state-specific factors, my research also identifies a key gap in policy diffusion theory regarding concepts and mechanisms focused on how state-specific factors can modulate federal influences on policy diffusion among local governments. My research also suggests that learning diffusion – often mediated by consulting firms and industry associations acting as key go-betweens – has played an important role in the spread of stormwater fees across the United States. This research also points to several internal local determinants of stormwater fee diffusion, including local government type and land use characteristics. Moreover, by combining quantitative analyses of a large, unprecedented dataset with detailed qualitative case studies of stormwater fee emergence and form, this research provided more finely resolved analyses of the mechanisms driving stormwater fee diffusion among local governments in the United States.

My inquiries into stormwater fee form contribute to the development of the institutional collective action framework by extending application of the framework into a new policy arena

(i.e., stormwater management and financing in jurisdictionally fragmented metropolitan regions). My case studies of stormwater fee form suggest widespread recognition of the benefits of collective action in stormwater management and finance in hydrologically interconnected and politically fragmented metropolitan regions. However, this research also indicates that several concepts posited by the institutional collective action framework present substantial barriers to collective action on stormwater management and finance in jurisdictionally fragmented, hydrologically interdependent metropolitan regions: abundant opportunities for externalization of stormwater flows and associated costs; significant informational, coordination, and external decision costs; and unfair division risks. My research also indicates broad recognition that vertical relationships among levels of government are central to navigating the substantial challenges of institutional fragmentation in stormwater management and financing in hydrologically interconnected metropolitan regions. Moreover, application of the institutional collective framework to my case studies of stormwater fee form suggests that state laws, local political institutions, and existing mitigating mechanisms play a key role in shaping the collaboration risks involved in collective action for stormwater management and finance in hydrologically interconnected, institutionally fragmented metropolitan regions. Finally, my case studies of stormwater fee form suggest that mechanisms mitigating collective action dilemmas of stormwater management and finance in hydrologically interconnected, jurisdictionally fragmented regions involve a distinct set of tradeoffs: more broadly scoped mitigating mechanisms may have to incur higher bargaining and enforcement costs and expose participants to higher unfair division risks in order to realize greater collective benefits and to minimize defection and incoordination risks.

All three branches of my research into stormwater fee phenomena emphasize the central role that vertical relationships among levels of government play in shaping stormwater fee policy outcomes in the federalist system of government in the United States. Federal legislation – often mediated by state agencies – has strongly influenced stormwater fee diffusion. State statutes and case law have moderated the effect of federal legislation on stormwater fee diffusion and influenced stormwater fee form. Regional and county institutions have also crucially shaped the incentives for the formation and endurance of multi-jurisdictional stormwater fees.

5.3 SUMMARY

Having spread from Billings, Montana in 1964 to at least 1,600 communities across 40 states in 2017, stormwater fees are now a firmly established American institution. As local governments across the country continue to face significant infrastructure investments required by increasingly stringent federal and state regulations of stormwater and combined sewer systems, the appeal of stormwater fees as relatively equitable and reliable financing mechanisms seems unlikely to diminish. I hope this research will help citizens, consultants, and public decision-makers in cities, counties, towns, boroughs, villages, metropolitan sewer districts, and other special-purpose districts across the United States better understand, design, and debate stormwater fees in their communities.

APPENDIX A

EMERGENCE

A.1 EVIDENCE CODING FRAMEWORKS

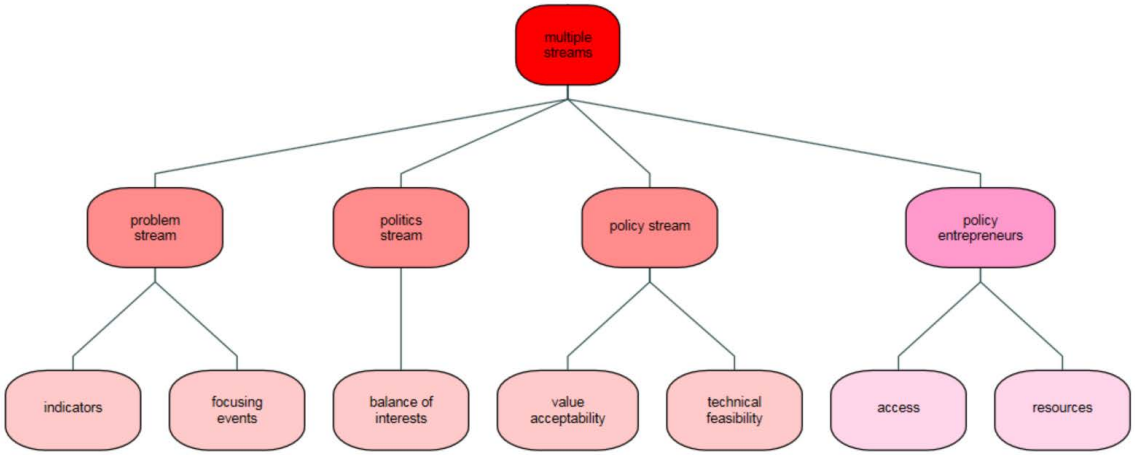


Figure A.1. Coding framework for the multiple streams framework.

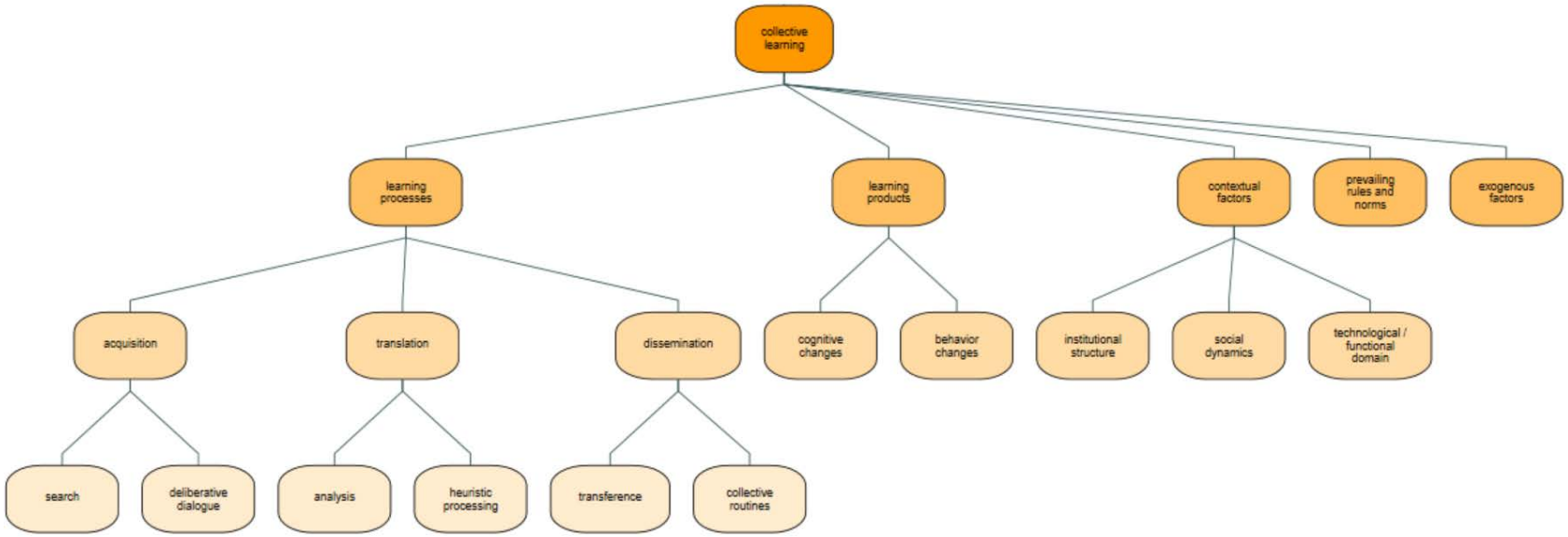
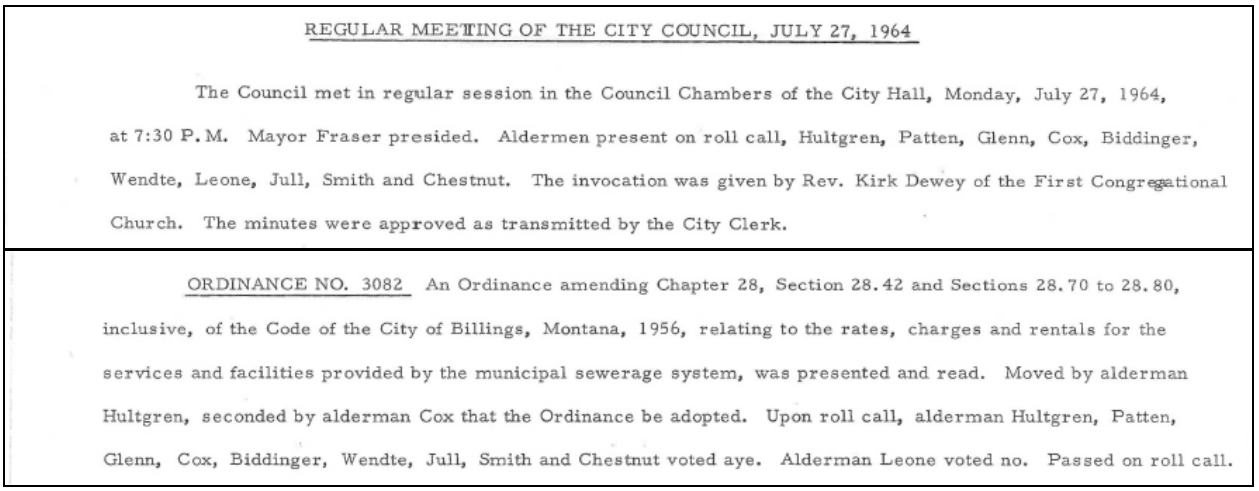


Figure A.2. Coding framework for the collective learning framework.

A.2 EVIDENCE IMAGES



REGULAR MEETING OF THE CITY COUNCIL, JULY 27, 1964

The Council met in regular session in the Council Chambers of the City Hall, Monday, July 27, 1964, at 7:30 P.M. Mayor Fraser presided. Aldermen present on roll call, Hultgren, Patten, Glenn, Cox, Biddinger, Wendte, Leone, Jull, Smith and Chestnut. The invocation was given by Rev. Kirk Dewey of the First Congregational Church. The minutes were approved as transmitted by the City Clerk.

ORDINANCE NO. 3082 An Ordinance amending Chapter 28, Section 28.42 and Sections 28.70 to 28.80, inclusive, of the Code of the City of Billings, Montana, 1956, relating to the rates, charges and rentals for the services and facilities provided by the municipal sewerage system, was presented and read. Moved by alderman Hultgren, seconded by alderman Cox that the Ordinance be adopted. Upon roll call, alderman Hultgren, Patten, Glenn, Cox, Biddinger, Wendte, Jull, Smith and Chestnut voted aye. Alderman Leone voted no. Passed on roll call.

Figure A.3. Excerpts from the 27 Jul 1964 regular meeting minutes of the Billings city council.

$4 MILLION STORM SEWERS

City Aldermen Give Okay To Sewer Rates, Charges

By Sam Blythe
Gazette Staff Writer

Billings City Council members approved an ordinance setting rates and charges for the city's $4 million storm sewer bond issue Monday.

Only dissenter was 4th Ward Alderman Joe Leone who said before the 40 minute meeting began that voters of his ward turned down sewers at the June 2 primary election.

"The rich people of the fourth ward are helping to pay for sewers for the poor people of northwest Billings," Leone remarked before the formal session.

But he had nothing to say at the meeting itself.

Charges will go on water bills and are based on the square footage of property and its usage.

The charge breakdown is as follows:

7,500 square feet or less, $3.60, $1.20; 7,501 to 15,000 square feet, $4.50, $1.50; 15,001 to 22,500 square feet, $5.40, $1.80; 22,501 to 30,000 square feet, $6.30, $1.80; 30,001 to 37,500 square feet, $7.20, $1.80; over 37,000 square feet, $7.20 plus 45 cents per 7,500 square feet or fraction thereof.

Sanitary sewer assessment rates were slightly increased to allow for storm sewer operation and maintenance costs.

Growing Problem

What several aldermen referred to as a growing problem came up when Edward Blaesius of 241 Ave. complained about "hot-rodding" in the Pioneer Park area.

Blaesius asked that aldermen consider the possibility of installing street "bumps" in the area to slow young drivers down. Many cities utilize them, he said.

"Last Saturday night my neighbor's dog got hit," he told aldermen.

"It could have been a kid."

Mayor Willard Fraser said he was holding a Tuesday meeting on a related matter and that Blaesius' problem would be discussed then.

Aldermen Joe Leone and James Patten briefly enlivened the short session with an exchange over the fire department's budget.

Leone's Courtesy

Leone asked that Patten's Public Safety Committee reconsider a proposed increase in firemen's salaries.

"Now Joe, don't try to run up my back," Patten said as he noted that the council, as a whole rather than individual committees, made budget decisions.

"I brought it you Jim as a courtesy," Leone rejoined.

"Well, courtesy my foot," Patten said and that ended it.

Alderman approved a traffic commission request the elimination of parking on both sides of Grand Avenue from 17th to 24th Streets West to provide for four-lane traffic.

In other business the council:

Awarded a $17,850 contract for gravel materials to Barry O'Leary Co. There were four other bidders.

Gave Sanitation Department Manager E. F. Edwards permission to call for bids on four garbage packer bodies, four truck chasis and a tractor.

Approved a $318 change order for the airport manager's office at Logan Field.

Approved the appointment of Orval Graham to the zoning commission after City Attorney James Thompson gave an opinion that Fraser had the power to make it with council permission.

Told City Clerk William Fry to issue some $8,660 sidewalk and curb construction warrents to O'Leary.

Approved a lease renewal agreement between the city and Mulvany Realty and D. J. Cole Co. for a parking lot at the southwest corner of 29th Street and 4th Avenue North. It expires July 1, 1966.

Paid a $1,132.32 claim for swimming pool architectural services to J. G. Linc and Co. and accepted officers reports.

Tales of the Town

Work at Fair

Four Billings residents will be employed at the Montana Pavilion at the New York World's Fair through the 1964 season. They are Mr. and Mrs. Kenneth Guyse of 2324 Stillwater Drive; Fred N. Iverson of 925 Burlington Ave., and Fred Erickson, who is an assistant to Centennial train director Jack Hume.

* * *

Now It's Annual

The former Sidney residents' picnic Sunday in North Park was so successful they decided to make it permanent.

Don Mercer will be chairman of next year's event and Mrs. Leslie A. Young, secretary. It will be held the fourth Sunday in July in North Park.

* * *

More Applications

The city has received three new applications for the airport manager's job, Mayor Willard Fraser said Monday.

They join a dozen or so others already received, Fraser said.

An airport commission com-

Motorcycle Hits Parked Car

A wild chase ended on Ninth Street West Sunday night when Ronald Trammel, 21, of 937 N. Broadway, riding a motorcycle, smashed into a parked car, Highway. Patrolman Kerry Keyser said Monday.

It was just a "varoom" as it went past, Patrolman Keyser said. "I couldn't see a thing." Keyser was west of Billings on the interstate highway when he first heard the cycle.

It came by again and Keyser chased the sound. He spotted the unlighted motorcycle on Shiloh Road, he said.

Keyser said it headed down Moore Lane, onto Central Avenue, then to Tenth Street West, cut to Terry Avenue and onto Ninth Street where it went out of control.

Trammel was treated at Deaconess Hospital for minor in-

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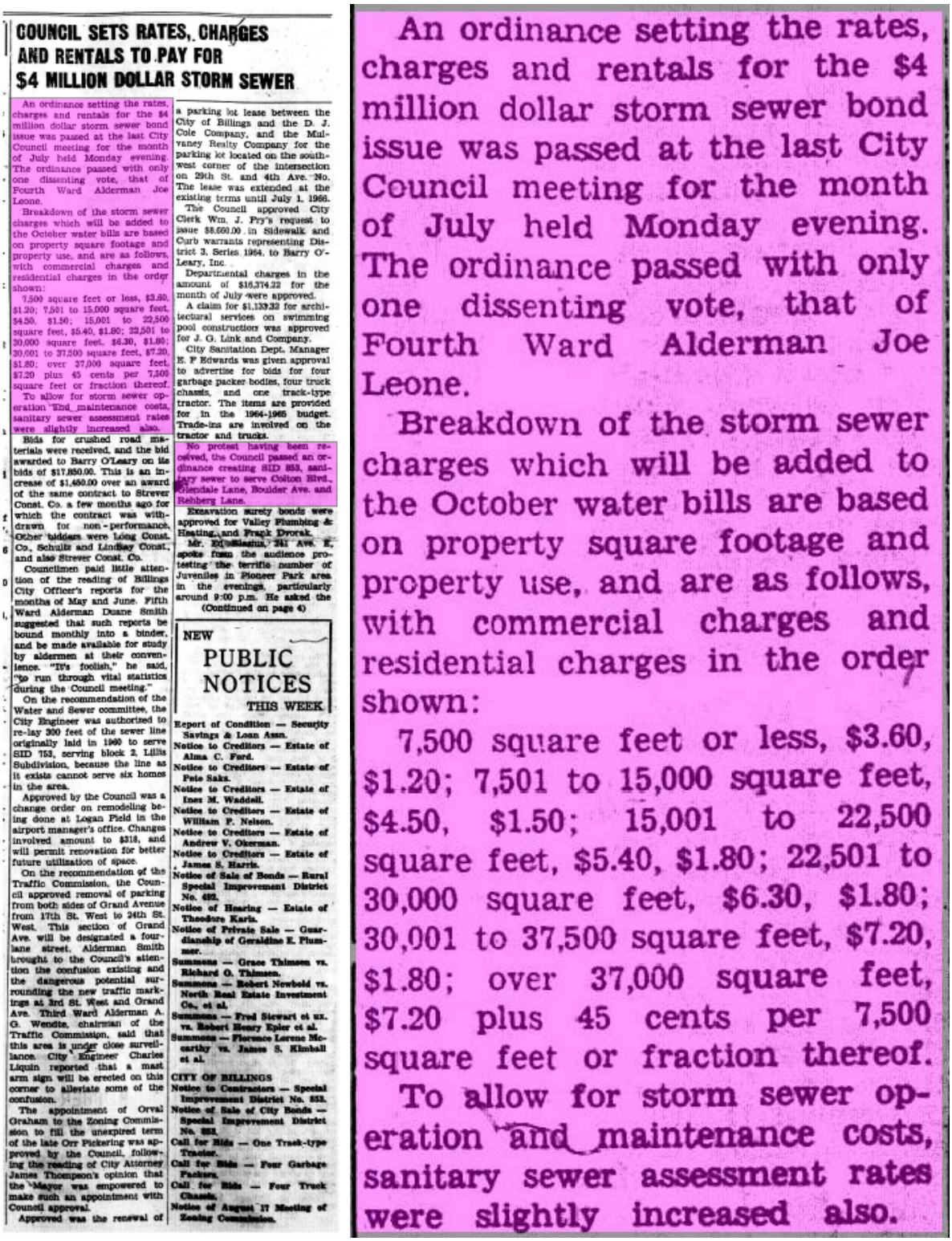
Sanitary sewer assessment rates were slightly increased to allow for storm sewer operation and maintenance costs.

Figure A.4. "City Aldermen Give Okay To Sewer Rates, Charges" by Sam Blythe in the *Billings Gazette* (28 Jul 1964, p. 2).



COUNCIL SETS RATES, CHARGES AND RENTALS TO PAY FOR $4 MILLION DOLLAR STORM SEWER

An ordinance setting the rates, charges and rentals for the $4 million dollar storm sewer bond issue was passed at the last City Council meeting for the month of July held Monday evening. The ordinance passed with only one dissenting vote, that of Fourth Ward Alderman Joe Leone.

Breakdown of the storm sewer charges which will be added to the October water bills are based on property square footage and property use, and are as follows, with commercial charges and residential charges in the order shown:

7,500 square feet or less, $3.60, $1.20; 7,501 to 15,000 square feet, $4.50, $1.50; 15,001 to 22,500 square feet, $5.40, $1.80; 22,501 to 30,000 square feet, $6.30, $1.80; 30,001 to 37,500 square feet, $7.20, $1.80; over 37,000 square feet, $7.20 plus 45 cents per 7,500 square feet or fraction thereof.

To allow for storm sewer operation and maintenance costs, sanitary sewer assessment rates were slightly increased also.

Bids for crushed road materials were received, and the bid awarded to Barry O'Leary on its bids of $17,850.00. This is an increase of $1,450.00 over an award of the same contract to Strever Const. Co. a few months ago for which the contract was withdrawn for non-performance. Other bidders were Long Const. Co., Schultz and Lindsay Const., and also Strever Const. Co.

Councilmen paid little attention of the reading of Billings City Officer's reports for the months of May and June. Fifth Ward Alderman Duane Smith suggested that such reports be bound monthly into a binder, and be made available for study by aldermen at their convenience. "It's foolish," he said, "to run through vital statistics during the Council meeting."

On the recommendation of the Water and Sewer committee, the City Engineer was authorized to re-lay 300 feet of the sewer line originally laid in 1960 to serve SID 753, serving block 2, Lillis Subdivision, because the line as it exists cannot serve six homes in the area.

Approved by the Council was a change order on remodeling being done at Logan Field in the airport manager's office. Changes involved amount to $318, and will permit renovation for better future utilization of space.

On the recommendation of the Traffic Commission, the Council approved removal of parking from both sides of Grand Avenue from 17th St. West to 24th St. West. This section of Grand Ave. will be designated a four-lane street. Alderman Smith brought to the Council's attention the confusion existing and the dangerous potential surrounding the new traffic markings at 3rd St. West and Grand Ave. Third Ward Alderman A. G. Wendte, chairman of the Traffic Commission, said that this area is under close surveillance. City Engineer Charles Liquin reported that a mast arm sign will be erected on this corner to alleviate some of the confusion.

The appointment of Orval Graham to the Zoning Commission to fill the unexpired term of the late Orr Pickering was approved by the Council, following the reading of City Attorney James Thompson's opinion that the Mayor was empowered to make such an appointment with Council approval.

Approved was the renewal of a parking lot lease between the City of Billings and the D. J. Cole Company, and the Mulvaney Realty Company for the parking lot located on the southwest corner of the intersection on 29th St. and 4th Ave. No. The lease was extended at the existing terms until July 1, 1966.

The Council approved City Clerk Wm. J. Fry's request to issue $8,650.00 in Sidewalk and Curb warrants representing District 3, Series 1964, to Barry O'Leary, Inc.

Departmental charges in the amount of $16,374.22 for the month of July were approved.

A claim for $1,133.32 for architectural services on swimming pool construction was approved for J. G. Link and Company.

City Sanitation Dept. Manager E. F Edwards was given approval to advertise for bids for four garbage packer bodies, four truck chassis, and one track-type tractor. The items are provided for in the 1964-1965 budget. Trade-ins are involved on the tractor and trucks.

No protest having been received, the Council passed an ordinance creating SID 853, sanitary sewer to serve Colton Blvd., Glendale Lane, Boulder Ave. and Rehberg Lane.

Exavation surety bonds were approved for Valley Plumbing & Heating, and Frank Dvorak.

Mr. Ed Blastus, 241 Ave. E, spoke from the audience protesting the terrific number of Juveniles in Pioneer Park area in the evenings, particularly around 9:00 p.m. He asked the

(Continued on page 4)

NEW

PUBLIC NOTICES

THIS WEEK

Report of Condition — Security Savings & Loan Assn.
Notice to Creditors — Estate of Alma C. Ford.
Notice to Creditors — Estate of Pete Saks.
Notice to Creditors — Estate of Ines M. Waddell.
Notice to Creditors — Estate of William P. Nelson.
Notice to Creditors — Estate of Andrew V. Okerman.
Notice to Creditors — Estate of James S. Harris.
Notice of Sale of Bonds — Rural Special Improvement District No. 492.
Notice of Hearing — Estate of Theodore Karis.
Notice of Private Sale — Guardianship of Geraldine E. Plummer.
Summons — Grace Thimsen vs. Richard O. Thimsen.
Summons — Robert Newbold vs. North Real Estate Investment Co., et al.
Summons — Fred Stewart et ux. vs. Robert Henry Epler et al.
Summons — Florence Lorene Mccarthy vs. James S. Kimball et al.

CITY OF BILLINGS

Notice to Contractors — Special Improvement District No. 853.
Notice of Sale of City Bonds — Special Improvement District No. 853.
Call for Bids — One Track-type Tractor.
Call for Bids — Four Garbage Packers.
Call for Bids — Four Truck Chassis.
Notice of August 17 Meeting of Zoning Commission.

Figure A.5. "COUNCIL SETS RATES, CHARGES AND RENTALS TO PAY FOR $4 MILLION DOLLAR STORM SEWER" in the *Billings Times* (30 Jul 1964, p. 1).

NOTICE OF SPECIAL ELECTION
CITY OF BILLINGS, MONTANA

NOTICE IS HEREBY GIVEN that on Tuesday, the 2nd day of June, 1964, a special election will be held in and for the City of Billings, Montana, for the determination of the question whether said City shall issue and sell its negotiable Revenue Bonds in the amount of Four Million Dollars ($4,000,000), to be issued in installments as the City Council shall determine and to be payable during a term not to exceed twenty (20) years from their respective dates of issue, and shall use the proceeds thereof to finance the reconstruction and extension of its municipal storm and sanitary sewer system, including but not limited to the construction of sewers to dispose of storm water and divert it from the sewage treatment plant and prevent pollution of sources of water supply, all in conformity with Revised Codes of Montana 1947, Title 11, Sections 11-2217 to 11-2221, inclusive, as amended, such bonds and the interest thereon to be payable solely out of net income and revenues to be derived from rates and charges for the use of the facilities provided by the undertaking and not to incur any obligation for the payment of which taxes may be levied except to pay for the services provided by the undertaking to the City itself, and any additional rates and charges necessary for the payment of such principal and interest to be removed when the bonds have been fully paid and redeemed, provided that such rates and charges shall always be sufficient to pay the reasonable expense of the operation, maintenance, depreciation and replacement of the system.

Further details as to said matter are set forth in Resolution No. 9929, duly passed by the City Council and approved and now on file and of record in the office of the City Clerk.

The places of voting at said election will be the polling places established within the City of Billings for the state primary nominating election to be held on said date, to-wit:

Ward	Precinct No.	Voting Place	Address
I.	2	Courthouse	No. 27th & 3rd Ave.
	6	Eastern Student Union Bldg.	1500 No. 30th
	8	North Park School	615 North 19th
	16	Lew Chevrolet Co.	1617 1st Ave. No.
	40	Rocky Mt. Tech Bldg.	1511 Poly Drive
	43	King Warehouse	421 No. 29th
	48	Eastern Elem. School	Normal Ave.
	49	New Rimrock School	2802 Iowa Street
	51	Navy Training Center	No. 22nd & 8th Ave.
	60	Rocky Mt. Tech. Bldg.	1511 Poly Drive
	67	Rocky Mt. Tech. Bldg.	1511 Poly Drive
II.	13	Jefferson School	No. 29th & 4th Ave.
	17	McKinley School	820 No. 31st
	21	Highland School	727 Parkhill Drive
	23	Senior High School	401 Grand Avenue
	31	McKinley School	820 No. 31st
	46	English Lutheran Church	1143 No. 31st
	47	Fire Station No. 3	Virginia Lane & Ave. E
	55	Highland School	727 Parkhill Drive
	56	Grand Ave. Grade School	1320 Grand Avenue
	62	Grand Ave. Grade School	1320 Grand Avenue
III.	22	Lewis & Clark Jr. Hi	1315 Lewis Avenue
	24	Central High School	3 Broadwater Avenue
	36	American Luth. Church	Lewis Ave. & Division
	38	Washington School	1044 Cook Avenue
	44	Y. W. C. A.	907 Wyoming Avenue
	45	Nazarene Church	Alderson & 8th St. West
	52	Senior High School	401 Grand Avenue
	53	Broadwater School	415 Broadwater Avenue
	54	Fire Station No. 4	Terry & 5th St. West
	57	Lewis & Clark Jr. Hi	1315 Lewis Avenue
	58	Washington School	1044 Cook Avenue
	63	Miles Ave. Grade School	1601 Miles Avenue
IV.	3	Taft School	515 South 26th
	14	Guadalupe Church	523 South 29th
	34	Orchard School	120 Jackson Street
	41	Garfield School	3212 1st Ave. So.
	61	Public Works Bldg.	Edwards St. & Monad Rd.
	65	Central Heights School	Eldorado & Pueblo Dr.
V.	26	West Senior High School	2201 St. Johns Ave.
	39	Rose Park School	1812 19th St. West
	59	Burlington School	2135 Lewis Avenue
	64	Burlington School	2135 Lewis Avenue
	66	West Sr. High School	2201 St. Johns Ave.
	68	Poly Drive Grade School	2410 Poly Drive
	69	Poly Drive Grade School	2410 Poly Drive
	72	Mt. Olive Luth. Church	24th St. W. & St. Johns

The polls for said election will be opened at eight o'clock a.m. and will remain open until eight o'clock p.m. being the hours fixed by law for the opening and closing of the polls for the state primary nominating election to be held on said date.

All, but only, the duly registered and qualified electors of the City whose names appear upon the last preceding assessment roll for state and county taxes as taxpayers upon property within said City are entitled to vote at said special municipal bond election.

Dated at Billings, Montana, this 14th day of May, 1964.

(Seal)

BY ORDER OF THE CITY COUNCIL
WM. J. FRY
City Clerk

(May 14, 21, 28, 1964)

NOTICE IS HEREBY GIVEN that on Tuesday, the 2nd day of June, 1964, a special election will be held in and for the City of Billings, Montana, for the determination of the question whether said City shall issue and sell its negotiable Revenue Bonds in the amount of Four Million Dollars ($4,000,000), to be issued in installments as the City Council shall determine and to be payable during a term not to exceed twenty (20) years from their respective dates of issue, and shall use the proceeds thereof to finance the reconstruction and extension of its municipal storm and sanitary sewer system, including but not limited to the construction of sewers to dispose of storm water and divert it from the sewage treatment plant and prevent pollution of sources of water supply, all in conformity with Revised Codes of Montana 1947, Title 11, Sections 11-2217 to 11-2221, inclusive, as amended, such bonds and the interest thereon to be payable solely out of net income and revenues to be derived from rates and charges for the use of the facilities provided by the undertaking and not to incur any obligation for the payment of which taxes may be levied except to pay for the services provided by the undertaking to the City itself, and any additional rates and charges necessary for the payment of such principal and interest to be removed when the bonds have been fully paid and redeemed, provided that such rates and charges shall always be sufficient to pay the reasonable expense of the operation, maintenance, depreciation and replacement of the system.

Further details as to said matter are set forth in Resolution No. 9929, duly passed by the City Council and approved and now on file and of record in the office of the City Clerk.

Figure A.6. "NOTICE OF SPECIAL ELECTION CITY OF BILLINGS, MONTANA" in the *Billings Times* (14 May 1964, p. 5). This same notice also ran in the *Times* 21 May 1964 (p. 5) and 28 May 1964 (p. 3).

★ ★ ★ ★ ★ ★

Bond Issues Appear To Make Clean Sweep

Billings' $380,000 fire station relocation bond issue won sweeping approval from the voters Tuesday while a controversial $4 million storm sewer measure just squeaked through.

It was a clean sweep as county's $500,000 nursing home bond issue apparently passed by a wide margin.

Complete returns from Billings' 47 precincts showed voters favoring fire stations by a 9,227—4,182 margin.

The final storm sewer count saw sewers approved 6,827-6,512 and it's always possible that a recount could reverse the tally.

Final unofficial returns showed the nursing home issue being approved 9,398-3,887.

South Side and Pioneer Park fire stations will re-located and bond issue proponents say fire insurance rates will remain stable as a result.

New training facilities will also be provided.

The storm sewer question was hotly contested by residents who said they had already paid for their own sewers and did not see why they should pay for west end trunks.

Backers said the sewer project makes permanent streets possible and will help alleviate flood dangers.

A Friday rain helped.

The nursing home issue was considered of prime importance by a Chamber of Commerce priority committee.

Committee members found what they termed a critical need for safe public nursing home facilities when they made investigations as to what the area most needed.

Few backers were available for comment late Tuesday evening.

But happiness must have been wide spread.

Figure A.7. "Bond Issues Appear To Make Clean Sweep" in the *Billings Gazette* (03 Jun 1964, p. 2L).

OR 155,000 OR UP?

Primary Ballots Could Be 203,000

By J. D. HOLMES

HELENA (AP)—Based on the previous three presidential-year primary elections in Montana, the turnout at the polls June 2 could range from about 155,000 to 203,000 of the state's 290,109 eligible voters.

The 155,000 low figure is based on the 53.5 per cent turnout of the 1952 Montana primary, while the high 203,000 stems from the 70.1 per cent turnout of the 1960 primary.

A midway estimate would be about 184,000 ballots, based on the 63.4 turnout of the 1956 primary.

Secretary of State Frank Murray Tuesday announced the official registration total of 290,109 for next month's nominating election. This is down 10,894 names from the 1962 primary, or a drop of 3.6 per cent.

The present registration total, however, is up 10,424 from the 1960 primary.

Of the statewide total of qualified electors, 124,132 are in the western 1st Congressional District and 165,977 in the eastern 2nd District. Two years ago, the western district had 128,363 electors and the eastern district 172,640.

Only five counties have larger registrations for this primary than in 1962. They are Beaverhead, Big Horn, Madison, Prairie and Wibaux.

This year, the state is divided into 1,066 precincts, six fewer than in 1962. In most cases, one precinct means one polling place but there are a few precincts with more than one polling place.

The 1964 primary registration totals, by county:

Western District — Beaverhead 3,396, Broadwater 1,375, Deer Lodge 6,876, Flathead 14,824, Gallatin 11,449, Granite 1,386, Jefferson 1,739, Lake 6,115, Lewis and Clark 13,938, Lincoln 5,020, Madison 2,796, Mineral 1,378, Missoula 20,181, Powell 3,237, Ravalli 5,749, Sanders 3,221 and Silver Bow 21,452.

Eastern District—Big Horn 3,730, Blaine 2,993, Carbon 4,081, Carter 1,142, Cascade 27,268, Chouteau 3,483, Custer 5,612, Daniels 1,848, Dawson 5,011, Fallon 1,802, Fergus 6,774, Garfield 958, Glacier 4,112, Golden Valley 653, Hill 6,952, Judith Basin 1,661, Liberty 1,222, McCone 1,543, Meagher 1,028, Musselshell 2,300, Park 5,587, Petroleum 468, Phillips 2,946, Pondera 3,173, Powder River 1,208, Prairie 1,161, Richland 4,571, Roosevelt 4,451, Rosebud 2,702, Sheridan 2,882, Stillwater 2,438, Sweet Grass 1,585, Teton 3,381, Toole 3,262, Treasure 591, Valley 5,600, Wheatland 1,596, Wibaux 880 and Yellowstone 33,322.

Safety Checks Set for Cars

Montana motorists were urged Tuesday to have their cars safety checked for mechanical defects before the start of the heavy summer driving season.

Roy Sorrells, chairman of the Montana Highway Commission, noted that free mechanical inspections would be offered in many communities during May and June as part of a voluntary nation-wide program to cut down on highway fatalities.

"This voluntary safety check gives every Montana motorist a chance to do his part in promoting traffic safety," Sorrells said.

The safety check, which is under the supervision of National Vehicle Safety-Check for Communities of Washington, D.C., will be conducted by teams of mechanics at designated highway lanes or other areas in communities.

The check will cover brakes, lights, steering, tires, exhaust, glass, wipers, mirror and horn. The inspection programs will be organized by local committees of garagemen, service station operators, automobile and tire dealers and police officials.

John Hanrahan Wins

Figure A.8. "Primary Ballots Could Be 203,000" in the *Billings Gazette* (13 May 1964, p. 11).

—Gazette Photo by Dennis Calkin

VERY PRETTY, BUT!—Storm clouds reflected in a shimmering pool of rain water could be the perfect setting for a pastoral scene. If the pool isn't covering the street in front of your home. This little lake turned up after a thunderstorm last summer. Billings taxpayers will vote on a new storm sewer system bond issue June 2.

Why Vote for New Storm Sewers?

By Sam Blythe
Gazette Staff Writer

Billings residents in two weeks will vote on storm sewer, fire station and nursing home bond issues.

The latter two measures needed petition signatures to insure their place on the June 2 ballot and considerable publicity resulted from petition drives.

Little has been heard on storm sewers, but facts are available now.

Costs $4 Million

The storm sewer project will cost $4 million and be financed through revenue bonds to be paid off in 20 years or less depending upon the city's growth.

City Council members will not adopt a storm sewer rate schedule until voters approve the bond issue but Morrison-Maierle Co., consulting engineers, say aldermen have informally agreed on approximate monthly rates which would be attached to water bills.

The rate would see residential property owners billed $1.20 a month for the first 7,500 square feet of their property and 30 cents for each additional 7,500 square feet or fraction thereof. Maximum charge would be $1.80 monthly.

Owners of commercial property would pay $3.60 a month for the first 7,500 square feet and 90 cents per 7,500 square feet thereafter to 37,500 square feet. There'd be a 45 cent assessment for each additional 7,500 square feet.

Four-Point Program

Engineers cite four major reasons on the need for storm sewers:

(1) They would provide storm drainage required on major street thoroughfares—a prerequisite to permanent street construction.

(2) Sewers would improve health and reduce safety hazards existing along the Arnold and city-county drains within the city.

(3) They would intercept runoff which engineers say now overloads the city's existing trunk line storm sewer setup.

(4) They would cut down street surface deterioration, basement flooding, etc., which now occur each time the city receives a good rain.

To City Limits

The proposed trunk line system would extend the current setup to present city limits.

Engineers say it would improve and cover major portions of those Arnold and city-County drain channels within the city.

New sewer additions and extensions would have at least as large a draining capacity as those storm sewers now serving the city, they say.

Planning has left room for future extension as the city grows.

City officials, private engineers and others supporting the storm sewer measure grant that the project is hard to sell, since sewers, after all, are underground and less tangible to the electorate than fire stations and nursing homes.

But results of storm sewer construction will be tangible, engineers say, and the taxpayer will save money in the long run.

Repair and maintenance costs on streets will go down once sewers are in and major street improvements will be possible only after construction, officials say.

Water pollution and drowning hazards will be reduced when drains are covered.

Some residents in areas which already have storm sewers have indicated they will not vote for the expansion project as they can't see how new sewers will help their property.

Not so, say project backers.

The system will alleviate overloading of existing facilities, they say.

Officials will have more to say on the project as election day approaches.

Paper ballots for the storm sewer and fire station bond issues were expected in City Clerk William Fry's office sometime Monday.

Voters may cast absentee ballots just as they would for the primary election.

Tales of the Town

Weed Control Week

Yellowstone County commissioners have proclaimed May 31-June 6 as "Yellowstone County Weed Control Week."

It was the commissioners' first proclamation in many months.

* * *

Sheehy to Speak

John C. Sheehy will speak at the meeting of the Teen Dems, Billings teenage Democrats, Tuesday 7:30 p.m. at 2217 Hewitt Drive. The meeting is open to all teenagers.

* * *

No Name Park

Yellowstone County commissioners turned their thoughts toward unnamed parks Monday.

Discussion began when someone suggested that commissioners really ought to name a park near the county's nursing home which is receiving increased use this year.

Commissioners had ideas:

They were Muggins Taylor (Anthony Healow); Chapple, (Joe Josephson), and Riverbend, (Thomas Deckert).

These are the same suggestions commissioners came up with a year ago and the impasse is still impassable.

Commission Chairman Deck-

BILLINGS TODAY

Billings Optimist Club meets at noon at Belnap Broiler.

Board of Directors of The Billings Lions meets at noon at Chamber of Commerce.

Exchange Club of Billings meets at noon at Northern Hotel.

Billings Duplicate Bridge Club meets at 1 p.m. at 2103 Spruce St.

Billings Assembly 24, Order of Rainbow for Girls, meets at 4 p.m. at Masonic Temple.

Billings Toastmasters Club 319 meets at 6:15 p.m. at Turf.

Job's Daughters Bethel No. 3 meets at 7:30 p.m. at Masonic Temple.

Al-Anon Family Group meets at 8 p.m. at 1120 16th St. W.

Golden Belle Chapter of Sweet Adelines meets at 8 p.m. at RMC in the Blue Room.

Alcoholics Anonymous meets at 8 p.m. at 644 Grand Ave.

American Legion Auxiliary meets at 8 p.m. at Legion Hall.

Mess Agate Chapter No. 126, OES, meets at 8 p.m. at Masonic Temple.

Veterans of WWI meets at 8 p.m. at Moose Hall.

Real Property Taxes Come in

Youth Injured In Accident

A 15-year-old Billings boy, Steve Day, suffered a broken leg and abrasions on head and hands when his motorcycle and a pickup truck collided Monday morning.

The boy, a son of Mr. and Mrs. Herman Day, 2321 Ave. B, was taken to Deaconess Hospital by the Billings Ambulance Service. The boy's doctor said he was in serious condition Monday night with a compound leg fracture, and possibly other injuries.

The boy was thrown from his motorcycle onto the windshield of a pickup driven by James Spurway of Rt. 1. Spurway was traveling west on Yellowstone Avenue and the boy was going south on 16th Street West when they collided.

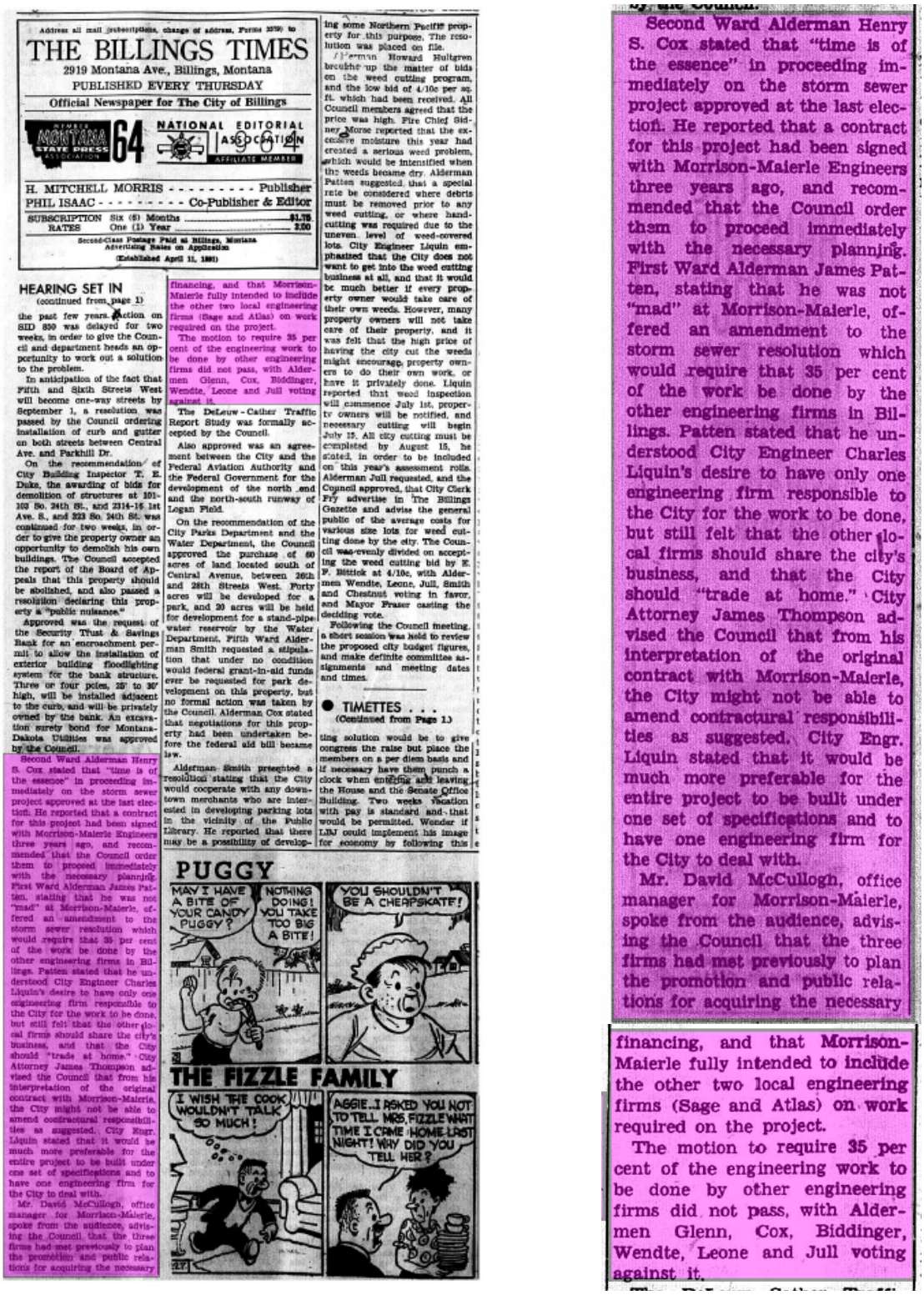
Day was unconscious when Billings police arrived at the scene.

Astrological Forecast

For Tuesday
By SYDNEY OMARR

ARIES (March 21-April 19): Be aware of limitations. Don't overextend yourself. Includes getting proper rest. Good for neglected bookwork, planning. Double check financial issues. Day to Cultivate

Figure A.9. "Why Vote for New Storm Sewers"
by Sam Blythe in the *Billings Gazette* (19 May 1964, p. 16L).



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THE BILLINGS TIMES

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PUBLISHED EVERY THURSDAY

Official Newspaper for The City of Billings

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(Established April 11, 1881)

HEARING SET IN
(continued from page 1)

the past few years. Action on SID 350 was delayed for two weeks, in order to give the Council and department heads an opportunity to work out a solution to the problem.

In anticipation of the fact that Fifth and Sixth Streets West will become one-way streets by September 1, a resolution was passed by the Council ordering installation of curb and gutter on both streets between Central Ave. and Parkhill Dr.

On the recommendation of City Building Inspector T. E. Duke, the awarding of bids for demolition of structures at 101-103 So. 24th St., and 2314-16 1st Ave. S., and 323 So. 24th St. was continued for two weeks, in order to give the property owner an opportunity to demolish his own buildings. The Council accepted the report of the Board of Appeals that this property should be abolished, and also passed a resolution declaring this property a "public nuisance."

Approved was the request of the Security Trust & Savings Bank for an encroachment permit to allow the installation of exterior building floodlighting system for the bank structure. Three or four poles, 25' to 30' high, will be installed adjacent to the curb, and will be privately owned by the bank. An excavation surety bond for Montana-Dakota Utilities was approved by the Council.

Second Ward Alderman Henry S. Cox stated that "time is of the essence" in proceeding immediately on the storm sewer project approved at the last election. He reported that a contract for this project had been signed with Morrison-Maierle Engineers three years ago, and recommended that the Council order them to proceed immediately with the necessary planning. First Ward Alderman James Patten, stating that he was not "mad" at Morrison-Maierle, offered an amendment to the storm sewer resolution which would require that 35 per cent of the work be done by the other engineering firms in Billings. Patten stated that he understood City Engineer Charles Liquin's desire to have only one engineering firm responsible to the City for the work to be done, but still felt that the other local firms should share the city's business, and that the City should "trade at home." City Attorney James Thompson advised the Council that from his interpretation of the original contract with Morrison-Maierle, the City might not be able to amend contractural responsibilities as suggested. City Engr. Liquin stated that it would be much more preferable for the entire project to be built under one set of specifications and to have one engineering firm for the City to deal with.

Mr. David McCullogh, office manager for Morrison-Maierle, spoke from the audience, advising the Council that the three firms had met previously to plan the promotion and public relations for acquiring the necessary financing, and that Morrison-Maierle fully intended to include the other two local engineering firms (Sage and Atlas) on work required on the project.

The motion to require 35 per cent of the engineering work to be done by other engineering firms did not pass, with Aldermen Glenn, Cox, Biddinger, Wendte, Leone and Jull voting against it.

The DeLeuw-Cather Traffic Report Study was formally accepted by the Council.

Also approved was an agreement between the City and the Federal Aviation Authority and the Federal Government for the development of the north end and the north-south runway of Logan Field.

On the recommendation of the City Parks Department and the Water Department, the Council approved the purchase of 80 acres of land located south of Central Avenue, between 26th and 28th Streets West. Forty acres will be developed for a park, and 20 acres will be held for development for a stand-pipe water reservoir by the Water Department. Fifth Ward Alderman Smith requested a stipulation that under no condition would federal grant-in-aid funds ever be requested for park development on this property, but no formal action was taken by the Council. Alderman Cox stated that negotiations for this property had been undertaken before the federal aid bill became law.

Alderman Smith presented a resolution stating that the City would cooperate with any downtown merchants who are interested in developing parking lots in the vicinity of the Public Library. He reported that there may be a possibility of developing some Northern Pacific property for this purpose. The resolution was placed on file.

Alderman Howard Hultgren brought up the matter of bids on the weed cutting program, and the low bid of 4/10c per sq. ft. which had been received. All Council members agreed that the price was high. Fire Chief Sidney Morse reported that the excessive moisture this year had created a serious weed problem, which would be intensified when the weeds became dry. Alderman Patten suggested that a special rate be considered where debris must be removed prior to any weed cutting, or where hand-cutting was required due to the uneven level of weed-covered lots. City Engineer Liquin emphasized that the City does not want to get into the weed cutting business at all, and that it would be much better if every property owner would take care of their own weeds. However, many property owners will not take care of their property, and it was felt that the high price of having the city cut the weeds might encourage property owners to do their own work, or have it privately done. Liquin reported that weed inspection will commence July 1st, property owners will be notified, and necessary cutting will begin July 15. All city cutting must be completed by August 15, he stated, in order to be included on this year's assessment rolls. Alderman Jull requested, and the Council approved, that City Clerk Fry advertise in The Billings Gazette and advise the general public of the average costs for various size lots for weed cutting done by the city. The Council was evenly divided on accepting the weed cutting bid by E. F. Bittick at 4/10c, with Aldermen Wendte, Leone, Jull, Smith and Chestnut voting in favor, and Mayor Fraser casting the deciding vote.

Following the Council meeting, a short session was held to review the proposed city budget figures, and make definite committee assignments and meeting dates and times.

● TIMETTES . . .
(Continued from Page 1)

ting solution would be to give congress the raise but place the members on a per diem basis and if necessary have them punch a clock when entering and leaving the House and the Senate Office Building. Two weeks vacation with pay is standard and that would be permitted. Wender if LBJ could implement his image for economy by following this

PUGGY

THE FIZZLE FAMILY

Second Ward Alderman Henry S. Cox stated that "time is of the essence" in proceeding immediately on the storm sewer project approved at the last election. He reported that a contract for this project had been signed with Morrison-Maierle Engineers three years ago, and recommended that the Council order them to proceed immediately with the necessary planning. First Ward Alderman James Patten, stating that he was not "mad" at Morrison-Maierle, offered an amendment to the storm sewer resolution which would require that 35 per cent of the work be done by the other engineering firms in Billings. Patten stated that he understood City Engineer Charles Liquin's desire to have only one engineering firm responsible to the City for the work to be done, but still felt that the other local firms should share the city's business, and that the City should "trade at home." City Attorney James Thompson advised the Council that from his interpretation of the original contract with Morrison-Maierle, the City might not be able to amend contractural responsibilities as suggested. City Engr. Liquin stated that it would be much more preferable for the entire project to be built under one set of specifications and to have one engineering firm for the City to deal with.

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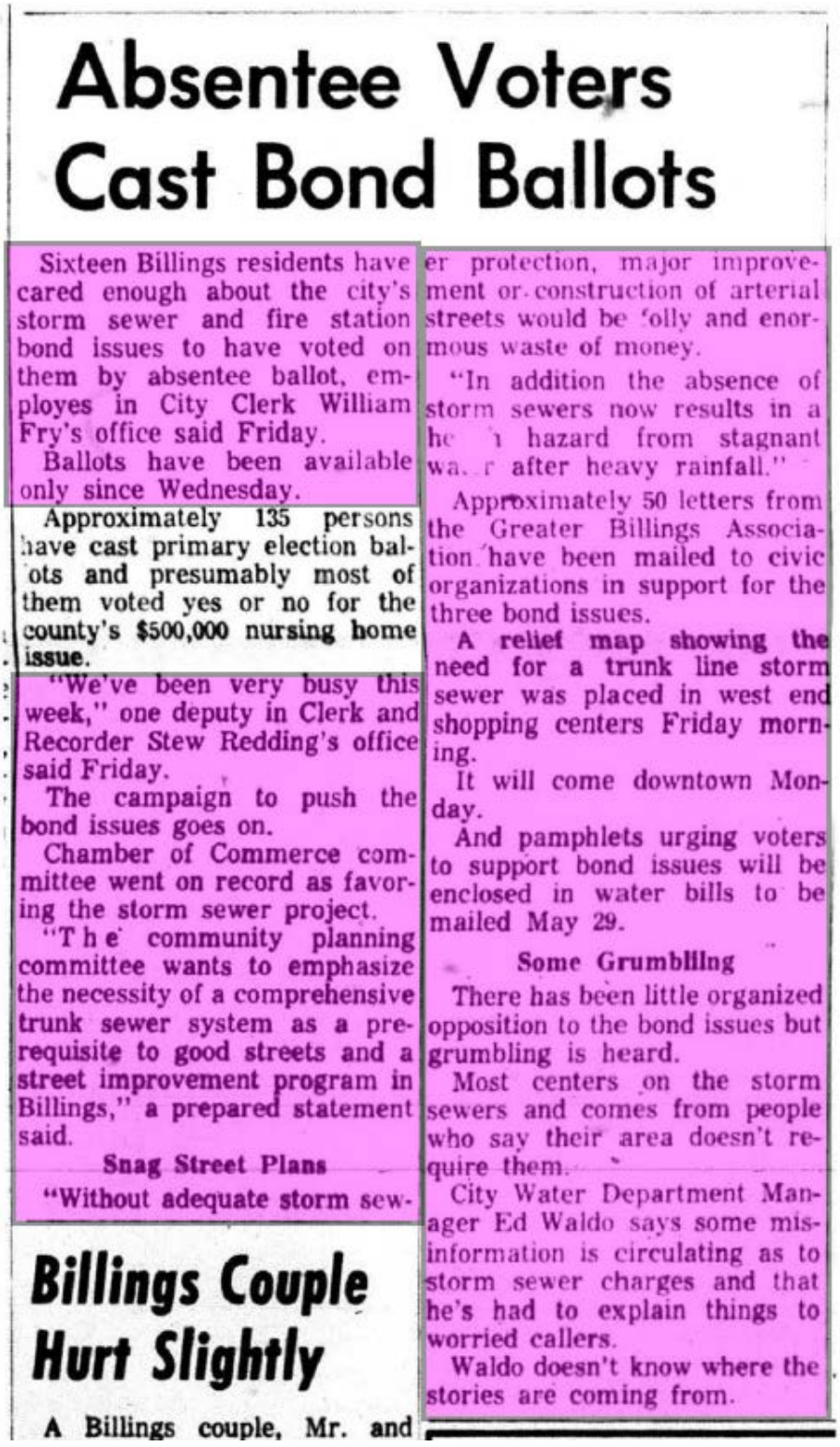
The motion to require 35 per cent of the engineering work to be done by other engineering firms did not pass, with Aldermen Glenn, Cox, Biddinger, Wendte, Leone and Jull voting against it.

Figure A.10. "HEARING SET IN AIRPORT MANAGER DISMISSAL CASE" in the *Billings Times* (25 Jun 1964, p. 4 continued from p. 1).



Absentee Voters Cast Bond Ballots

Sixteen Billings residents have cared enough about the city's storm sewer and fire station bond issues to have voted on them by absentee ballot, employes in City Clerk William Fry's office said Friday.

Ballots have been available only since Wednesday.

Approximately 135 persons have cast primary election ballots and presumably most of them voted yes or no for the county's $500,000 nursing home issue.

"We've been very busy this week," one deputy in Clerk and Recorder Stew Redding's office said Friday.

The campaign to push the bond issues goes on.

Chamber of Commerce committee went on record as favoring the storm sewer project.

"The community planning committee wants to emphasize the necessity of a comprehensive trunk sewer system as a prerequisite to good streets and a street improvement program in Billings," a prepared statement said.

Snag Street Plans

"Without adequate storm sewer protection, major improvement or construction of arterial streets would be folly and enormous waste of money.

"In addition the absence of storm sewers now results in a health hazard from stagnant water after heavy rainfall."

Approximately 50 letters from the Greater Billings Association have been mailed to civic organizations in support for the three bond issues.

A relief map showing the need for a trunk line storm sewer was placed in west end shopping centers Friday morning.

It will come downtown Monday.

And pamphlets urging voters to support bond issues will be enclosed in water bills to be mailed May 29.

Some Grumbling

There has been little organized opposition to the bond issues but grumbling is heard.

Most centers on the storm sewers and comes from people who say their area doesn't require them.

City Water Department Manager Ed Waldo says some misinformation is circulating as to storm sewer charges and that he's had to explain things to worried callers.

Waldo doesn't know where the stories are coming from.

Billings Couple Hurt Slightly

A Billings couple, Mr. and

Figure A.11. "Absentee Voters Cast Bond Ballots" in the *Billings Gazette* (23 May 1964, p. 9H).

Figure A.12. Greater Billings Association's full-page ad supporting bond issues in the *Billings Gazette* (Tuesday 26 May 1964, p. 11). This same ad also ran in the *Gazette* Monday 01 June 1964 (p. 12), one day before the vote.

CAMPAIGN FACTS

PUBLISHED AS A NON-PARTISAN PUBLIC SERVICE — BY THE LEAGUE OF WOMEN VOTERS — BILLINGS, MONTANA, MAY, 1964

Our Candidates Answer Questions

League of Women Voters Give Office Seekers Opportunity to Present Views to Voters

As a service to the registered voters of Yellowstone County, the Billings Chapter of the League of Women Voters, a non-partisan organization, conducted a survey of all candidates, both on the county and state level. Candidates were asked biographical information and viewpoints on pertinent questions. Some editing was necessary for space demands.

CANDIDATES FOR NATIONAL OFFICES WERE ASKED:

1. What, in your opinion, should be the U. S. policy on economic aid to the developing nations in Asia, Africa, and Latin America? Why?
2. Do you think there is need for further Congressional action on Civil Rights? Please explain.
3. To what domestic economic problems should the federal government give priorities?
4. What national or international problem interests you most? Please explain.

United States Senator

ALEX BLEWETT
Republican

1. The same answer would not apply or obtain for all of

also a need to strive to realize the American concept of the ideal of equal opportunity for all under the Constitution. On the question of the position of states in the civil rights field,

the spread of Communism. Since then, foreign aid has become a form of United States financed international charity! Between 1946-1963 the sum of approximately 104 billion dollars has been spent. Much foreign aid has been a government to government procedure and has failed to reach broad masses of people. It supports, instead, many governments whose economic development is totalitarian. The goal of foreign aid should be re-evaluated in light of the present situation. Military assistance has kept nations from Communism. Technical assistance has done a far better job than handouts in improving living conditions. Whatever our goal, it should be on a loan basis instead of one of charity.

2. No! The right to vote, to equal treatment before the law, to hold property, and to the protection of contracts are clearly guaranteed by the 14th and 15th Amendments to the Constitution. The rights of association, of thought, and of choice are individual and moral issues and cannot be solved by passing laws. I be-

domestic products, such as meat, should be overhauled so that those who pay the cost of government through taxes would not be put at an unfair advantage.

4. On the international front, the continual spread of Communism throughout the Western Hemisphere and through the free nations of the world finds the most concern in Congress. We must find ways and means of getting off of the defensive in this ideological war in attempt to insure the rights of all people to a free selection of their representatives in government.

ROBERT L. KELLEHER
Democrat, 41

Education: Mt. Carmel College—PhB. Catholic University of America—LLB and M.A. (Ibero-American History) Harvard University Fellow in Economics and Law 1953-1954). Attended Russian Language School of Sixth U. S. Army (1963).

Attorney at law and politician.

Former Attorney in Anti-Communist section of U. S.

CANDIDATES FOR GOVERNOR WERE ASKED:

1. What do you consider the most important legislation you would propose to the Legislative Assembly?
2. What duties assigned to the Board of Examiners do you think are paramount?

TIM BABCOCK
Republican

No reply.

MIKE KUCHERA
Democrat, 52

I graduated cum laude from the University of Experience. My major field was hard work. I've also acquired several minors in honest dealings, love of my fellow man, and allied subjects.

I have been a successful wheat rancher. I founded the furniture company bearing my name. I employ 12 people, pay my taxes, and have been successful in my business career.

1. I would consider a recommendation for a complete study on the possibility of consolidating operation of the University System into one office as important. Montana taxpayers

ROLAND R. RENNE
Democrat, 58

B.S. Rutgers University, M.S. University of Wisconsin, Ph.D. University of Wisconsin. Honorary degrees University of Philippines, Rutgers University and National University of Asuncion, Paraguay.

President Montana State College—20 years. Assistant Secretary of Agriculture for International Affairs—1963 and early 1964. Served as member Water Resources Policy Commission. National Forestry Advisory Board. National Advisory Commission on Indian Affairs. Chairman Water Resources Committee of the Association of State Universities and Land Grant Colleges. Advisory Council Montana State Planning Board. National Manpower Council.

1. (a.) To increase Montana State School Foundation Program contributions up to the

ant (13 years) major oil company prior to entering real estate and insurance business in Yellowstone County in 1951. Actively engaged in real estate brokerage and casualty insurance brokerage business (15 years) in Yellowstone County. Past president Billings Board of Realtors and presently serving as semi-permanent treasurer of this organization. Enlisted in WW2 as private and discharged 5 years later after overseas service as captain. Served as commanding officer U. S. Army Reserve unit 5 years, and executive officer, same category, 800 man battalion size unit.

1. Examination of County operating statement indicated 40% increase in departmental expenses of various departments and a large increase in poverty type expenses of the county. I would vote to curtail any further increases along this line until the tax base is broadened as too heavy a burden of taxes is necessary on real property, etc., to maintain any further increases.

2. Yes—providing careful expenditure of these monies is always maintained. Large capital expenditures via the Bond Issue process should be planned at least 5 years in advance with proper liaison between the County and City so that undue burdensome bond issues do not hit the property tax payer within too short a period of time. This has happened too often in the past indicating absolutely no planning between the City and County government leaders.

3. Yes, I believe that planning of this type is absolutely necessary. However, it must be a continuous process and not have 2 years of planning and then several years without supervision as heretofore in the past. Permanency in this phase of government must be

the judgment given. If elected

(No reply)

Special Bond Election For City of Billings

Editor's Note: The two following issues for fire stations and sewers will appear on separate paper ballots.

FIRE DEPARTMENT BUILDING BONDS

☐ FOR the City of Billings, Montana, issuing and selling its negotiable general obligation Fire Department Building Bonds in the amount of Three Hundred Eighty Thousand Dollars ($380,000), to be payable during a term not to exceed twenty (20) years from date of issue, for the purpose of acquiring sites for and constructing, furnishing and equipping public fire department buildings.

☐ AGAINST (Same as above).

STORM AND SANITARY SEWERS

☐ FOR the City of Billings, Montana, issuing and selling its negotiable Revenue Bonds in the amount of Four Million Dollars ($4,000,000), to be issued in installments as the City Council shall determine and to be payable during a term not to exceed twenty (20) years from their respective dates of issue, and using the proceeds thereof to finance the reconstruction and extension of its municipal storm and sanitary sewer system, including but not limited to the construction of sewers to dispose of storm water and divert it from the sewage treatment plant and prevent pollution of sources of water supply, all in conformity with Revised Codes of Montana 1947, Title 11, Sections 11-2217 to 11-2221, inclusive, as amended, such bonds and the interest thereon to be payable solely out of net income and

Bond Issue For Residents of Yellowstone County

FOR COUNTY NURSING HOME FUND ISSUE

Shall the Board of County Commissioners be authorized to issue and sell bonds of the County in the amount of Five Hundred Thousand ($500,000.00), bearing interest at a rate not exceeding six per cent (6%) per annum, payable semi-annually, during a period of twenty years, redeemable on any due date after five years; for the purpose of erecting a new county nursing home sufficiently large to house persons, who are residents of Yellowstone County, State of Montana, and who are in need of such confinement including, but not limited to County patients, and equipment for furnishing the same.

Editor's Note: The County Nursing Home Bond Issue will appear on voting machine.

revenues to be derived from rates and charges for the use of the facilities provided by the undertaking and not to incur any obligation for the payment of which taxes may be levied except to pay for services provided by the undertaking to the City itself, and any additional rates and charges necessary for the payment of such principal and interest to be removed when the bonds have been fully paid and redeemed, provided that such rates and charges shall always be sufficient to pay the reasonable expense of the operation, maintenance, depreciation and replacement of the system.

☐ AGAINST Same as above).

condition of the country as he may deem expedient; he reviews bills passed by the Legislature, signing or vetoing; approves or disapproves any item in an appropriation bill; presents and sponsors the State budget before the Legislature; Commander-in-Chief of the National Guard; acts as representative of Montana in negotiations between Montana and other states of the federal government; serves as chairman of the State Board of Examiners, State Land Board and ex-officio of various Boards and Commissions.

Salary: $22,000 a year.

LIEUTENANT GOVERNOR

Term: 4 years.
Qualifications: Does not need to reside in Helena.
Duties: Serves in absence of Governor; President of Senate; power to vote if Senate is equally divided.
Salary: No salary except $20 per diem during legislature and acting as Governor.

SECRETARY OF STATE

Tearm: 4 years.
Qualifications: 25 years old, citizen of U. S. resided in state 2 years preceding his election.
Duties: Keeps all state records, signs as witness all official acts of the governor, arranges for printing and distribution of state documents, member of 9 boards or commissions, including Board of Examiners.
Salary: $10,000 a year.

STATE AUDITOR

Term: 4 years.
Duties: Audits all claims against the state; keep financial accounts of the state; presents warranty to Treasury for payments of money authorized by the Legislature. He is directly over state fire marshal; supervises and inspects these departments; commissioner of Insurance ex-officio which gives him power of inspection over insurance companies; he is the investment commissioner ex-officio and has certain regulatory powers.
Salary: $10,000 a year.

STATE TREASURER

Term: 4 years.
Qualifications: 25 years old, citizen of U. S., resided in state 2 years, preceding his election.
Duties: Custodian of the funds of the state; receives and keeps all monies belonging to the state; reports to the governor and legislature on the condition of treasury. Exofficio member of 3 boards and commissions.
Salary: $10,000 a year.

ATTORNEY GENERAL

Term: 4 years.
Qualifications: 30 years old, citizen of the U. S. resided in state 2 years, preceding his election. Must have been admitted to practice in the Supreme Court of the State, and

Figure A.13. May 1964 *Campaign Facts* for Billings published by the League of Women Voters.

Mayor Sees Major Need for Sewers

Mayor Willard Fraser and Street Superintendent Al Brown toured a sewerless area in southwest Billings Tuesday afternoon and said later that residents are in desperate need.

The area was annexed several weeks ago but a suit protesting the annexation's legality has been filed.

City special improvement districts for storm sewers were dropped after the court action but need for sewers is great, Fraser said.

He saw children playing in seepage during his tour.

Metropolitan SID (they would include service to a few residents outside city limits) have been proposed. City Engineer Charles Liquin and project engineer Jack Mueller visited county commissioners to explain the setup Tuesday.

Fraser doesn't like the MSID proposal.

He hopes the law suit will be dropped so that the city can proceed with its districts.

Figure A.14. "Mayor Sees Major Need for Sewers" in the *Billings Gazette* (20 May 1964, p. 2).

Sewers Come Before Good Roads

By Sam Blythe
Gazette Staff Writer

All of the city will benefit from construction of Billings proposed storm sewer system even if some areas are not in the immediate construction zone, City Engineer Charles Liquin said Thursday.

Benefits will come in markedly reduced street maintenance costs, Liquin said.

Every city taxpayer helps pay the street repair bill and it's a big one.

Runoff breaks up streets and Liquin and his predecessor, Bill Purvis, have contended that no permanent street building program is possible here until the entire city is served by adequate storm sewers.

Some of the load carried by existing sewers would be diverted to the new system if voters approve the $4 million issue.

Liquin says this would reduce the chances of property damage in areas which have storm sewers.

Morrison-Maierle Co., consulting engineers, did a vast amount of research before drawing up final storm sewer plans.

Engineers decided the project would be most economically feasible if sewers were designed to handle a "two year storm."

This means that once every two years a storm equal or greater in intensity to the load capacity of the proposed sewer might be expected.

But Liquin says that by allowing a few minutes of ponding in the streets and surcharging of drain lines, the system can be used in excess of its capacity and handle larger storms without danger of flood.

Engineers also considered the percentage of rain falling on the drainage area which actually reaches the storm sewer and the size of area to be drained in determining the proposed design.

Drain construction where feasible follows existing open channels of the Arnold and city-county drains.

This eliminates the cost of right-of-way in unplatted areas, said some residents are complaining that they'd still be paying for sewers after bonds were paid off in 20 years.

Much confusion exists here, and Waldo says it's due to the mistaken notion that the charge for construction of the city's sewage disposal plant has never been taken off.

Voters approved the plant construction in 1945 and bonds were paid off about three years ago, Waldo says.

Residents haven't been paying construction costs since.

There is a charge for plant maintenance and operation, replacement and depreciation, etc., he says.

"We grant that a little maintenance on the storm sewer system would be needed," Waldo said.

But costs would be tiny in comparison to money needed for disposal plant operation and the city proposes to cover with its sanitary sewer charge.

Revenue bond issues must be covered by 150 per cent to obtain the lowest interest rate and sanitary sewer revenues would be used to guarantee storm sewer bonds, Waldo says.

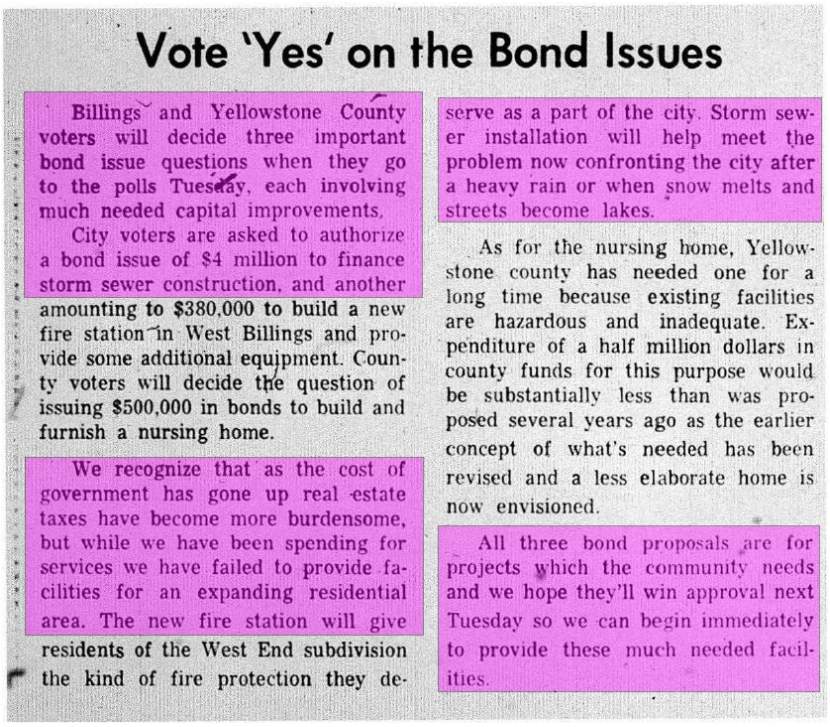
The lower interest rate tends to cut the cost to the guy who foots the bill—Billings water users, he says.

Taxpayers will vote on storm sewers at the June 2 election.

As a revenue bond issue, a simple majority of those voting is required to approve the measure.

Forty per cent of the registered voters must turn out and the majority of them must approve general obligation bond issues such as those for fire station relocation and a county nursing home.

Figure A.15. "Sewers Come Before Good Roads" by Sam Blythe in the *Billings Gazette* (22 May 1964, p. 12L).



Vote 'Yes' on the Bond Issues

Billings and Yellowstone County voters will decide three important bond issue questions when they go to the polls Tuesday, each involving much needed capital improvements.

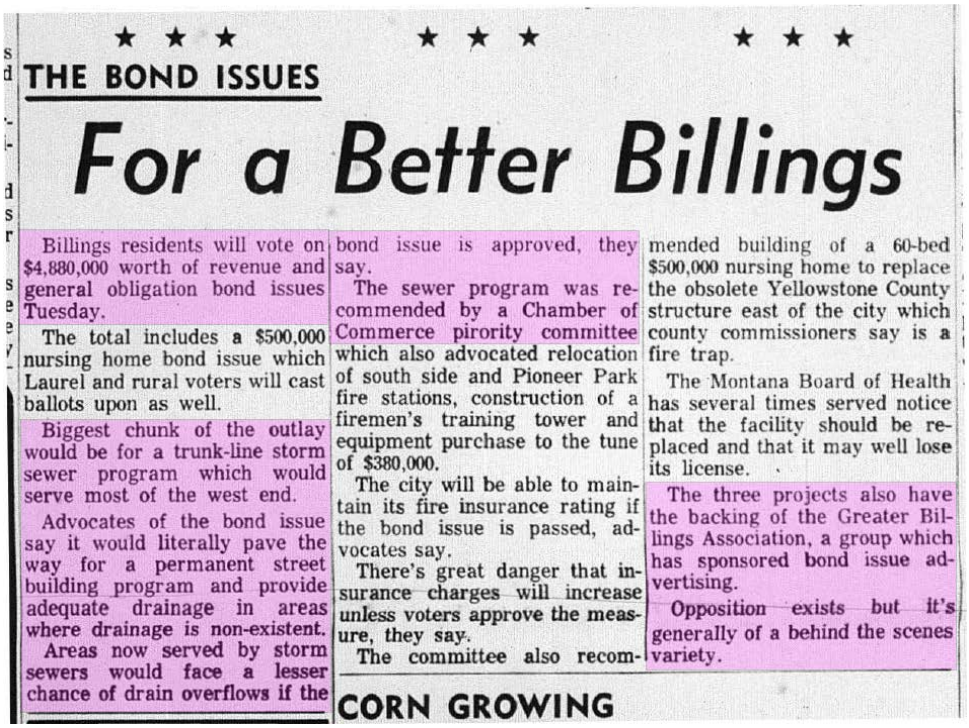
City voters are asked to authorize a bond issue of $4 million to finance storm sewer construction, and another amounting to $380,000 to build a new fire station in West Billings and provide some additional equipment. County voters will decide the question of issuing $500,000 in bonds to build and furnish a nursing home.

We recognize that as the cost of government has gone up real estate taxes have become more burdensome, but while we have been spending for services we have failed to provide facilities for an expanding residential area. The new fire station will give residents of the West End subdivision the kind of fire protection they deserve as a part of the city. Storm sewer installation will help meet the problem now confronting the city after a heavy rain or when snow melts and streets become lakes.

As for the nursing home, Yellowstone county has needed one for a long time because existing facilities are hazardous and inadequate. Expenditure of a half million dollars in county funds for this purpose would be substantially less than was proposed several years ago as the earlier concept of what's needed has been revised and a less elaborate home is now envisioned.

All three bond proposals are for projects which the community needs and we hope they'll win approval next Tuesday so we can begin immediately to provide these much needed facilities.

Figure A.16. "Vote 'Yes' on the Bond Issues"
in the *Billings Gazette* (29 May 1964, p. 4)



★ ★ ★ ★ ★ ★ ★ ★ ★

THE BOND ISSUES

For a Better Billings

Billings residents will vote on $4,880,000 worth of revenue and general obligation bond issues Tuesday.

The total includes a $500,000 nursing home bond issue which Laurel and rural voters will cast ballots upon as well.

Biggest chunk of the outlay would be for a trunk-line storm sewer program which would serve most of the west end.

Advocates of the bond issue say it would literally pave the way for a permanent street building program and provide adequate drainage in areas where drainage is non-existent.

Areas now served by storm sewers would face a lesser chance of drain overflows if the bond issue is approved, they say.

The sewer program was recommended by a Chamber of Commerce pirority committee which also advocated relocation of south side and Pioneer Park fire stations, construction of a firemen's training tower and equipment purchase to the tune of $380,000.

The city will be able to maintain its fire insurance rating if the bond issue is passed, advocates say.

There's great danger that insurance charges will increase unless voters approve the measure, they say.

The committee also recommended building of a 60-bed $500,000 nursing home to replace the obsolete Yellowstone County structure east of the city which county commissioners say is a fire trap.

The Montana Board of Health has several times served notice that the facility should be replaced and that it may well lose its license.

The three projects also have the backing of the Greater Billings Association, a group which has sponsored bond issue advertising.

Opposition exists but it's generally of a behind the scenes variety.

CORN GROWING

Figure A.17. "For a Better Billings"
in the *Billings Gazette* (31 May 1964, p. 17).

'GOOD DAY FOR BILLINGS'

Bond Issue Votes Please Officials

Bond issues for a county nursing home, city fire stations and storm sewers were approved Tuesday by margins ranging from landslide to razor-thin and voters' decisions were hailed by bond issue backers.

Mayor Willard Fraser thought it was a great day for Billings.

"I have been very pleased by the results," Fraser said Wednesday morning.

"We have given the people the leadership and they have responded," Fraser said.

"When people have facts they will respond. This is a turning point in the history of Billings."

Fraser attributed the successful conclusion to the bond issues to "time and plenty of effort on the part of a lot of people."

"It's a good day for Billings and I'm talking about all of the bond issues," Fraser said.

Only First Steps

Chamber of Commerce President Russ Hart had a statement which reminded people that the area eventually will require other improvements if it is to progress.

"We are very pleased that the voters have approved the three bond issues which are so important to future growth and progress," Hart said Wednesday.

"This is the first step in a long range capital improvement program which we must pursue if we are to assume our position as the outstanding city of the region."

Hart said the chamber thanked individuals and groups who "worked so diligently to bring the facts before the public and thus insure a favorable vote."

"We particularly want to thank The Billings Gazette for its outstanding efforts in its educational work," he said.

"I'm elated," said County Welfare Director John Laitinen when asked what he thought of the overwhelming support of the nursing home bond issue.

"This speaks well for the support that the public is giving older people and others who will need such a facility," Laitinen said.

"It's nice that the community responded so well."

Fire Chief Happy

Fire Chief Sidney Morse said he was "real pleased" Billings voters approved the $380,000 fire station relocation issue by a hefty margin.

"It's a vote of confidence for fire department activities," Morse said.

"I want to thank the Greater Billings Association and The Billings Gazette which did a real good job."

City Engineer Charles Liquin said he was highly pleased that the $4 million storm sewer issue made it.

The margin here was narrow *and Liquin thinks Friday's violent* rain storm might well have made the difference.

He knows of one man who had been campaigning against the project until Friday, Liquin said.

Then the man's basement was flooded and the city had a new ally.

Liquin says current plans call for first storm sewer bid openings in September.

Winter construction will involve the city-county drain.

Second Ward Alderman Henry Cox, chairman of the City Council's storm sewer committee said the successful bond issue vote might well be indicative of good things to come.

Voters apparently realize they have a responsibility for progress, Cox said.

Morse said he hoped for fire station construction to start by late fall.

It will take at least 90 days for architects to complete specifications, he said.

Yellowstone County commissioners thanked voters as well.

"We think the fact these bond issues carried so well is a manifestation of community spirit that has been lacking in the past," commissioners said.

"We're particularly happy about the vote on the county nursing home," they said.

Commissioners indicated they'd be deliberate about making nursing home plans so that controversy may be avoided.

Commissioners and Laitinen said they had talked with some people who wanted to vote for the $500,000 nursing home issue who overlooked it on voting machines.

A number of people simply couldn't find it, they said.

They believe the landslide "yes" vote would have been even higher if more people voted.

Some city and county employes said they had doubted if voters would respond to the premise that the area had needs that could only be solved by increased expenditures on the part of property owners.

But the response was there Tuesday.

And people said it felt good to live in Billings as a result.

SOVIETS TAKE OVER

ZANZIBAR (UPI) — Thirteen Soviet marine engineers and port officials are due to take over operations of Zanzibar's ports and two inter-island vessels. The Soviets will replace former British civil servants who were dismissed by the Zanzibar revolutionary regime.

NOBEL WINNER DIES

HELSINKI, Finland (AP) — Frans Eemil Sillanpaeae, Finnish winner of the 1939 Nobel Prize for literature, died Wednesday in Helsinki. He was 75.

Bond issues for a county nursing home, city fire stations and storm sewers were approved Tuesday by margins ranging from landslide to razor-thin and voters' decisions were hailed by bond issue backers.

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NOBEL WINNER DIES

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Figure A.18. "Bond Issue Votes Please Officials" in the *Billings Gazette* (04 Jun 1964, p. 16).

PLANT PAID OFF

Payments End When Sewer Bonds Retired

By Sam Blythe
Gazette Staff Writer

Billings residents won't be paying storm sewer construction costs after bonds are retired if voters approve the city's $4 million storm sewer bond issue Tuesday.

Water Department Manager Ed Waldo has said there's no truth to persistent rumors and he said it again with emphasis Thursday.

Some are confusing an operation and maintenance charge for the sewage disposal plant which is placed on water bills with construction costs, Waldo says.

Bonds on the 1945 disposal plant have been paid off for several years, he notes.

But it takes money to keep the plant going and Waldo says there's a big difference between plant operations and storm sewers.

Billings has grown since the sewage disposal plant was built and the Montana Board of Health has drastically heightened disposal requirements.

"If we didn't have that charge we would have to close our doors and discharge raw sewage into the river," Waldo says.

The sewage disposal plant has been constantly improved to match state requirements, he says.

Machinery wears out and a far greater amount of sewage is treated now than 10 years ago.

Waldo says a $333,200 contract for sewage plant modernization is nearly completed. It was largely paid for through charges on water bills.

Storm sewers are a far different matter, Waldo says.

There are no moveable parts to wear out and Waldo notes that the city has water mains and storm sewers which were installed 50 or so years ago which are as good as the day they went in.

Operation and maintenance costs for storm sewer are therefore negligible when compared to a going, expanding operation such as the sewage disposal plant.

And Waldo says what costs there are could be covered by the sanitary sewer charge now on the books.

A question has also been raised about the terminology of the bond issue's legal advertising.

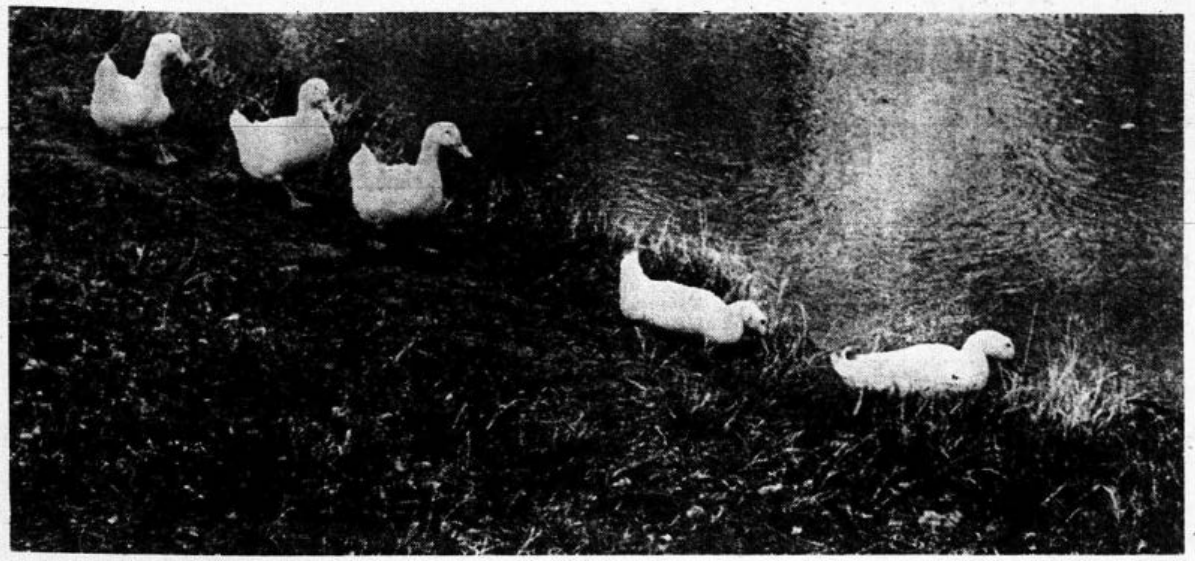
Some people are concerned about a line that reads that bond issue proceeds may be used ". . . to finance the reconstruction and extension of (the city's) municipal storm and sanitary sewer system including but not limited to the construction of sewers to dispose of storm water. . . ."

Waldo says bonding law requires that sanitary sewers be included in legal terminology.

Not one cent of the bond issue money will be used for sanitary sewer construction, Waldo says.

Breakin Appears To Be for Nothing

Figure A.19. "Payments End When Sewer Bonds Retired" by Sam Blythe in the *Billings Gazette* (29 May 1964, p. 3H).



—Gazette Photo by Dennis Calkin

JUST DUCKY—Most Billings residents have had enough rain to last for quite some time but not these ducks at the Yellowstone Boys Ranch. They took to the water like ducks and went swimming in the rain.—Gazette photo by Dennis Calkin

Rain Sends Creek Over Banks

The heavy rainstorm that saturated the Billings area this weekend caused Blue and Pryor creeks to overflow their banks.

There was some flooding in the low levels near the creeks, but farmers and rural residents, regarded the moisture as commonplace.

The area received 1.26 inches of moisture by 11 a.m. Monday.

Clarence Avery, Pryor Creek resident, said Monday that the rain didn't bother him even though his home is only 40 feet from the creek.

Avery said many of his fences were out from an earlier storm "so this storm couldn't do much more." The flooding this weekend wasn't as serious as the previous flood, Avery added.

George Appell, Blue Creek resident, said that the storm sent Blue Creek out of its banks, but that it had gone down by noon and didn't pose any threat.

Appell said that water was over some of the low roads leading to farms, but wasn't deep enough to hamper travel.

County Surveyor Harlan Lund reported three Blue Creek bridges under water as a result of Sunday's rain.

Lund said it was impossible to estimate damage to county bridges and culverts until the water goes down.

But he did not think damage would be particularly great.

City Crews Out

The late Sunday downpour gave city crews trouble, too.

"If I were optimistic, I'd call it routine," Street Superintendent A. L. Brown said Monday.

Brown called it a "solvable problem."

Crews were on the job soon after the rain began falling, he said.

"We had the usual problems of plugged sewers and storm drains and in most places we don't have the drains," Brown noted.

Chronic flood areas in the west end behaved typically:

They were wet and "lakes" abounded.

Crews were pumping from one place to another in attempts to alleviate the worst flooding, Brown said.

But the water itself will vanish only through evaporation, he noted.

Warmer Tuesday

Temperatures will rise to around 68 degrees Tuesday and the weather will be clear, weathermen said. Low Monday night will be around 40. Southwesterly winds will increase Tuesday.

Temperatures in Montana east of the Continental Divide will average a few degrees above the seasonal normal from Monday night to Saturday. Highs will be from 60 to 70 degrees; lows from 35-50. Higher valleys in the southwest will have lows of 25 to 30.

There may be scattered rain showers Wednesday and again Saturday with precipitation averaging from one to three tenths of an inch locally.

SOME UP . . . SOME DOWN

Rates on Automobile Insurance to Change

Chances are you won't be paying the same for your automobile insurance next year.

Some motorists will pay lower premiums, others will pay higher.

Montana Insurance Department has approved a rate overhaul, effective Jan. 1, 1965, submitted to all states by National Bureau of Casualty Underwriters and National Automobile Underwriters Association.

The new system, based upon a sample of 300,000 risks and supported by state bureau statistical experience,, divides risks into 52 driver categories, combined with five car-use categories. Bad risk categories will shoulder a larger burden and good risk categories will be rewarded.

Big changes are due for women drivers and young drivers.

Age and marital status will become factors in setting premiums for women, as well as men.

At present, all female drivers, regardless of age or marital status, pay rates the same as males 25 years and older.

Changes for Women

Under the new plan, the premium for woman driver, 30 to 64 years old, who lives alone and is the sole operator of the under 25 or to a car used for business.

Also at present the discount applies only when both cars are insured for collision. The new plan allows the discount regardless of the coverages for which each is insured.

Parents of youthful operators who attend school more than 100 miles from home will get a break. Rates will be reduced to reflect the fact that the youthful driver will not be driving the family car most of the school year.

WHERE

Figure A.20. "Rain Sends Creek Over Banks" in the *Billings Gazette* (12 May 1964, p. 3).

IN YELLOWSTONE COUNTY

Storm Leaves Road, Bridge Crews Busy

Yellowstone County employes charged with road and bridge maintenance had a ball this winter as the snow refused to come down.

They're making up for it now.

The weekend storm did more damage to bridges and roads although Assistant County Surveyor Harry Wolverton says the storm of a week ago was worse.

Rain washed away approaches to the Blue Creek Bridge early Monday and Wolverton says the bridge is closed to traffic.

He hopes it can be opened again by Tuesday but he's making no predictions.

Crews will drive sheet piling along edges of the river channel and back, Wolverton says.

Road crews reported 15 to 24 inches of snow at the south end of Duck Creek and in the Cormier Loop, Wolverton says.

Plow at Work

A plow was still digging the area out Monday. It was called into service Sunday.

Wolverton received several Monday morning calls from residents who reported culvert washouts.

City Engineer Charles Liquin said he's received some reports of flooding but that damage wasn't as widespread as it w a week ago.

It didn't rain as hard or long this time, Liquin said.

"Of course, this contin moisture does our streets good", he said Monday.

Rain undoes street patch w and many recently patch streets must get the same again.

The city will hold a $4 mill storm sewer bond issue el tion June 2 and Liquin says rain won't hurt that measur chances a bit.

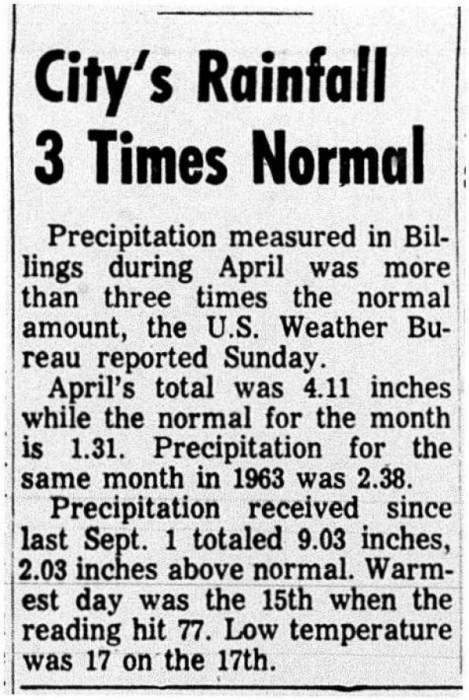
Billings-Red Lodge Route Bids Called

Bids for a Billings-Red Lod star route will be opened in Se tle May 29.

Bids are for a four-year c tract to haul mail from Billin to Red Lodge and back twi daily six days a week. The ro also services post offices Laurel, Silesia, Joliet, Boyd a Roberts.

Bid forms are available at t office of Assistant Postmas Richard J. Duncan in the B lings post office.

Figure A.21. "Storm Leaves Road, Bridge Crews Busy" in the *Billings Gazette* (05 May 1964, p. 3).



City's Rainfall 3 Times Normal

Precipitation measured in Billings during April was more than three times the normal amount, the U.S. Weather Bureau reported Sunday.

April's total was 4.11 inches while the normal for the month is 1.31. Precipitation for the same month in 1963 was 2.38.

Precipitation received since last Sept. 1 totaled 9.03 inches, 2.03 inches above normal. Warmest day was the 15th when the reading hit 77. Low temperature was 17 on the 17th.

Figure A.22. "City's Rainfall 3 Times Normal" in the *Billings Gazette* (11 May 1964, p. 2L).

Torrential Rains Hit Billings

Billings Street Department workers remained on 24 hour call Friday night after a 1.54-inch rain caused flooding in Billings' south side and sent a 100-foot waterfall cascading off the airport road Friday afternoon.

Damage resulting from the storm, which started at 2 p.m., was difficult to estimate, Al Brown, Billings street superintendent, said.

Although Friday's downpour dumped less moisture, it caused more damage than two other storms during the past two weeks, Brown said.

Flooding in the area south of State and Monroe Streets gave residents trouble. Flood waters backed into yards of Jackson Street residents, he said.

A woman who lives in the area said waters had run underneath the flooring of her home. However, Brown had received no reports of basement flooding.

The state highway department evidently diverted water along the rims, Brown said. A 100-foot waterfall ran off the airport road Friday afternoon. Water from drainage areas on top of the rims fell to streets below, but they had it stopped later.

"If it wasn't so muddy, it would have been beautiful," Brown said.

Weathermen at Logan field expected that the storm would end late Friday night or early Saturday.

Billings was high among state weather stations reporting precipitation, they said.

Bridges in the Billings area appeared to be in good shape. According to Brown, a worker

(Continued on Page 5, Col. 4.)

Billings

FROM PAGE 1

is checking bridges and ditch banks continuously.

"I gave all my men warning not to set their boots too far away," he said.

Water in the BBWA Canal was cut down and below normal Friday night, ditch officials said.

"I'm not worried," Ted Sikora, canal superintendent, said.

Memorial Day Mass, scheduled for Sunday morning at Holy Cross Cemetery, will be held 9:30 a.m. at St. Patrick's Catholic Church.

The services will be scheduled at 9:30, a half hour later than planned, to allow for delays caused by storm damaged streets and roads.

About three large patches of washed-out gravel and dirt across the airport road slowed traffic during the noon hour but by 2 p.m. highway crews had the four-lane highway clear.

The cave-in area on Poly Drive isn't in bad shape, Brown said. Most trouble there is cleaned up, but basements are flooding in other areas and some storm sewers are about to blow their lids. Every man on the street department was out working Friday afternoon.

Current storm sewers just can't take all this wet weather, Brown said, and the one at 24th Street and Sixth Avenue is in particularly bad shape.

Long-time Billings residents were reminded Friday of the historic flood of June 12, 1937, when, following several days of rain, a heavy thunderstorm and hail swept over the area west of the city.

The BBWA ditch that year broke near the Hilands Golf Club sending two feet of water across what was then northwest Billings. The ditch had been turned off but sheets of water pouring over the rims soon surpassed the ability of the ditch to carry it off.

The Weather Bureau said 2.7 inches of moisture fell during the 24-hour period immediately preceeding the 1937 ditch break.

The 1937 flood waters coursed down Billings streets to eventually discharge into the Yellowstone River. The water filled basements and invaded some first stories of buildings. When the water receded inches of mud and silt covered most of the city.

The 1937 storm was general in the area. Billings was cut off from the outside world except by telegraph. At least 300 Billings persons were forced from their homes by the flood waters. Damage was estimated in the millions.

The Red Lodge-Cooke City road will be open Saturday morning, Montana highway patrol officials said.

According to reports, Red Lodge residents basked Friday in sunshine.

Figure A.23. "Torrential Rains Hit Billings" in the *Billings Gazette* (30 May 1964, p. 1 and p. 5).

Leak in a Ditch Undermines Road

By Billye Proctor
Gazette Staff Writer

A 100-foot section of pavement in the 2400 block on Poly Drive caved in early Thursday after an irrigation ditch wall collapsed and water rushed through a self-made channel under the street.

Water had probably been seeping from the ditch on the north side of Poly and cutting a channel under the street for some time, Al Brown, city street superintendent, said.

When the ditch wall broke, water rushed through the channel.

None Injured

No one was injured and only slight damage to the home of Mr. and Mrs. R. R. Thomas, 2214 Meadowood St., was reported. The Thomases are vacationing.

Water spread onto the construction site of a new nursing home, Brown said, and into the basement of one home.

Street crews were cleaning out the basement Thursday morning.

The cave-in probably occurred about 4 a.m., Brown said. He expected street crews to have temporary repair measures in the barricaded area completed by Thursday night.

Crews, busy since 4:30 a.m., had the situation under control by 10:30 a.m.

"It appeared we might lose a water main at first," Brown said, "But we aren't going to, and everything's under control."

It's a stroke of luck that no one was injured, Brown thinks.

"A large section of pavement caved in. If a car had come along just at the right time, it would have gone in five or six feet deep. Or someone could have fallen in," he said.

Take It in Stride

Children going to Poly Drive School, just west of the cave-in area, were unconcerned.

"Most of them hardly noticed the men working," Mrs. Muriel Fischer, School District 2 primary division consultant, said. "They aren't at all excited."

"It's really an uneventful day far as we're concerned," she said.

The washout was being backfilled Thursday, Brown said. Repaving can't be done until the area is settled and dry.

Storm sewers would have prevented what damage occurred, Brown said.

"If we'd had a storm sewer, we could have diverted the water into it," he said. "The nursing home grounds wouldn't have been flooded and we could have kept mud off the street."

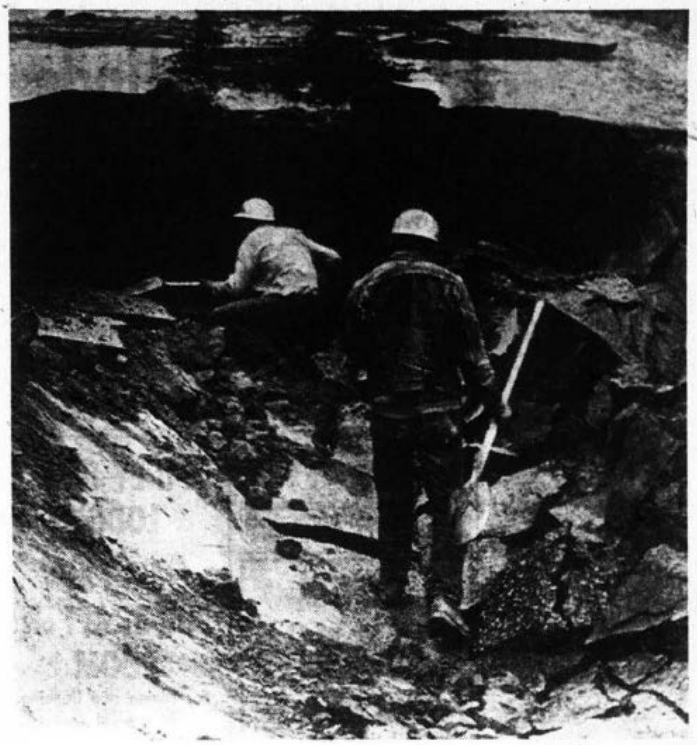
Such an incident poses a good argument for storm sewers, Mrs. Fischer said.

"I just drove to the administration building. Several different places look like they're about to give away," she said.

Ann Arnold Named Council Secretary

Miss Ann Arnold, Eastern Montana College faculty member, has been appointed secretary of the University Faculty Council.

Dr. James Platt, council president, also of EMC, said the Billings unit of the council elected Dr. Harold McCleave of Eastern as local chairman.



BIG HOLE—Roy Frickey, left, and Sam Reiter begin repairs on a 100-foot section of Poly Drive which collapsed early Thursday morning after an irrigation ditch bank collapsed and water rushed under the street. No one was injured and water seeped into the basement of only one home.

LIBRARY BOARD URGES

Books for Rural Kids

Billings' Library Board has proposed that library services be expanded so that books may be taken via bookmobile to rural schools.

It's also proposed that out-of-city residents be able to borrow books from the main or Evergreen branch library free of charge.

25,000 county residents live outside Billings and that only Laurel and Worden have libraries.

The library would need to increase its book supply by 2,500 if the program is adopted and at an average $4 per copy the price tag would be $10,000.

A bookmobile driver would be upkeep on the bookmobile itself at $2,500.

County commissioners said they'd study the proposal closely.

Commissioners first want to check out libraries in the involved schools and determine their requirements.

Figure A.24. "Leak in a Ditch Undermines Road"
by Billye Proctor in the *Billings Gazette* (29 May 1964, p. 7).

The Billings Gazette Saturday, May 30, 1964 Morning Edition 2

Water pouring over the rims swept in a sheet over Airport Road, left, Friday, and turned Rimrock Road into mud at Virginia Lane.

City Streets—Or Puddles?

By Sam Blythe
Gazette Staff Writer

More than an inch of rain fell on Billings Friday. It brought mixed emotions to backers of the city's $4 million storm sewer bond issue.

They sympathized with residents who suffered damage to basements and other costly inconveniences brought about by the heavy rain.

But the storm, they said, dramatically and graphically showed how great the need is here for adequate storm drainage.

There was general street flooding reported throughout west end areas without storm sewer protection.

U.S. Weather Bureau forecasters at Logan Field say the worst is over and that Sunday might well be a nice day.

But rainfall for May far exceeds the month's precipitation average and it's been the same story all spring.

Mayor Willard Fraser, who is presumably enjoying better weather in New York City, had a storm sewer release prepared for Friday and the mayor's timing turned out good.

Fraser predicts storm sewer bond issue success and a similar fate for fire station relocation and nursing home measures.

"Because of . . . pride in our past and faith in our future the people of Billings are going to go to the polls on Tuesday and vote positively and support the bond issues submitted to them for approval," the mayor said.

"This is the act and obligation of a responsible citizenery and a duty the people of Billings have no mind to shirk," his statement said.

Water Department Manager Ed Waldo—who won't be in town election day and has already voted for the measures—thinks the rain will help.

Waldo and other officials are concerned, however, that an apparent lack of interest in the primary election might mean a scanty turnout at the polls.

Overconfidence can hurt, too.

Fire Chief Sidney Morse notes that many people have told him they think the fire station bond issue is a cinch.

Morse says he's counting on nothing until the votes are tabulated.

More than 30 persons dripped water on city hall floors Friday morning as they cast absentee ballots on storm sewer and fire station projects.

Hundreds more have voted on the nursing home bond issue across the street in the Yellowstone County courthouse when they voted for primary election candidates by absentee voter ballot.

The nursing home issue will be on voting machines Tuesday and backers of the project hope voters won't miss it.

It's located in the upper left corner of every machine.

Engineers, City To Meet on Base

U.S. Corps of Engineers officials are expected to meet with Airport Commission members next week to plan for the Air Force's $2.3 million dispersal base at Logan Field.

Assistant Airport Manager Robert Scarborough said it should take place by mid-week.

The corps wants a right of entry permit signed soon, Scarborough says.

But land negotiations must probably be concluded first.

Scarborough says the Air Force has sent out bid specifications on four sections of the project.

Bids will be opened in late June, Scarborough says.

Awards Presented To Hardin Students

HARDIN — The four Hardin High school seniors who received four year "A" average

Figure A.25. "City Streets–Or Puddles?"
by Sam Blythe in the *Billings Gazette* (30 May 1964, p. 2).

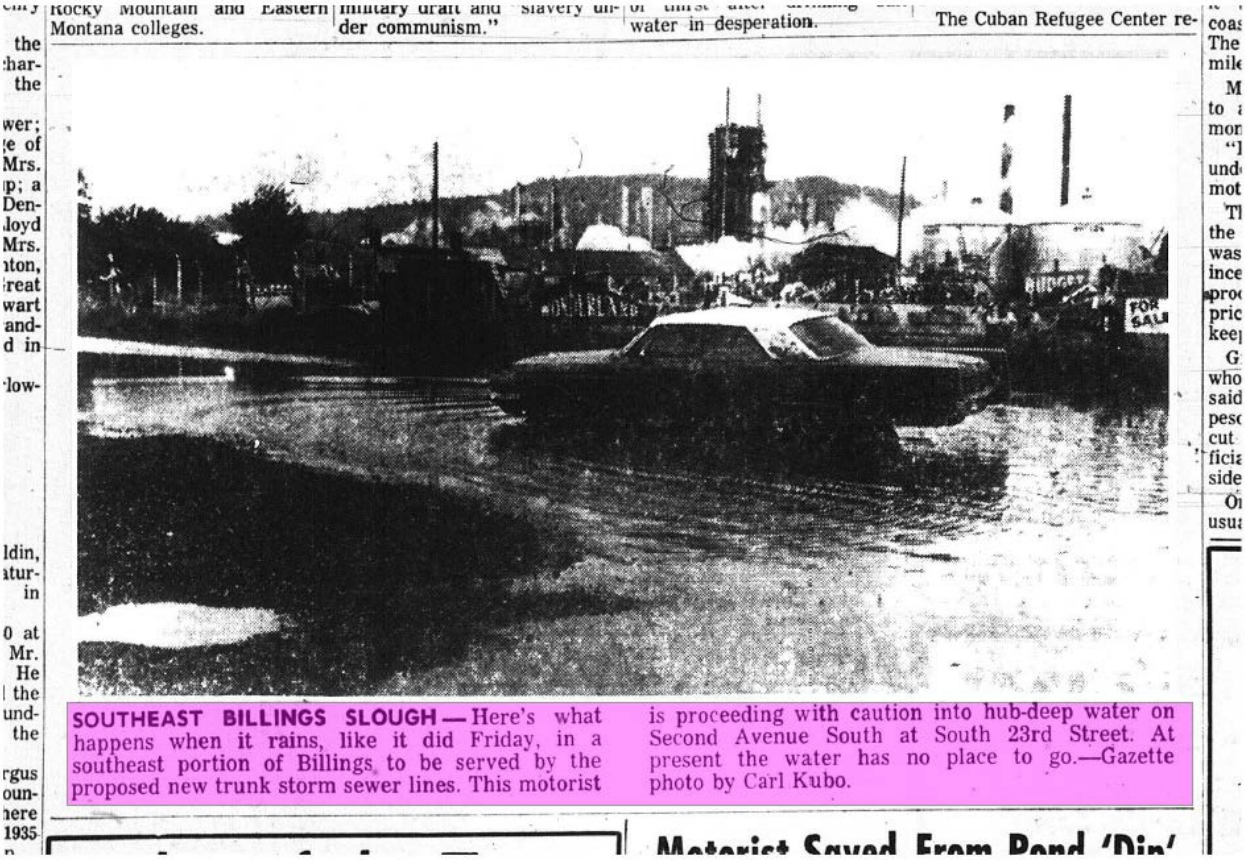


Figure A.26. "SOUTHEAST BILLINGS SLOUGH"
caption on photo by Carl Kubo in the *Billings Gazette* (01 June 1964, p. 8L).

IN SOUTHWEST CITY AREA

Fraser's Deciding Vote Stalls Sanitary Sewers

By Sam Blythe
Gazette Staff Writer

Residents in a recently annexed southwest Billings area which is involved in a annexation law suit may have to wait awhile before they are able to obtain some much desired sanitary sewers.

Mayor Willard Fraser's vote broke a 5-5 standoff and sent all bids on two sanitary sewer special improvement districts back to their mailers unopened.

It's conceivable that no new districts will be formed until a law suit questioning the legality of a large southwest Billings area's annexation is resolved.

First Ward Alderman Howard Hultgren led those who did not want to open bids.

Hultgren said city attorney James Thompson and Stuart Conner, Thompson's immediate predecessor, worried that the city might get stuck for district costs if the courts eventually find against the city in the annexation suit.

Fifth Ward Alderman Duane Smith took the opposite viewpoint.

Opposite Viewpoint

"We shouldn't turn the district down," Smith said.

Residents in the area were officially inside the city and many of them favored annexation so they could receive sanitary sewer service.

"We have a moral obligation to these people to provide them with sewers," Smith said.

Fourth Ward Alderman William Jull agreed saying since sewer requesting residents were inside the city, they should receive all its advantages.

First Ward Alderman James Patten, an attorney himself, said it wasn't correct to assume that residents were actually inside the city.

The courts will decide that score Patten said.

He said the city and a special improvement district were separate legal entities and that the city could not be held financially responsible for sewer costs in any event.

The balloting saw aldermen Charles Glenn, A. G. Wendte, Harry Bieddinger, Henry Cox and Hultgren vote to return SID bids unopened.

Voting to open them were council members Joe Leone, Wayne Chestnut, Smith, Jull and Patten.

Fraser then broke it and bids will be going back Tuesday.

Meeting Stalls

The meeting came to a virtual standstill as an elderly woman bitterly and at length protested the city's attempted condemnation of her property on South Broadway.

She spoke in a heavy-accented and emotion-charged voice and many council members found it difficult to understand her.

Aldermen held off any action for a week until they can make their own investigation.

"I'd like a committee to go along with me" Building Inspector Ted Duke said of the matter.

"I don't like to go down there alone."

Duke will get his committee.

Barricade Complaints

Jull told the mayor and other council members that he's received some complaints about recently set up barricades on North 28th Street which blocked traffic for the duration of a boat show.

The council was not advised that the barricades were to go up, he said, and never took action on the question.

Jull, wondering where council authority began and ended, told Fraser that the council had spent two weeks on a "weighty" problem dealing with a banner to be strung across a downtown street.

Fraser said the boat show was traditional and that the request for barricades came in too late for council action.

Jull replied that anything requiring a quick decision could come in after a council meeting. He asked how these problems should be handled.

Jull received support from Hultgren but Chestnut said the mayor should be commended for his action in making a decision on his own.

There are many matters which are not necessarily legislative in nature which the council finds itself contending with, Chestnut said.

In other action the council:

Awarded a $5,010.05 contract for a sanitary sewer contract in Partington Park Subdivision to Holm-Sutherland Co. of Billings.

Approved fire hydrant installation at 16th Street West and Avenue E and at Rimrock Road locations.

Approved a Logan Field contract between the city and H. H. Hendrickson & Sons of Billings.

Discontinued an alley between 5th and 6th Avenues South and South Broadway.

Sent a request for curb cuts at St. Vincent Hospital to committee.

Approved a resolution formally calling for a $380,000 fire station relocation bond issue.

Allocated retirement funds for former police lieutenant Clyde Montee.

Billings High School students, led by Billings Senior's Gary Day who served as mayor, took over once the regular meeting broke up.

The kids discussed such items as walk and wait signals and ditch culverts.

Thieves Staging Arbor Day?

A green thumb and sticky fingers were indicated in a theft reported by police Monday.

An arborvitae and six juniper bushes were stolen from the west side of the Buttrey Shopping Center.

The tree and bushes, planted only about 10 days ago, were taken up very neatly and will probably be transplanted somewhere, a store representative said.

F. O. Butler, 425 18th St. W., told police two coin purses and about $25 in a bank were taken from his home. Entry was gained through an unlocked garage door. Police said the burglar went through the top of the garage into the attic of the home.

Dan Lanworthy, 537 Alderson Ave., reported theft of two hubcaps, and Henry Adler, 518 S. 27th St., told police two young men and a girl tried to rob him.

Vandals shot a hole in a window of the Elmer Ralie home, 603 N. 26th St., police reported. Mrs. Ralie told police she thought they were trying to hit her cat, which was sitting just outside the window.

Vandals Enter Automobile Wash

Someone apparently was against clean cars or dissatisfied with a car wash job.

Vandals entered the Supersonic Car Wash Inc. Sunday night, Joe Greco, manager told police.

They switched off all electricity turned on two main gas pipes, allowing gas inside the building, and smashed several quart bottles against the outside of the building.

Nothing was reported missing, police said.

Security Bank

TV GUIDE

TUESDAY, MAY 5

—KOOK-TV Ch. 2—

6:55 Daily Word
7:00 Sunrise Semester
7:30 Captain Kangaroo
8:00 Mike Wallace
8:30 I Love Lucy
9:00 The Real McCoys
9:30 Pete and Gladys
10:00 Love of Life
10:25 CBS News
10:30 Tennessee Ernie Ford
11:00 Father Knows Best
11:30 As the World Turns
12:00 Password
12:30 House Party
1:00 General Hospital
1:30 Edge of Night
Watch for Security
T.N.T. Service
2:00 Secret Storm
2:30 The Price Is Right
3:00 Search for Tomorrow
3:15 Guiding Light
3:30 A Visit With Axe
4:00 Trailmaster
5:00 Mattles Funnies With Beanie and Cecil
5:30 Woody Woodpecker
6:00 The Flintstones
6:30 Four Star Final News
7:00 My Three Sons

By Sam Blythe
Gazette Staff Writer

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Fraser said the boat show

Figure A.27. "Fraser's Deciding Vote Stalls Sanitary Sewers" by Sam Blythe in the *Billings Gazette* (05 May 1964, p. 2L).

Commissioners Approve MSID

County Commissioners Wednesday passed a resolution of intention to create what many southwest Billings residents say is a direly need Metropolitan Special Improvement District for storm sewers.

Most of the area involved has been recently annexed by the city and some residents are protesting the annexation's legality.

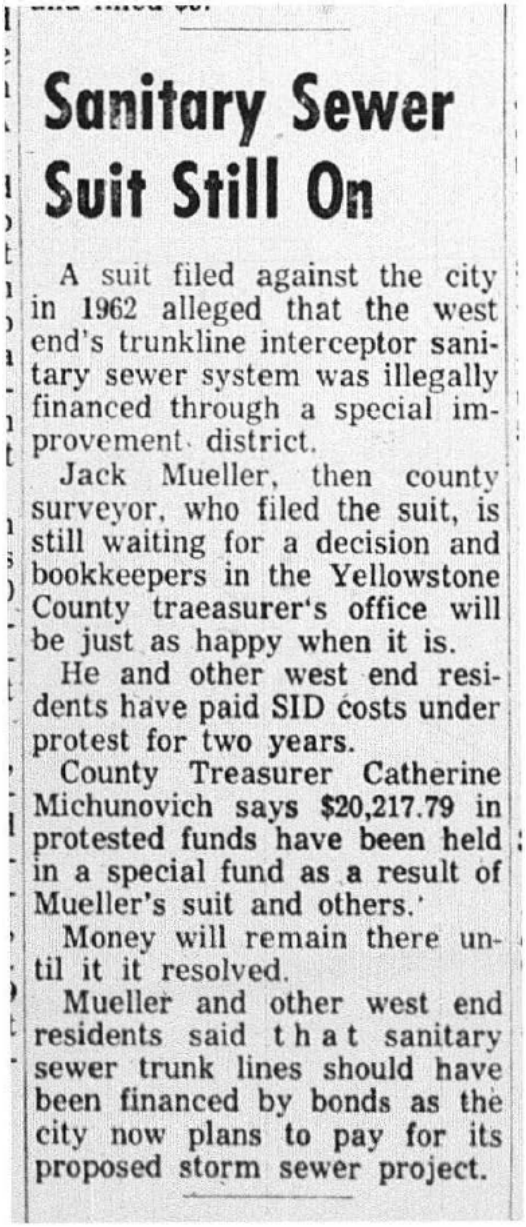
The city dropped plans for sanitary sewer special improvement districts in the annexed area after the City Attorney Stuart Conner warned that the city might wind up paying SID construction costs if the annexation were declared illegal.

The metropolitan district was suggested as a means of providing residents with sanitary sewers now instead of holding off until the suit is resolved.

City Council members are expected to pass a similar resolution at Monday's council meeting.

Sage Engineers is handling the project.

Figure A.28. "Commissioners Approve MSID" in the *Billings Gazette* (22 May 1964, p. 17L).



Sanitary Sewer Suit Still On

A suit filed against the city in 1962 alleged that the west end's trunkline interceptor sanitary sewer system was illegally financed through a special improvement district.

Jack Mueller, then county surveyor, who filed the suit, is still waiting for a decision and bookkeepers in the Yellowstone County traeasurer's office will be just as happy when it is.

He and other west end residents have paid SID costs under protest for two years.

County Treasurer Catherine Michunovich says $20,217.79 in protested funds have been held in a special fund as a result of Mueller's suit and others.

Money will remain there until it it resolved.

Mueller and other west end residents said that sanitary sewer trunk lines should have been financed by bonds as the city now plans to pay for its proposed storm sewer project.

Figure A.29. "Sanitary Sewer Suit Still On" in the *Billings Gazette* (29 May 1964, p. 6H).

'PROBABLY AUTHENTIC'

Group May Protest Charges For $4 Million Bond Issue

A report that the Yellowstone County Taxpayers Association plans to protest charges for the city's $4 million storm sewer bond issue was termed "probably authentic" by an association member Wednesday.

Member Peter Yegen Jr., said association members were vitally concerned about sewer charges and that circulating petitions protesting its financing was likely.

But neither City Engineer Charles Liquin nor Water Department Manager Ed Waldo knew of any formal drive to block sewer construction, they said Wednesday.

"As far as I know, the city did nothing illegal on the storm sewers," Liquin said.

Waldo didn't see how petitions could halt construction since voters have already approved the measure.

He granted, however, that storm sewer foes could go to court.

One man guessed that petitions might be directed to the Montana Public Service Commission and protest the charges as part of a city water bill.

Almost as many people voted against sewers as for them.

Mayor Willard Fraser said Wednesday the sewers were the first step the city had made in street improvement since the early 1920s.

"It could have cost less many years ago but nothing was done," the mayor said.

"So we have to pay for good streets."

The city contends that a permanent street building program isn't feasible in much of the city until storm sewers are installed.

Figure A.30. "Group May Protest Charges For $4 Million Bond Issue" in the *Billings Gazette* (08 Oct 1964, p. 11).

A.3 ADDITIONAL EVIDENCE CODING RESULTS

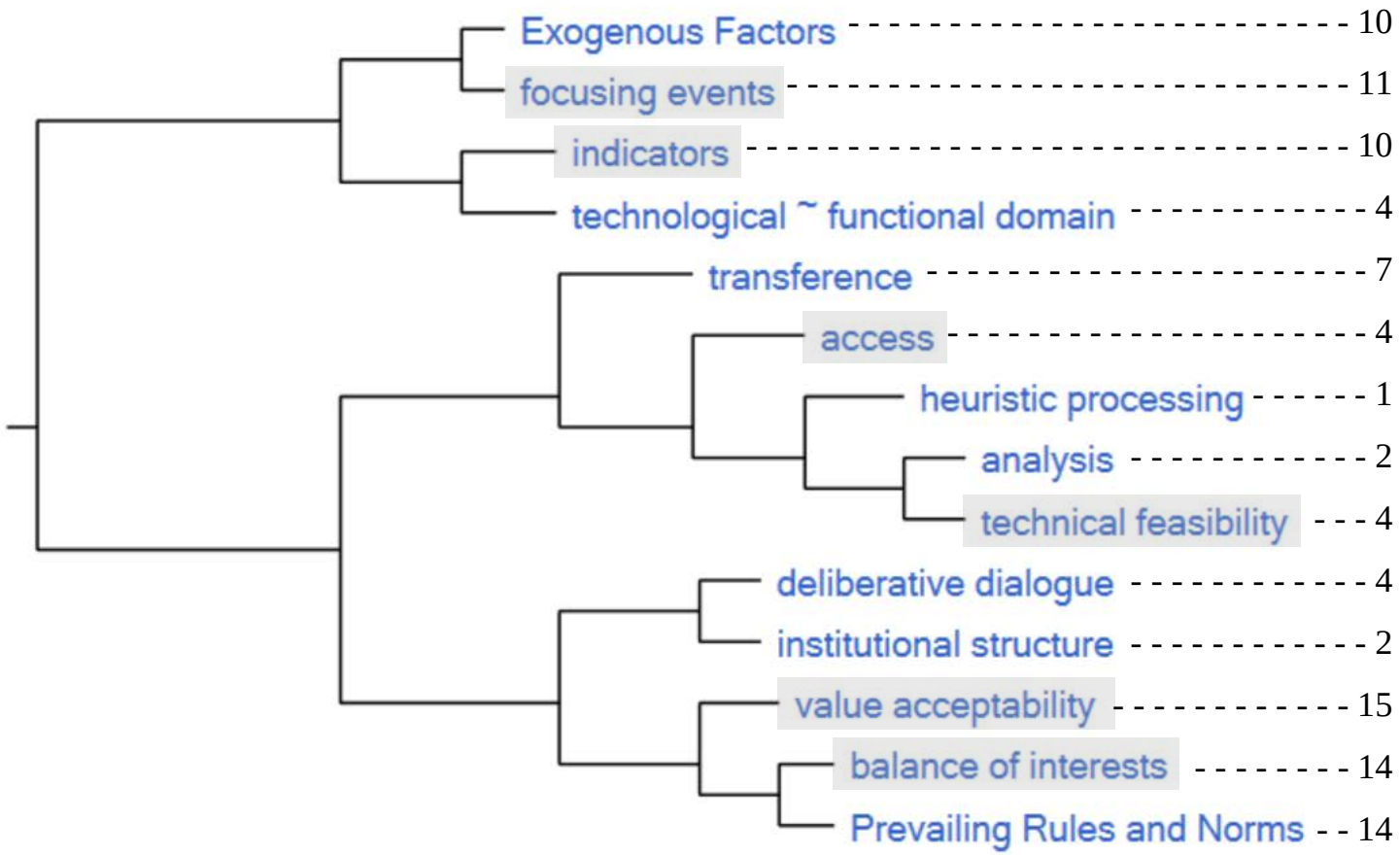


Figure A.31. Dendrogram of coded concepts for the emergence case study. Concepts clustered by Pearson correlation coefficient based on number of times each concept was coded to each piece of evidence. Grey highlighting indicates concepts from the collective learning framework. Numbers indicate the number of times each concept was coded across all evidence.

APPENDIX B

DIFFUSION

B.1 DATA FOUNDATION

I created the foundation of my diffusion dataset by merging together three TIGER/Line shapefiles from the United States Census Bureau: (1) county subdivisions, (2) places, and (3) counties.[133,134] The Census Bureau distinguishes between places and county subdivisions in that places are generally population-based areas including boroughs, cities, and villages, whereas county subdivisions geographically defined areas, primarily townships (United States Census Bureau, 2013). From this merged shapefile, I selected only those records indicated as being legally valid.[135] Next, I deleted certain redundant records associated with consolidated city-county governments, such as the City of Indianapolis / Marion County in Indiana.[136]

[133] All three shapefiles were 2014 edition.

[134] I also merged in Washington, D.C. from the state shapefile.

[135] I based my definition of legally valid records on two data fields defined by the Census Bureau: legal/statistical area description (LSAD) codes; and functional status (funcstat) codes.

[136] For each pair of records associated with consolidated city-county governments, I deleted the less geographically expansive record, generally representing the city.

B.2 DATA ATTRIBUTES

The attributes I added to the merged and pruned Census Bureau shapefiles were derived from six other national datasets (Table B.1): (1) the National Land Cover Database (NLCD); (2) the urbanized area shapefiles from the Census Bureau; (3) various demographic, housing stock, and income data from the Census Bureau 2016 American Community Survey and 2010 Census; (4) a dataset on regulated MS4s from USEPA;[137] (5) a publicly available dataset of permitted CSOs; and (6) the 2017 Western Kentucky University Stormwater Utility Survey (Campbell et al., 2017).

From the NLCD, I used GIS software to calculate the percentage of each land use recorded in the dataset for each polygon in the foundation shapefile. I calculated these percent land use attributes based on the 2011 and 1992 editions of the NLCD. I also calculated the change in percent land use between 2011 and 1992 for each polygon in the foundation shapefile.

Similarly, for each polygon in the foundation shapefile, I used the urbanized area shapefiles from the Census Bureau – both 2000 and 2010 editions – to calculate the percent urbanized area for each polygon in the foundation dataset.

Data from the 2010 Census and the 2016 American Community Survey were easily joined with the foundation shapefile based on a common unique identifier field (GEOID). An important consideration with the population data has to do with overlapping jurisdictions. For example, the population data indicate a population of 34,200 for Silver Bow County, Montana. There is only one legally recognized, general-purpose subcounty government in Silver Bow County: the Town of Walkerville, which has a population of 675. Because the jurisdiction of Silver Bow County overlaps the Town of Walkerville, the 675 people in Walkerville are counted in the population data for the town and in the population data for the county. This "double counting" of population is fairly minimal in places like Silver Bow County where the population in overlapped jurisdictions represents a very small proportion of the total population (e.g., in many western and southern states where large proportions of land and population are unincorporated by subcounty governments). Population double counting becomes more pronounced in areas where most or all land and population are incorporated by subcounty

[137] Holly Galavotti, USEPA Office of Wastewater Management

governments. For instance, the population data indicate the population of Allegheny County, Pennsylvania as 1,223,348. However, nearly all of the land and population in Allegheny County is incorporated in subcounty governments, and the population of Allegheny County is simply the sum of the population of the 130 subcounty governments in the county. As a result, the population data count the people living in Allegheny County twice: once as residents of their respective subcounty jurisdictions and once as residents of the county. This double counting also applies to the land area data: summing all the land area in my diffusion dataset results in a sum greater than the total land area of the contiguous United States due to jurisdictional overlap in many regions. Because some county and special-district governments enact stormwater fees involving all or some of the subcounty governments they encompass, this "double counting" of population and land area associated with jurisdictional overlap are not necessarily problematic for purposes of this research. That said, issues of jurisdictional overlap do merit awareness and discussion as pertains to my research and other research on stormwater fees. As discussed further below in relation to special-district stormwater fees, future research can build on my research by further assessing and accounting for aspects of jurisdictional overlap related to stormwater fees. The median household income data from the 2016 American Community Survey and the 2010 Census contained a substantial number of missing values (i.e., more than 5,000). Due to the relatively large proportion of missing values, I did not use the median household income data in the regression analyses.

I joined the regulated MS4 and permitted CSO datasets to the records in the foundation dataset by matching state, name, and government type (e.g., city, county, village). Due to some ambiguities in the regulated MS4 and permitted CSO data (e.g., two distinct records with the same state, name, and government type), I reviewed several dozen records individually to make sure records were appropriately matched to the foundation dataset. While the vast majority of records in the regulated MS4 database could be unambigously matched with records in the foundation shapefile, 265 records in the regulated MS4 data could not be matched due to ambiguity. For example, there were multiple records in the regulated MS4 data for Washington Township in Pennsylvania. It was impossible to disambiguate these records and accurately match them with the multiple Washington Township, Pennsylvania records in the foundation shapefile without further information (e.g., knowing the county for each record in the regulated MS4 data). The ambigous records in the regulated MS4 data were mostly townships (220

townships) in seven states – mostly in Pennsylvania (123 townships) and Ohio (60 townships) – along with towns (20 towns) in five states – mostly in Wisconsin (13 towns). In instances where CSO permits are held by special-purpose districts, I associated the permitted CSO data with the general-purpose local government where the CSO permittee was predominately located. For instance, I associated the ALCOSAN CSO permit data with the City of Pittsburgh. This approach to the permitted CSO data provdies a reasonable indication of which general-purpose local governments are served by combined sewer systems, which was my primary interest in incorporating the permitted CSO data. However, future research in stormwater fee diffusion may want to consider alternative ways of incorporating CSO data.

I used a similar process for matching records from the 2017 Western Kentucky University Stormwater Utiltiy Survey (Campbell et al., 2017) as I did for the regulated MS4 and permitted CSO data: matching unambigous records based on state and name, then reviewing and resolving any remaining ambigous records individually. Some records in the 2017 Western Kentucky Univesity Stormwater Utility Survey (Campbell et al., 2017) represented special-district governments, which I address in greater detail in the following section.

Table B.1. Variables used in diffusion regression analyses.

category	name	description/formula	units	source/basis (year)	notes
jurisdiction geometry	land area		square miles	Census Tiger (2014) NLCD (2011)	polygons from Census Tiger (2014) land area (excluding water) from NLCD (2011)
	perimeter		miles	Census Tiger (2014)	
	border complexity	perimeter / (2 * (π * area)$^{0.5}$)	dimensionless	Census Tiger (2014)	see below for further details
regulatory status	# CSO discharges	number of permitted CSO discharges		USEPA (2018)	implemented as a binary variable for state-specific enactment sequence regression
	MS4 phase	MS4 regulation phase		USEPA (2018)	
demographics	population	total population	human beings	Census (2010, 2016)	
	population density	total population divided by land area	human beings per square mile	Census (2010, 2016) NLCD (2011)	
	median age		years	Census (2010, 2016)	
	% white	percent of population identifying racially as white		Census (2010, 2016)	
	% black	percent of population identifying racially as black		Census (2010, 2016)	
	% not white and not black				
	racial diversity	standard deviation across all % racial identities		Census (2010, 2016)	white, black, native, asian, island, two or more, latino
land use	% developed	percent developed land use		NLCD (2011, 1992)	includes low, medium, and high intensity developed use, but not open space developed use
	% forest			NLCD (2011, 1992)	includes deciduous, coniferous, and mixed use
	% deciduous			NLCD (2011, 1992)	subset of % forest
	% agriculture			NLCD (2011, 1992)	
	% wetland			NLCD (2011, 1992)	
	land use diversity	standard deviation across all % land uses	dimensionless	NLCD (2011, 1992)	
	change in % [developed, forested, agricultural] land use (2011-1992)	(% [developed, forested, agricultural] land use in 2011) - (% [developed, forested, agricultural] land use in 1992)		NLCD (2011, 1992)	
demographics and land use	% urbanized	the Census Bureau defines geographic areas as "urbanized" based on population density and land use	proportion	Census (2010, 2000)	I evaluated urbanized area based on the delineations from the 2010 census and 2000 census, but I only used the 2010 delineations in the analyses presented here.

category		name	description/formula	units	source/basis (year)	notes
housing	tenancy	housing units % owner-occupied	percent of occupied housing units occupied by owners (vs. renters)		Census (2010, 2016)	
		housing units tenancy diversity	standard deviation of (housing units % owner-occupied) and (housing units % renter-occupied)		Census (2010, 2016)	
	vintage	housing units % built before 1950			Census (2010, 2016)	
		housing units % built after 1999			Census (2010, 2016)	
		housing units newness index	difference between (housing units % built after 1999) and (housing units % built before 1950)		Census (2010, 2016)	
		housing unit vintage diversity	standard deviation of (housing units % built after 1999) and (housing units % built before 1950)		Census (2010, 2016)	
	value	housing units median value	median value of owner-occupied housing units	dollars	Census (2010, 2016)	
		housing units % valued under/over [$]	percent of owner-occupied housing units valued over or under some amount		Census (2010, 2016)	also implemented as differences (e.g., % valued over $300,000 minus % valued under $150,000)
income		median household income		dollars	Census (2016)	
stormwater fee		enactment year			Campbell et al. (2017)	
state		state			Census Tiger (2014)	
local government type		local government type			Census Tiger (2014)	

All geometry and % land use calculations executed under an Albers equal-area, conic projection for the contiguous United States (EPSG 102003). NLDC refers to the National Land Cover Dataset. Census (2016) records refer to 5-year esimates from the 2016 American Community Survey. Census (2010, 2016) records indicate a combination of data from the 2010 decennial census and 5-year estimates from the 2016 American Community Survey. All % metrics implemented as proportions (i.e., 50.0% = 0.500).

B.2.1 Jurisdictional considerations

The geographic jurisdictions of some stormwater fees recorded by Campbell et al. (2017) – especially some of the special-district fees – do not align exactly with the boundaries of general-purpose local government units. For example, in the southeastern suburbs of Denver, Colorado, the jurisdiction of the Southeast Metro Stormwater Authority includes all of the City of Centennial, plus the developed areas of unincorporated Arapahoe County, and small portions of unincorporated Douglas County (Figure B.1). For local governments where only part of the jurisdiction was assessed a stormwater fee, I considered the entire jurisdiction as having a stormwater fee rather than breaking up these jurisdictions into separate records corresponding to which parts of the jurisdiction are subject to a stormwater fee. For example, since parts of unincorporated Arapahoe and Douglas counties in Colorado are subject to the Southeast Metro Stormwater Authority stormwater fee, in my diffusion dataset, Arapahoe and Douglas counties are considered to have stormwater fees.

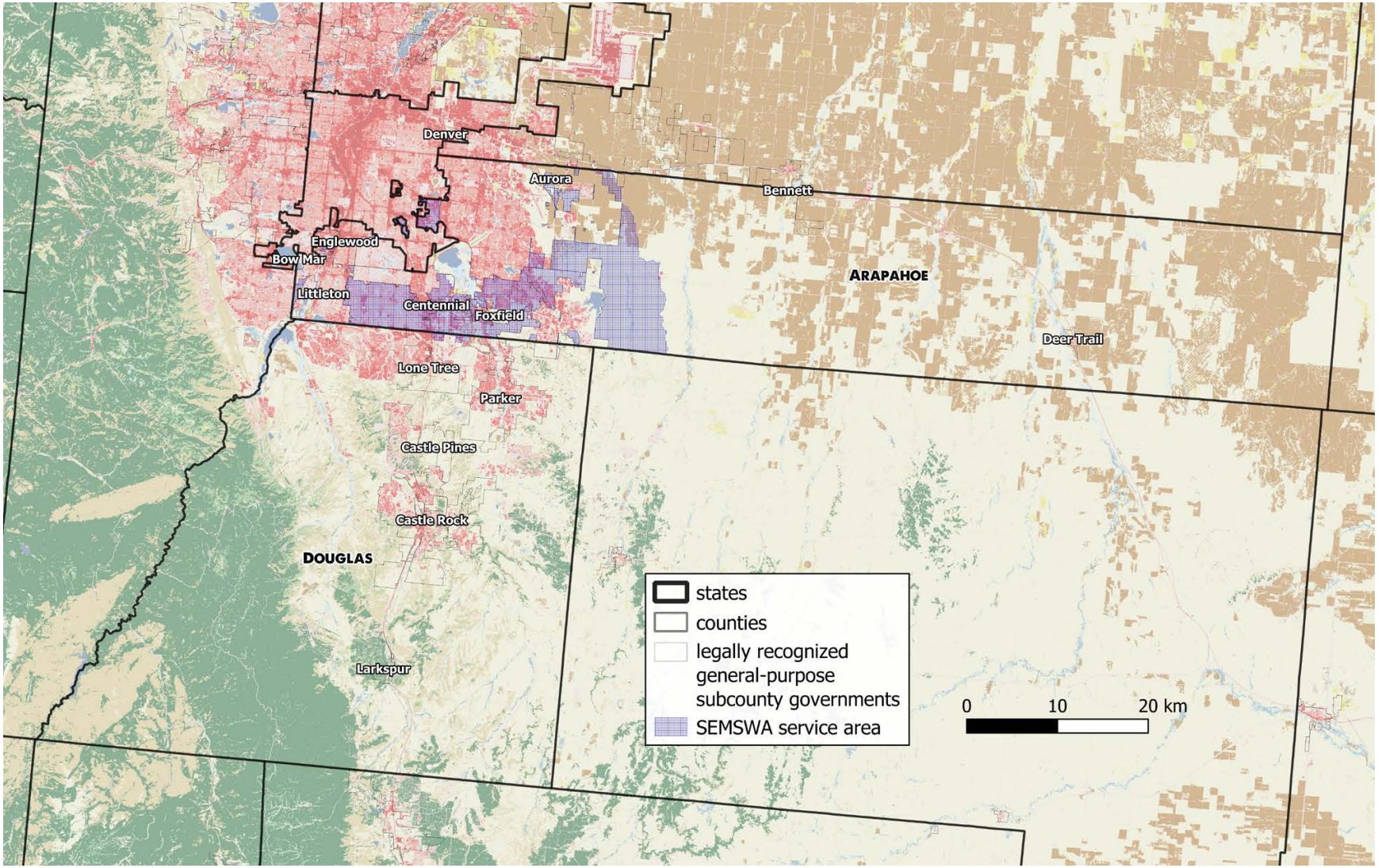


Figure B.1. Service area of the Southeast Metro Stormwater Authority in Colorado.
Arapahoe County and Douglas County labeled along with nearby cities, towns, and villages. Also shows land use [2011 National Land Cover Dataset].
[Jurisdiction boundary source is United States Census Bureau 2014 TIGER/Line shapefiles.]

Another jurisdictional issue with special-district stormwater fees has to do with local governments that are part of a special-district stormwater fee, but also have their own stormwater fees. For example, the jurisdiction of the Long Creek Watershed Management District includes small portions of three cities (i.e., Portland, South Portland, Westbrook), plus a sliver of one town (i.e., Scarborough) in southern Maine. However, the City of Portland also enacted its own city-specific stormwater fee subsequent to the enactment of the Long Creek Watershed Management District stormwater fee.[138,139] Campbell et al. (2017) document the enactment year for the Long Creek Watershed Management District stormwater fee as 2010, and include a separate stormwater fee record without an enactment year for the City of Portland. In my diffusion dataset, I associated the attributes (e.g., enactment year) of the Long Creek Watershed Management District with South Portland and Westbrook, but not with Portland, which I associated only with the Portland record from Campbell et al. (2017).

A similar situation exists with the Muskingum Watershed Conservancy District, which began assessing a stormwater fee – technically a "maintenance assessment" – in 2008 on roughly 750,000 parcels across all or parts of 381 local governments in eastern Ohio. Campbell et al. (2017) do not record an enactment year for the Muskingum Watershed Conservancy District stormwater fee, but do record various enactment years – ranging from 1985 to 2013 – for nine local governments[140] included in the Muskingum Watershed Conservancy District. I handled these records in the same way as I the records associated with the Long Creek Watershed Management District: associating attributes recorded by Campbell et al. (2017) for the special-district stormwater fee only with any relevant local governments records that did not also have an individual stormwater fee also recorded by Campbell et al. (2017).

While the partial-jurisdiction issues associated with special-district stormwater fees appear to be extremely rare, future research may benefit by assessing and accounting jurisdictional issues in a more detailed and nuanced manner. Similarly, future research may

[138] Although the enactment year was not recorded by Campbell et al. (2017), the City of Portland's website indicates the city's stormwater fee was enacted 21 January 2015.

[139] The credit manual for Portland's stormwater fee indicates that property owners can receive up to 100% credit against the city stormwater fee for stormwater fees paid to the Long Creek Watershed Management District.

[140] These nine local governments are: the cities of Wooster (Wayne County, 1985), Zanesville (Muskingum County, 1987), Newark (Licking County, 2005), Louisville (Stark County, 2005), Ashland (Ashland County, 2006), Barberton (Summit County, 2006), Massillon (Stark County, 2010), and Coshocton (Coshocton County, 2010); as well as the Village of Buckeye Lake (Fairfield/Licking counties, 2013).

benefit from more detailed accounting of jurisdictional extents even for some stormwater fees implemented by individual local governments. As noted in Chapter 3, some stormwater fees enacted by individual county governments only apply to certain areas (e.g., unincorporated areas) within the county. For purposes of this research, if a county was recorded by Campbell et al. (2017) as having enacted a stormwater fee, I considered the fee applicable to the entire county. In at least one case, a stormwater fee was enacted on a subdivision scale. At the request of the Homeowners Association of Miami Trails Subdivision, located in Miami Township in northwestern Clermont County, Ohio, the county commissioners created a stormwater district and associated stormwater fee encompassing the lots in that specific subdivision. Future research could improve upon my diffusion dataset by better accounting for these jurisdictional nuances.

B.2.2 Border complexity

I used the following formula to calculate the border complexity metric:

$$\text{border complexity} = \text{perimeter} \,/\, (2 * (\pi * \text{area})^{0.5})$$

The relationship between the area and border complexity among local governments in the contiguous United States varies notably by local government type (Figure B.2). The vast majority of the largest local governments (i.e., those with jurisdictions of 250 square miles or more) are parish, county, or consolidated city-county governments, which tend to have fairly low border complexity (i.e., generally less than two) (Figure B.2). Local governments with jurisdictions between 10 square miles and 100 square miles and border complexity less than two are mostly townships (Figure B.2) in several midwestern states (e.g., Minnesota, Illinois, Pennsylvania, North Dakota, Ohio, Kansas, Michigan, Indiana, South Dakota, Nebraska, Missouri), along with towns (Figure B.2) in Wisconsin, New York, and several New England states (e.g., Maine, Massachusetts, Vermont, New Hampshire, Connecticut, Rhode Island). Smaller local governments with low border complexity (i.e., those with jurisdictions less than ten square miles and border complexity less than two) are largely boroughs, cities, and villages, along with towns (Figure B.2) in several southern and midwestern states. Local governments

with more complex borders (i.e., border complexity greater than 2.5) are mostly cities (Figure B.2) in California and several southern and midwestern states (e.g., Texas, Illinois, Georgia, Missouri, Florida, Ohio, Alabama, Kentucky, Kansas, Tennessee, Oklahoma, Wisconsin, Arkansas, Minnesota), along with many villages in Illinois and towns in North Carolina.

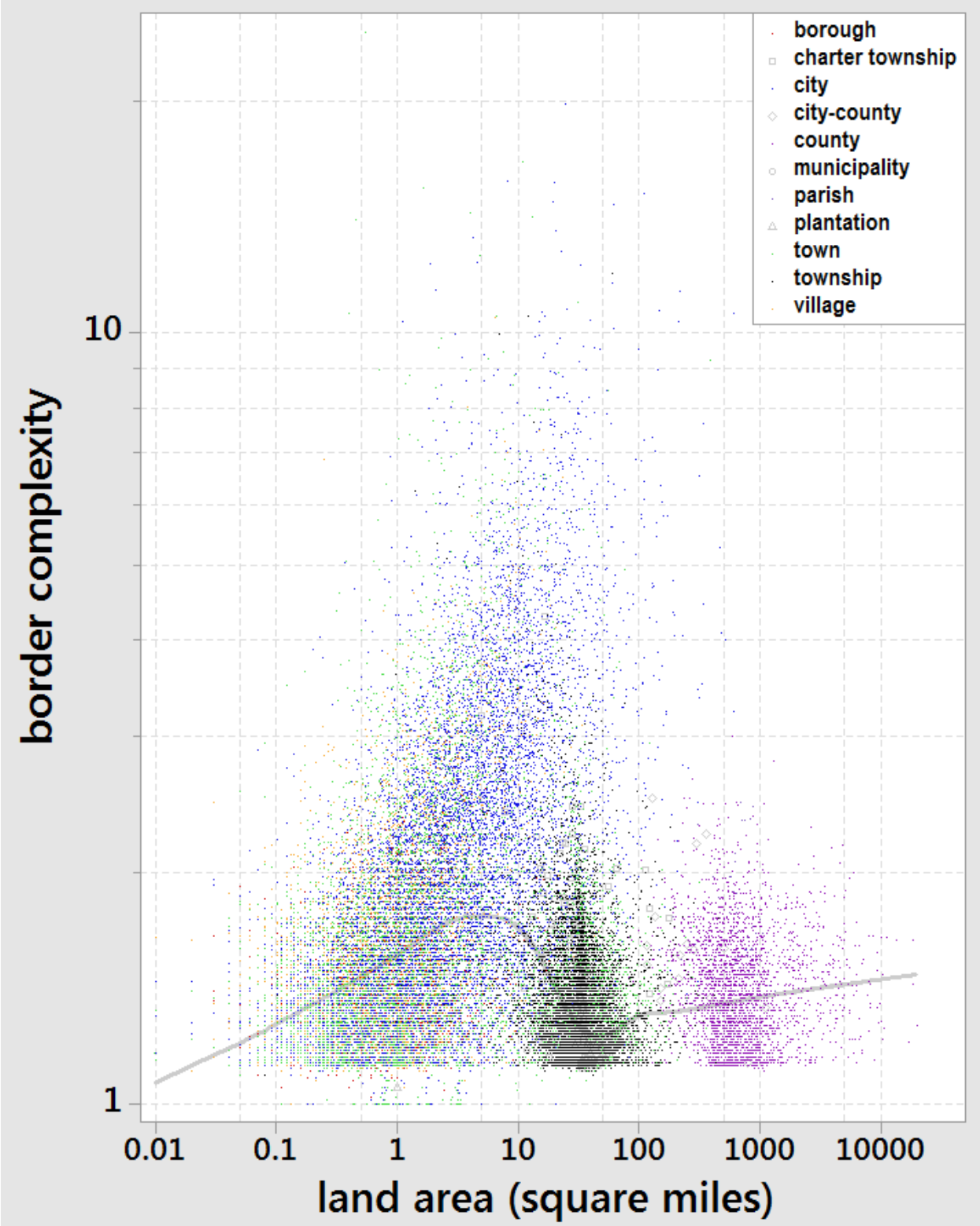


Figure B.2. Scatterplot of border complexity vs. land area for legally valid, general-purpose governments in the United States. Symbols correspond to government type: township (black dot); city (blue dot); town (green dot); village (orange dot); county (purple dot); parish (light purple dot); borough (red dot); charter township (grey square); plantation (grey triangle); city-county (grey diamond); and municipality (grey circle). Locally weighted smoothing curve shown in dark grey. Both axes log scaled.

The lowest possible value for the border complexity metric is one, which indicates a perfect circle. Perhaps surprisingly, many local governments in the United States have circular jurisdictions, such as the City of Eatonton in Putnam County, Georgia (Figure B.3). Local governments with circular jurisdictions are mostly cities and towns located in the southern states of Georgia (71), South Carolina (29), North Carolina (15), Kentucky (7), and Alabama (4). Local governments with approximately square jurisdictions also have fairly low border complexity. In fact, for a perfect square, the border complexity metric takes a value of 1.13. Border complexity increases, however, in cases like Granville Township in McHenry County, North Dakota, which is almost a perfect six-mile square, but with a small "hole" (i.e., the City of Granville) in the northwest portion of the township (Figure B.4). Border complexity also increases for local governments that border waterways or waterbodies, such as Goodhue County in southeastern Minnesota, where the county borders are mostly rectilinear excepting the irregular northeastern border along the Mississippi River (Figure B.5). Extreme high values of border complexity (i.e., over ten) are observed for local governments with long, thin stretches of jurisdiction along roads, waterways, or other relatively thin features. For example, the City of Alvin in Brazoria County, Texas has a border complexity of 19.8 because the city borders follow several waterways and drainage features (Figure B.6), such as the Austin Bayou.

Local governments in some states tend to have less complex borders than other states (Figure B.7, Figure B.8). States with the lowest average local government border complexity include North Dakota (Figure B.9), South Dakota, Michigan, New York, and the New England states of Connecticut, Maine, New Hampshire, and Rhode Island (Figure B.7, Figure B.8). States with highest average local government border complexity are the southern states of Alabama (Figure B.10), North Carolina, South Carolina, Florida, and Tennessee, along with Texas, Oklahoma, Colorado, and Arizona (Figure B.7, Figure B.8). In many states, local government borders are more complex in metropolitan regions around larger cities. For instance, in Alabama, local government borders are particularly complex around Birmingham, Tuscaloosa, Montgomery, and Huntsville (Figure B.10).

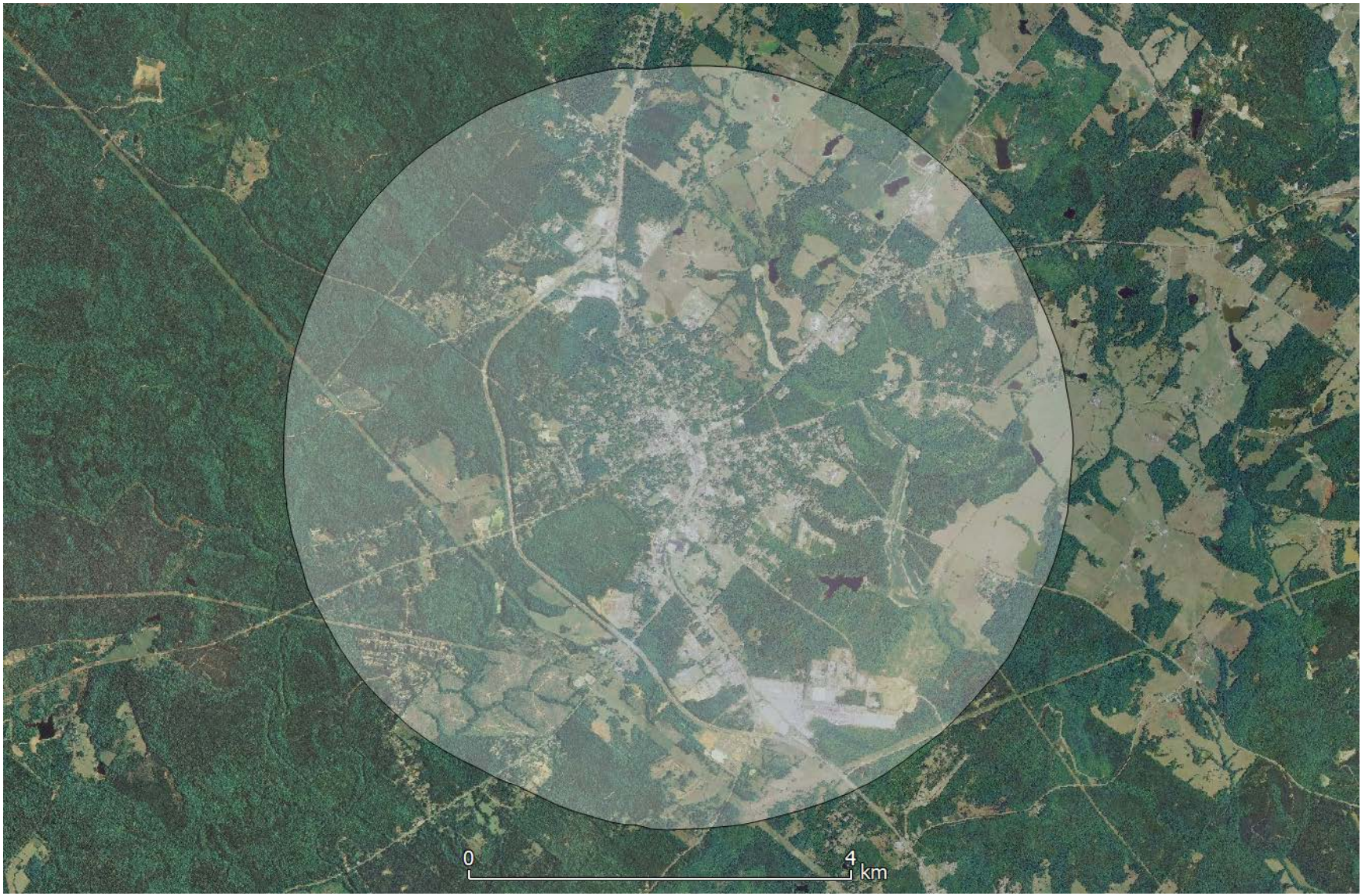


Figure B.3. Jurisdiction of the City of Eatonton in Putnam County, Georgia
(land area = 20.4 square miles; perimeter = 16.1 miles; border complexity = 1).
[Jurisdiction boundary source is United States Census Bureau 2014 TIGER/Line shapefiles. World imagery basemap courtesy of ESRI.]

Figure B.4. Jurisdiction of Granville Township in McHenry County, North Dakota
(land area = 35.1 square miles; perimeter = 26.6 miles; border complexity = 1.25).
[Jurisdiction boundary source is United States Census Bureau 2014 TIGER/Line shapefiles. World imagery basemap courtesy of ESRI.]

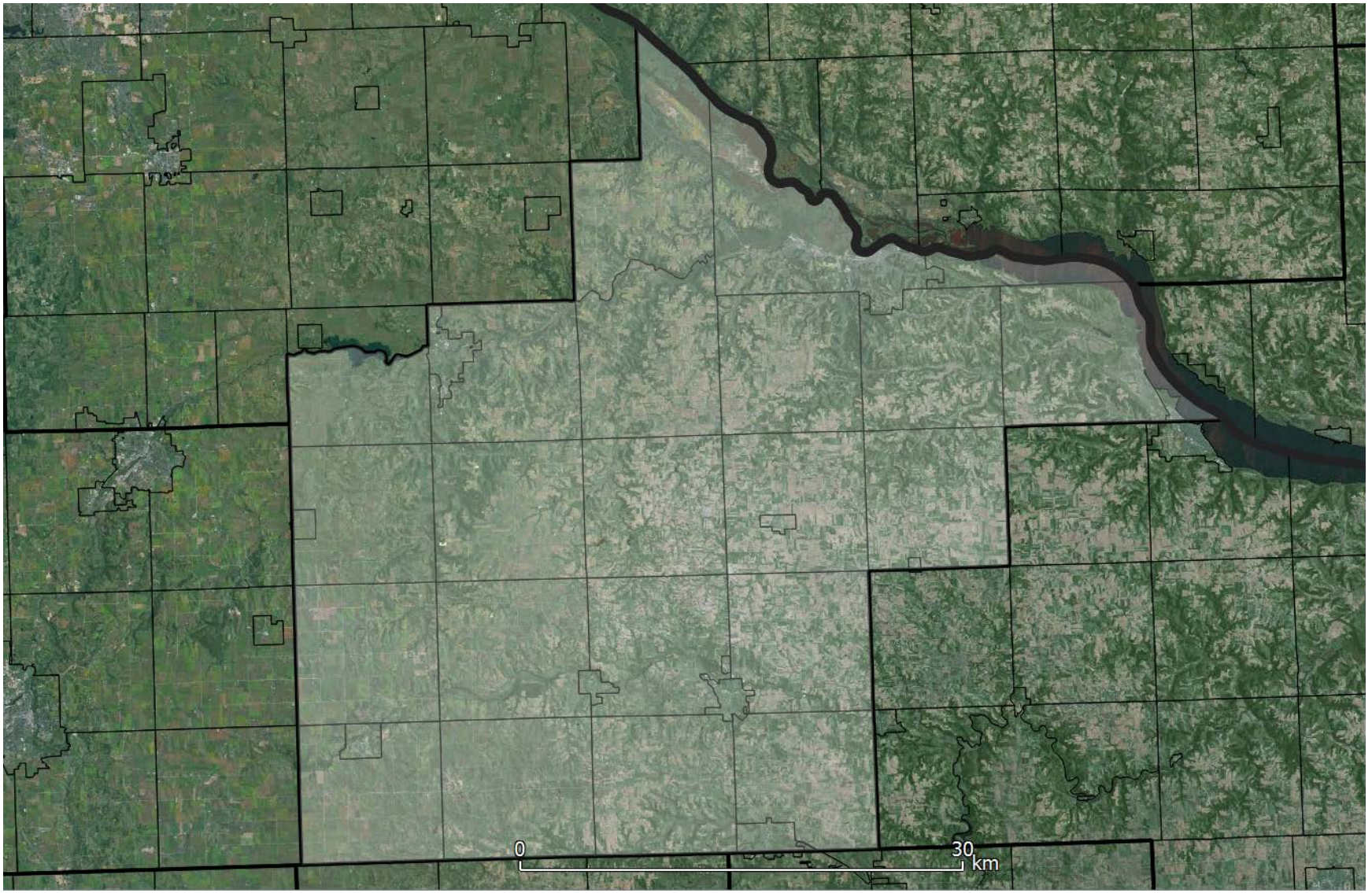


Figure B.5. Jurisdiction of Goodhue County, Minnesota
(land area = 751.6 square miles; perimeter = 145.1 miles; border complexity = 1.46).
[Jurisdiction boundary source is United States Census Bureau 2014 TIGER/Line shapefiles. World imagery basemap courtesy of ESRI.]

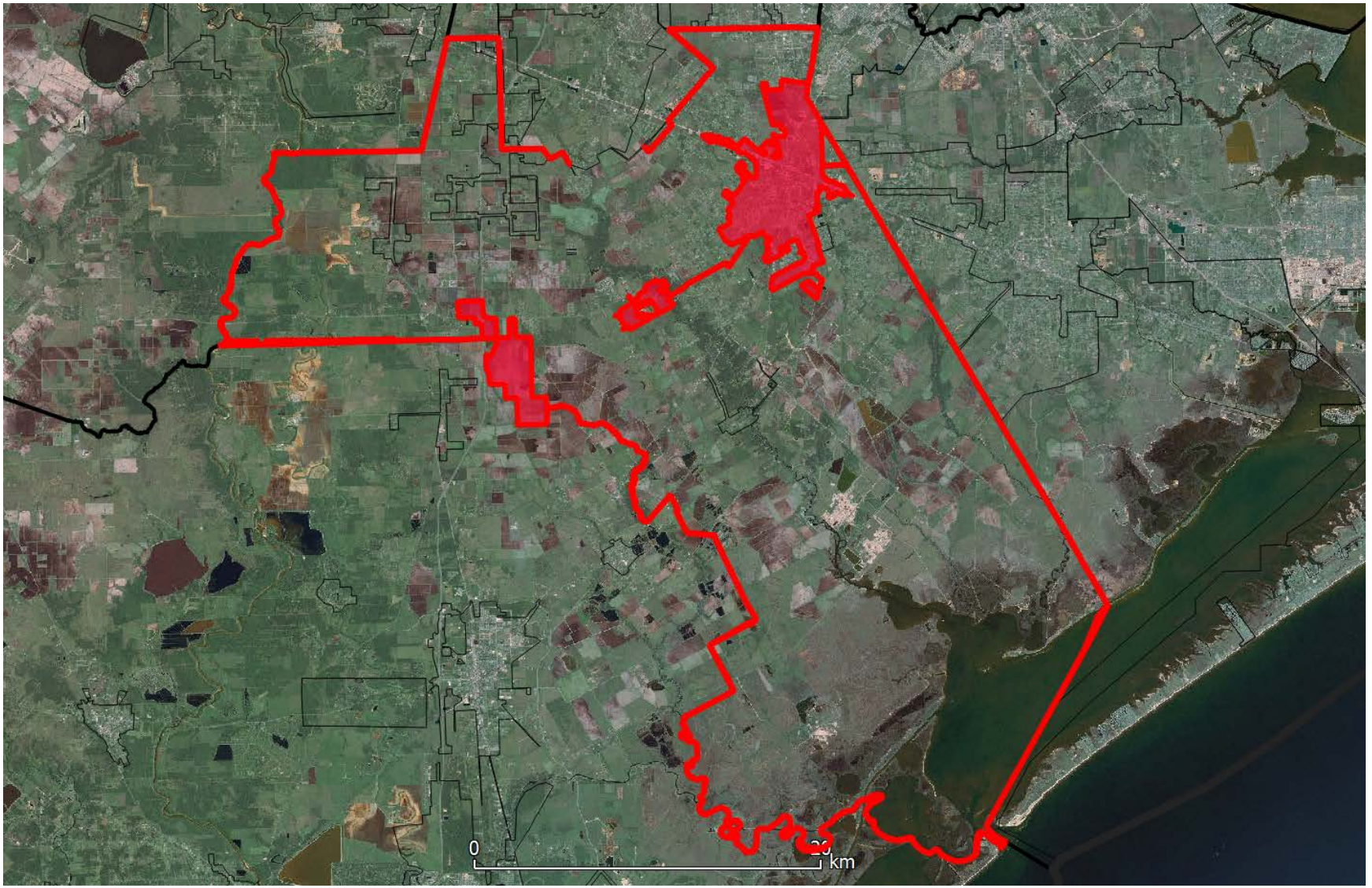


Figure B.6. Jurisdiction of the City of Alvin in Brazoria County, Texas
(land area = 24.5 square miles; perimeter = 355.5 miles; border complexity = 19.8).
[Jurisdiction boundary source is United States Census Bureau 2014 TIGER/Line shapefiles. World imagery basemap courtesy of ESRI.]

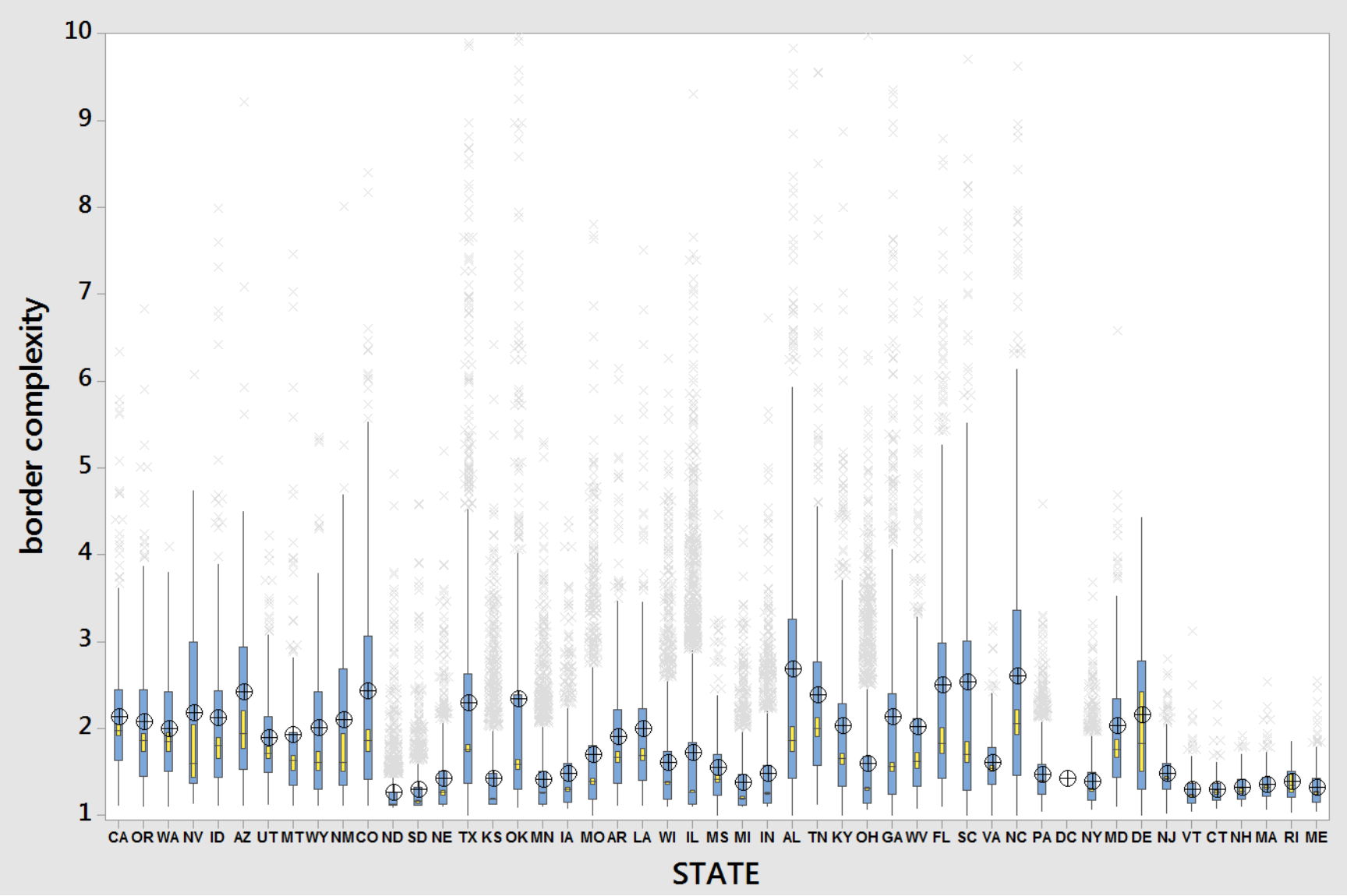


Figure B.7. Box-and-whisker plot of border complexity by state, with states ordered by longitude of centroid. Outlier (grey Xs) and mean (circular crosshairs) values marked, with 95% confidence intervals around median values (yellow boxes). Y-axis truncated to maximum value of ten.

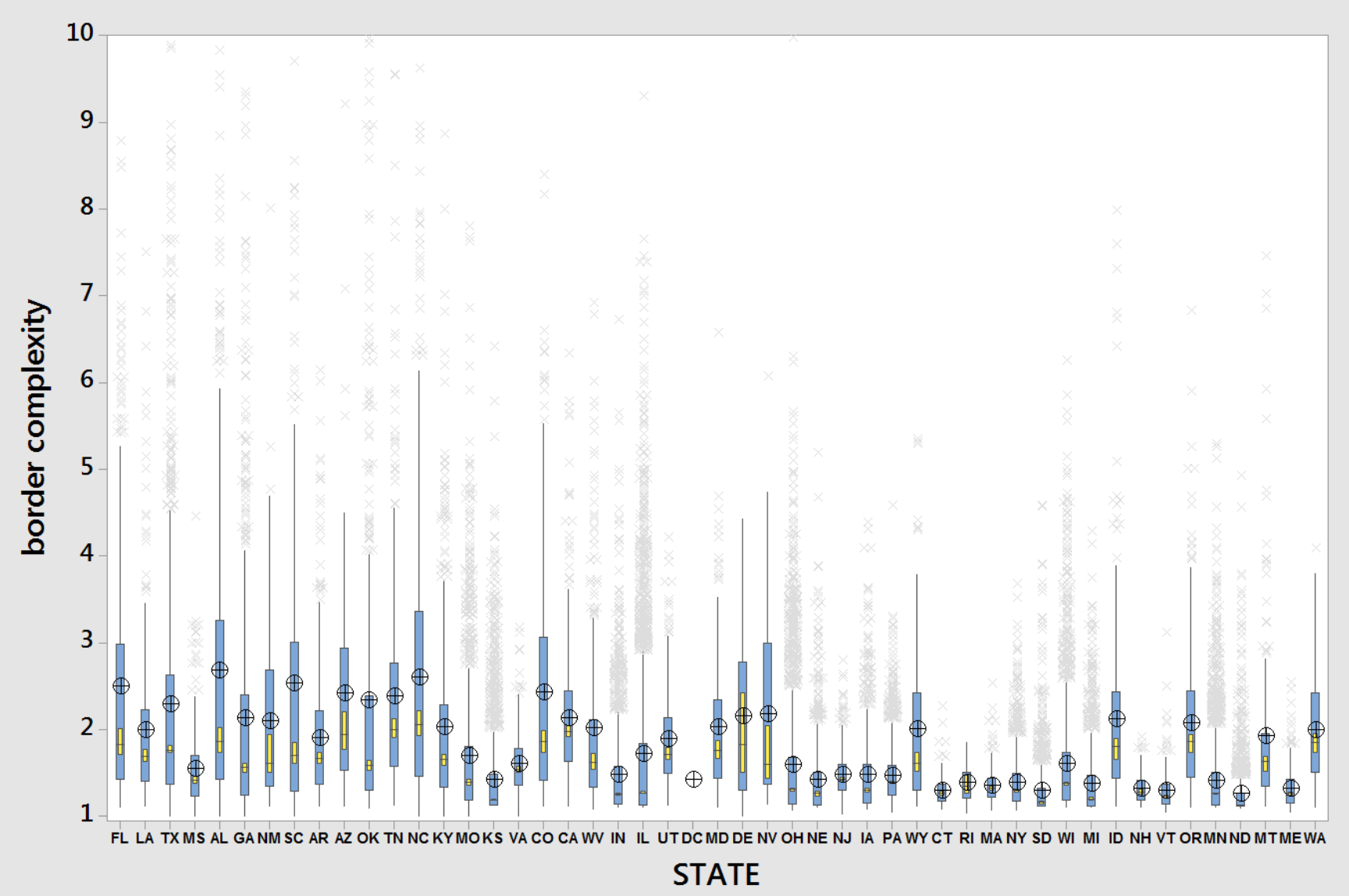


Figure B.8. Box-and-whisker plot of border complexity by state, with states ordered by latitude of centroid. Outlier (grey Xs) and mean (circular crosshairs) values marked, with 95% confidence intervals around median values (yellow boxes). Y-axis truncated to maximum value of ten.

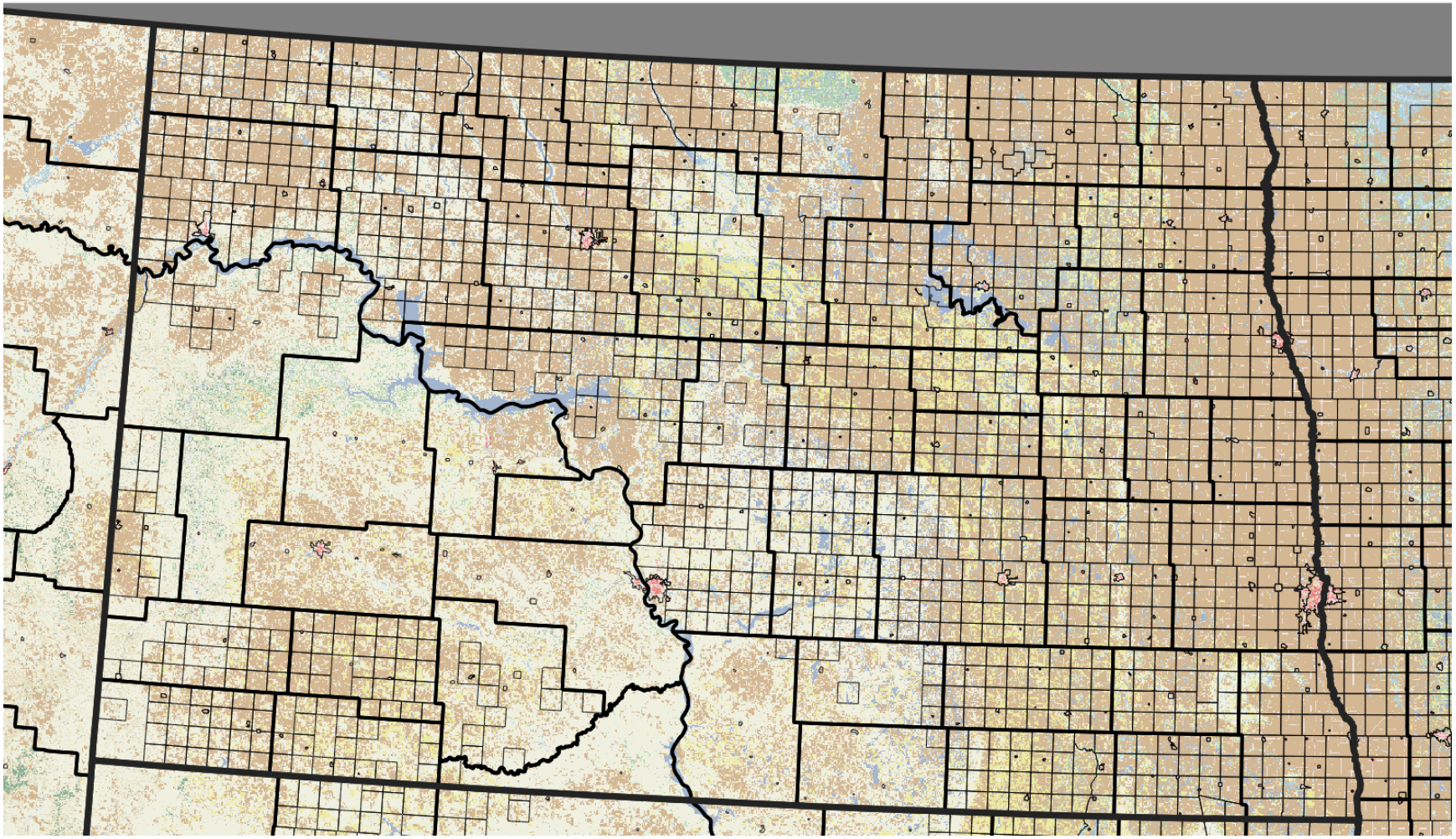


Figure B.9. Local government boundaries in North Dakota.
Also shows land use [2011 National Land Cover Dataset].
[Jurisdiction boundary source is United States Census Bureau 2014 TIGER/Line shapefiles.]

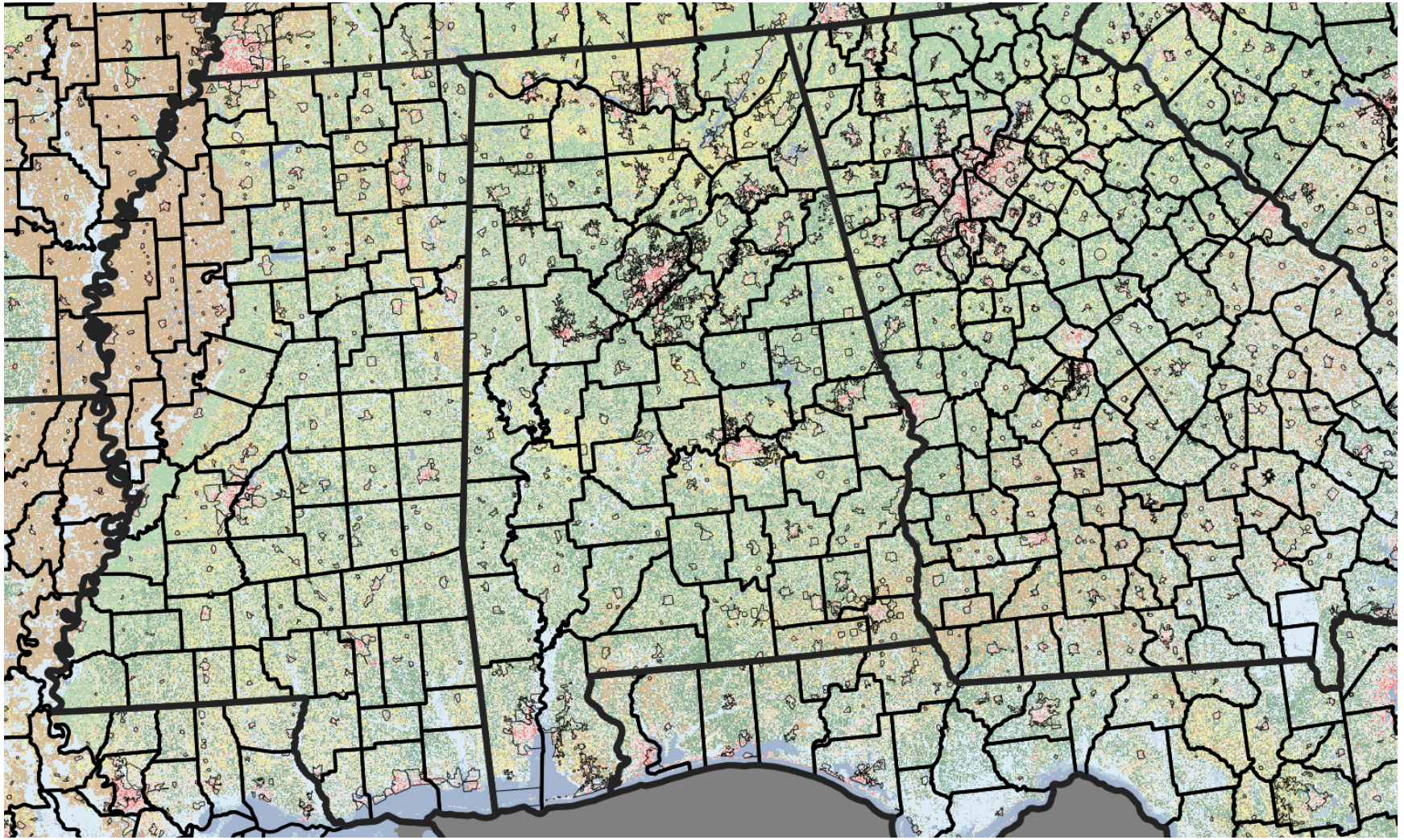


Figure B.10. Local government boundaries in Alabama.
Also shows land use [2011 National Land Cover Dataset].
[Jurisdiction boundary source is United States Census Bureau 2014 TIGER/Line shapefiles.]

B.3 SUPPORTING INFORMATION FOR EXPLORATORY ANALYSES

Table B.2. Number of new stormwater fees by state and decade.

STATE	1970-1979	1980-1989	1990-1999	2000-2009	2010-2017	total			
						# w/ year	# w/o year	# overall	% w/ year
AL				1	1	2	2	4	50.0
AR				1		1		1	100.0
AZ			1	3	2	6		6	100.0
CA	1	2	25	11	2	41	15	56	73.2
CO	1	6	5	19	3	34	3	37	91.9
DC						0	1	1	0
DE				1	1	2		2	100.0
FL		15	81	56	10	162	21	183	88.5
GA			3	27	13	43	16	59	72.9
IA			3	24	16	43	63	106	40.6
ID				2	1	3	1	4	75.0
IL		1	1	8	12	22	5	27	81.5
IN			4	25	10	39	41	80	48.8
KS			6	14	4	24	13	37	64.9
KY		1	2	7	1	11		11	100.0
MA			1	3	5	9		9	100.0
MD			1	3	12	16	1	17	94.1
ME				1	2	3	2	5	60.0
MI	1	1	1	2	2	7	2	9	77.8
MN		15	42	76	8	141	56	197	71.6
MO			2	2		4		4	100.0
MT		2		2	2	6	1	7	85.7
NC			6	22	10	38	37	75	50.7
ND		1	1			2	2	4	50.0
NM				1		1		1	100.0
NV				1	1	2	1	3	66.7
NY					1	1		1	100.0
OH		6	14	57	14	91	15	106	85.8
OK		1	3	5	3	12	10	22	54.5
OR	2	1	15	11	5	34	18	52	65.4
PA					10	10	2	12	83.3
SC		1	4	19	5	29	9	38	76.3
SD		1	1	1		3	1	4	75.0
TN			1	14	8	23	4	27	85.2
TX			14	44	24	82	27	109	75.2
UT		1	4	13	7	25	11	36	69.4
VA			7	3	15	25	5	30	83.3
VT				2	2	4		4	100.0
WA	1	19	49	29	3	101	16	117	86.3
WI			14	80	14	108	17	125	86.4
WV				4	4	8	1	9	88.9
SUM	6	74	311	594	233	1218	419	1637	74.4
COUNT	5	16	28	37	35	41	32	41	
SUM cumulative	*6*	*80*	*391*	*985*	*1218*				
COUNT cumulative	*5*	*16*	*29*	*38*	*40*				

Table B.3. Area (square miles) under the jurisdiction of various types of local governments by state.

STATE	borough	village	town	township	charter township	municipality	plantation	city	city-county	county or parish	total	subcounty total	% not subcounty	% not county
MT			50					247		147,040	147,040	297	99.8	
WY			115					210		97,813	97,813	325	99.7	
ID								669		83,569	83,569	669	99.2	
NM		178	117					809		121,590	121,590	1,104	99.1	
NV								1,144		110,415	110,572	1,144	99.0	0.1
OR			7					1,029		98,379	98,379	1,035	98.9	
CO			518					1,410		103,906	104,094	1,928	98.1	0.2
WV		11	108					334		24,230	24,230	453	98.1	
UT			510					1,644		84,898	84,898	2,154	97.5	
WA			47					1,842		71,298	71,298	1,889	97.4	
MD		1	176					281		12,314	12,406	458	96.3	0.7
IA								2,162		56,273	56,273	2,162	96.2	
AZ			1,404					3,057		113,991	113,991	4,461	96.1	
MS		24	373					1,730		48,441	48,441	2,127	95.6	
TX		50	566					11,308		268,596	268,596	11,924	95.6	
AR			296					2,174		53,179	53,179	2,470	95.4	
KY								1,257	683	39,725	40,408	1,941	95.2	1.7
CA			312					8,622		163,463	163,695	8,935	94.5	0.1
OK			1,085					2,934		69,899	69,899	4,019	94.2	
SC			794					1,095		32,020	32,020	1,889	94.1	
DE		1	71					79		2,489	2,489	150	94.0	
VA			529					2,218		40,557	42,775	2,748	93.6	5.2
NC		100	1,793					2,194		53,819	53,819	4,088	92.4	
GA			230					3,022	1,268	58,133	59,425	4,520	92.4	2.2
LA		266	394					1,301	2,082	49,943	52,375	4,043	92.3	4.6
FL		101	473					5,521		65,757	65,757	6,095	90.7	
TN			756					2,624	773	41,372	42,144	4,153	90.1	1.8
AL			1,473					3,796		52,420	52,420	5,269	89.9	
NE		135		18,358				589		77,347	77,347	19,083	75.3	
MO		149	50	14,292				2,815		69,641	69,707	17,306	75.2	0.1
SD		0	80	34,873				449		77,116	77,116	35,403	54.1	
ME			17,705				1,532	922		35,380	35,380	20,159	43.0	
MI		340		55,329	4,168			2,061		96,713	96,713	61,898	36.0	
ND				48,412				537		70,698	70,698	48,949	30.8	
MN				66,359				4,656		86,935	86,935	71,016	18.3	
MA			7,771					1,237		4,025	10,554	9,008	14.7	61.9
WI		1,312	54,114					1,753		65,496	65,496	57,178	12.7	
KS				70,268				1,444	935	81,344	82,278	72,647	11.7	1.1
NJ	729	8	89	6,554				480		8,723	8,723	7,860	9.9	
RI			1,271					146		0	1,545	1,417	8.3	100.0
CT	26		4,617					467		0	5,544	5,110	7.8	100.0
NH			8,199					476		9,349	9,349	8,676	7.2	
NY		1,058	49,438					1,117		54,087	54,555	51,613	5.4	0.9
IL		2,273	41	50,316				2,300		57,914	57,914	54,931	5.1	
OH		865		39,581				3,056		44,826	44,826	43,501	3.0	
VT		50	9,296					81		9,616	9,616	9,426	2.0	
PA	1,431		5	43,147		68		482	143	45,912	46,054	45,276	1.7	0.3
DC								68		0	68	68	0	100.0
IN			817	36,081				1,405	368	36,017	36,420	38,671	-6.2	1.1

B.4 SUPPORTING INFORMATION FOR REGRESSION ANALYSES

B.4.1 Which

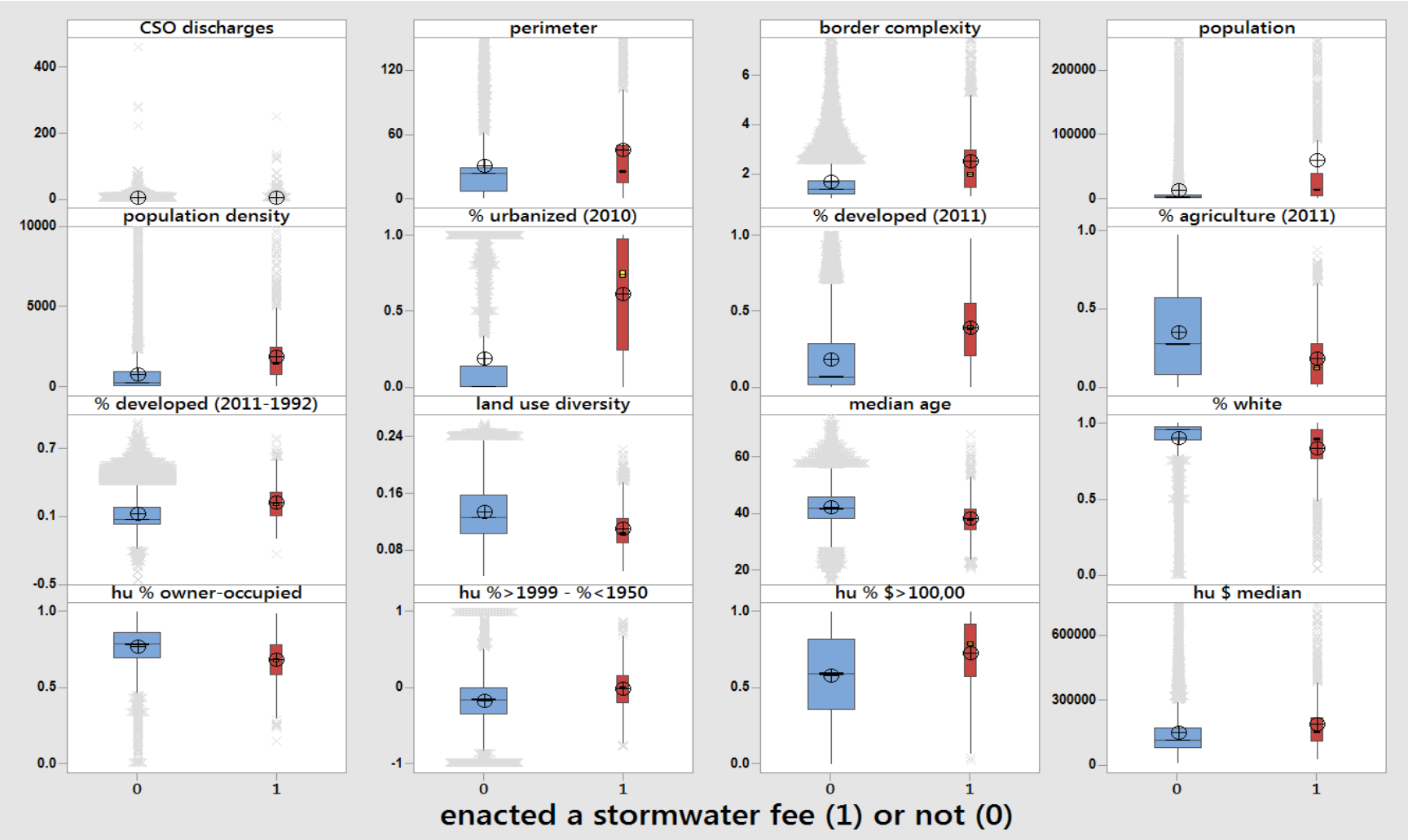


Figure B.11. Boxplot of continuous variables whose distributions exhibited the greatest separation between local governments that have and have not enacted stormwater fees. Box widths are proportional to sample size. Outlier (grey Xs) and mean (circular crosshairs) values marked, with 95% confidence intervals around median values (yellow boxes). Y-axes truncated for perimeter, border complexity, population, population density, % developed (2011-1992), median age, and housing unit median value to visually emphasize separation between distributions.

Table B.4. Pearson correlation coefficients for continuous variables selected for regression analysis on binary stormwater fee enactment variable. Variables in grey text were eliminated due to high collinearity with other variables.

	# CSO discharges	perimeter	border complexity	population	population density	% urbanized (2010)	% urbanized (2000)	% developed (2011)	% agriculture (2011)	% developed (1992)	% agriculture (1992)	Δ % developed (2011-1992)	land use diversity	median age	% white	housing units % owner-occupied	housing units % built after 1999	housing units % built before 1950	housing units newness index	housing units % valued > $100,000	housing units median value
# CSO discharges	1																				
perimeter	0.03	1																			
border complexity	0.04	0.19	1																		
population	0.31	0.31	0.05	1																	
population density	0.16	-0.14	0.16	0.14	1																
% urbanized (2010)	0.10	-0.06	0.34	0.11	0.63	1															
% urbanized (2000)	0.10	-0.07	0.29	0.11	0.64	0.95	1														
% developed (2011)	0.10	-0.22	0.29	0.08	0.75	0.70	0.69	1													
% agriculture (2011)	-0.05	-0.02	-0.23	-0.07	-0.37	-0.44	-0.44	-0.49	1												
% developed (1992)	0.09	-0.25	0.21	0.06	0.72	0.63	0.65	0.88	-0.50	1											
% agriculture (1992)	-0.05	-0.07	-0.17	-0.08	-0.35	-0.39	-0.41	-0.41	0.93	-0.47	1										
Δ % developed (2011-1992)	0.02	-0.18	0.35	0.03	0.30	0.46	0.41	0.59	-0.33	0.32	-0.14	1									
land use diversity	-0.03	0.06	-0.30	-0.07	-0.18	-0.32	-0.29	-0.35	0.53	-0.32	0.44	-0.35	1								
median age	-0.04	-0.06	-0.22	-0.09	-0.25	-0.24	-0.21	-0.26	0.05	-0.20	-0.01	-0.22	0.20	1							
% white	-0.06	-0.13	-0.22	-0.13	-0.30	-0.30	-0.30	-0.27	0.27	-0.28	0.25	-0.14	0.26	0.34	1						
housing units % owner-occupied	-0.10	-0.08	-0.30	-0.12	-0.42	-0.40	-0.39	-0.47	0.33	-0.44	0.31	-0.26	0.34	0.44	0.46	1					
housing units % built after 1999	-0.03	0.17	0.19	0.04	-0.10	0.03	-0.04	-0.14	0.01	-0.24	0.06	0.09	-0.10	-0.16	-0.04	0.09	1				
housing units % built before 1950	0.05	-0.22	-0.24	-0.07	0.01	-0.17	-0.14	0.01	0.21	0.08	0.18	-0.11	0.24	0.15	0.26	0.05	-0.49	1			
housing units newness index	-0.05	0.23	0.26	0.07	-0.05	0.14	0.08	-0.06	-0.15	-0.16	-0.11	0.12	-0.22	-0.18	-0.21	0.00	0.77	-0.93	1		
housing units % valued > $100,000	0.00	0.13	0.07	0.08	0.12	0.27	0.25	-0.02	-0.01	-0.09	-0.03	-0.01	0.00	0.02	0.09	0.14	0.37	-0.32	0.39	1	
housing units median value	0.00	0.03	0.02	0.08	0.22	0.33	0.33	0.11	-0.15	0.11	-0.17	0.05	-0.02	0.11	0.00	0.10	0.19	-0.20	0.22	0.64	1

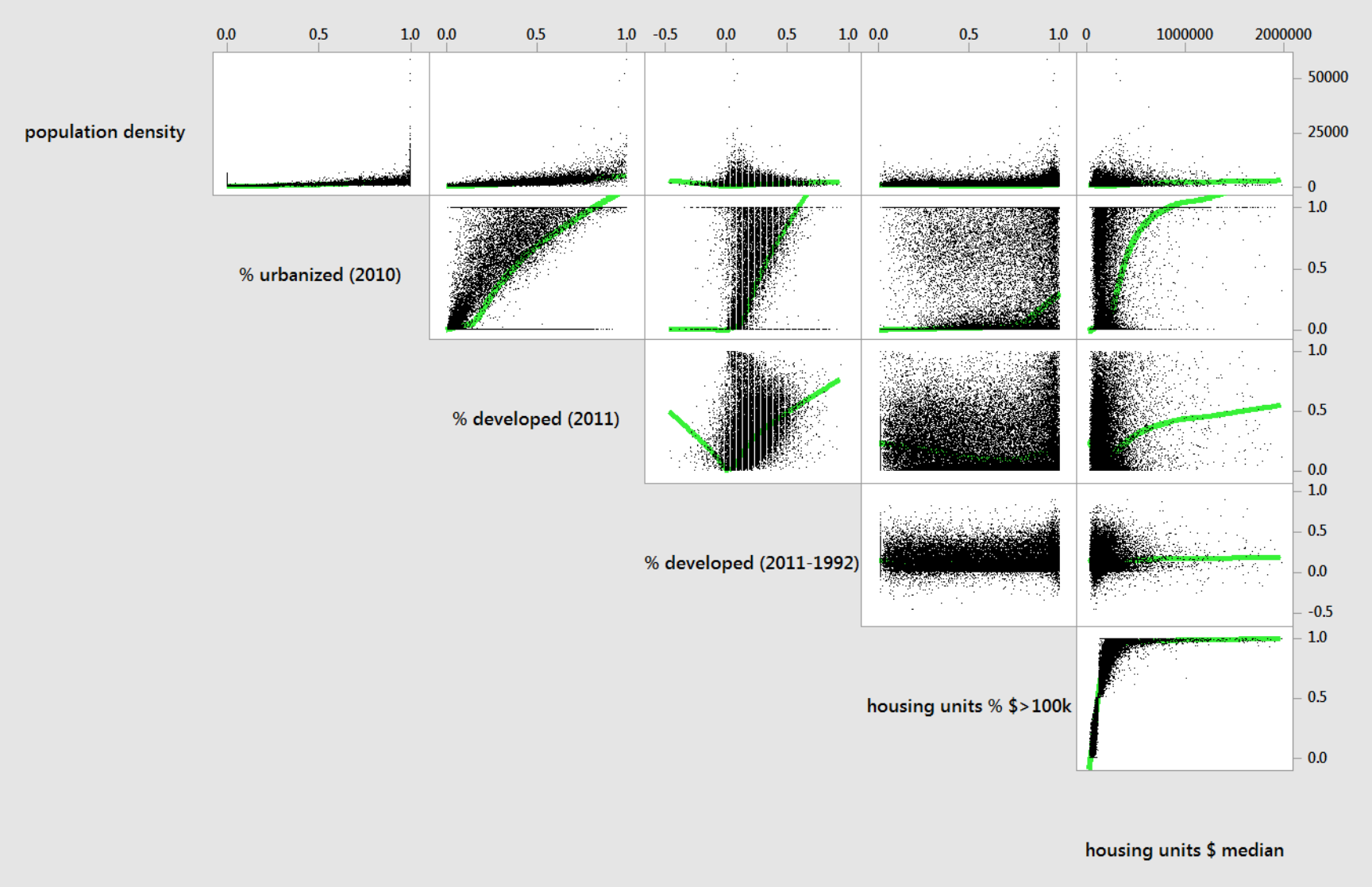


Figure B.12. Matrix scatterplot of the most highly correlated continuous variables selected for regression analysis on binary stormwater fee enactment variable. Locally weighted smoothing curves shown in green.

Table B.5. Cross-tabulation of MS4 phase against government type on the binary stormwater fee enactment variable.

MS4 phase	borough			village			town			township			charter township	municipality	plantation	city			city-county			county			parish	SUM		
	w/o fee	w/ fee		w/o fee	w/ fee		w/o fee	w/ fee		w/o fee	w/ fee		w/o fee	w/o fee	w/o fee	w/o fee	w/ fee		w/o fee	w/ fee		w/o fee	w/ fee		w/o fee	w/o fee	w/ fee	
	#	#	%	#	#	%	#	#	%	#	#	%	#	#	#	#	#	%	#	#	%	#	#	%	#	#	#	%
0	652	3	0.5	2987	135	4.3	6888	39	0.6	11746	254	2.1	78		34	6932	336	4.6	6		0	2438	16	0.7	49	31810	783	2.4
1				6	8	57.1	39	12	23.5							361	218	37.7		7	100.0	37	33	47.1	1	444	278	38.5
2	562	2	0.4	552	71	11.4	828	83	9.1	652	14	2.1	39	3		1343	822	38.0	2	1	33.3	371	62	14.3	12	4364	1055	19.5
waiver							10		0																			
SUM	1214	5	0.4	3545	214	5.7	7765	134	1.7	12398	268	2.1	117	3	34	8636	1376	13.7	8	8	50.0	2846	111	3.8	62	36628	2116	5.5

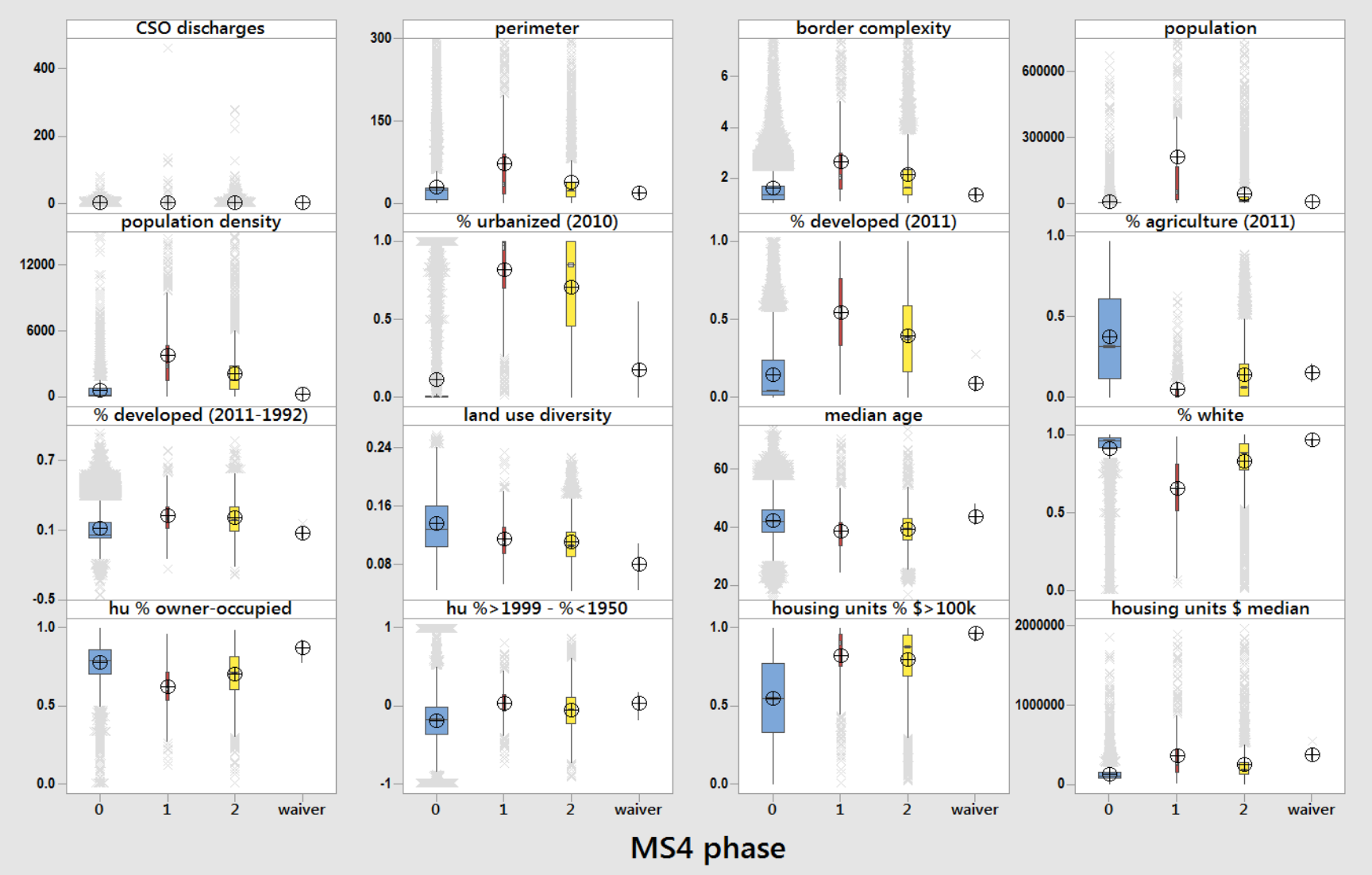


Figure B.13. Boxplot of continuous variables whose distributions exhibited the greatest separation between local governments that have and have not enacted stormwater fees by MS4 regulation phase. Box widths are proportional to sample size. Outlier (grey Xs) and mean (circular crosshairs) values marked, with 95% confidence intervals around median values (white boxes). Y-axes truncated for perimeter, population, population density, change in percent developed land use, and median age to visually emphasize separation between distributions.

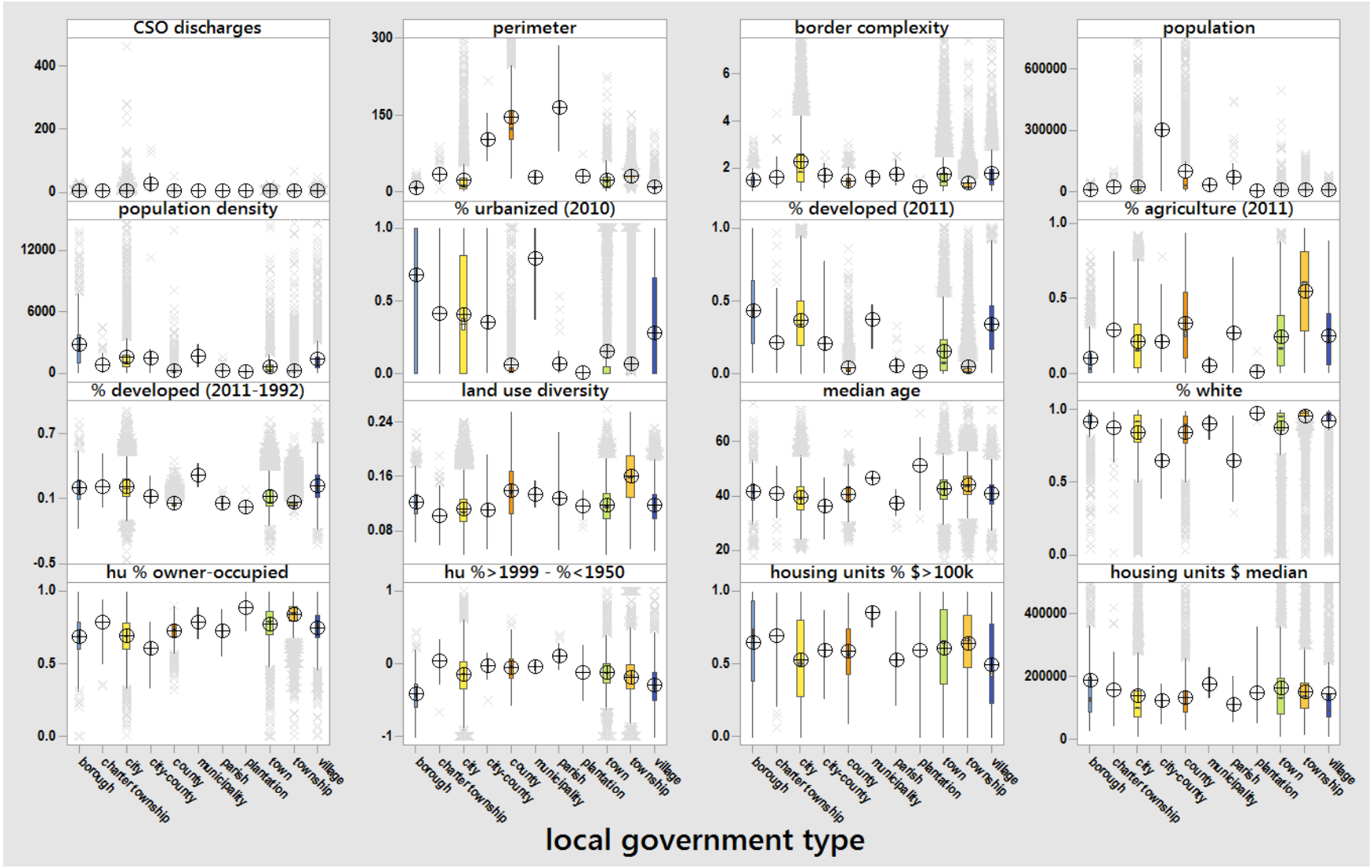


Figure B.14. Boxplot of continuous variables whose distributions exhibited the greatest separation between local governments that have and have not enacted stormwater fees by local government type. Box widths are proportional to sample size. Outlier (grey Xs) and mean (circular crosshairs) values marked, with 95% confidence intervals around median values (white boxes). Y-axes truncated for perimeter, population, population density, change in percent developed land use, median age, and median housing unit value to visually emphasize separation between distributions.

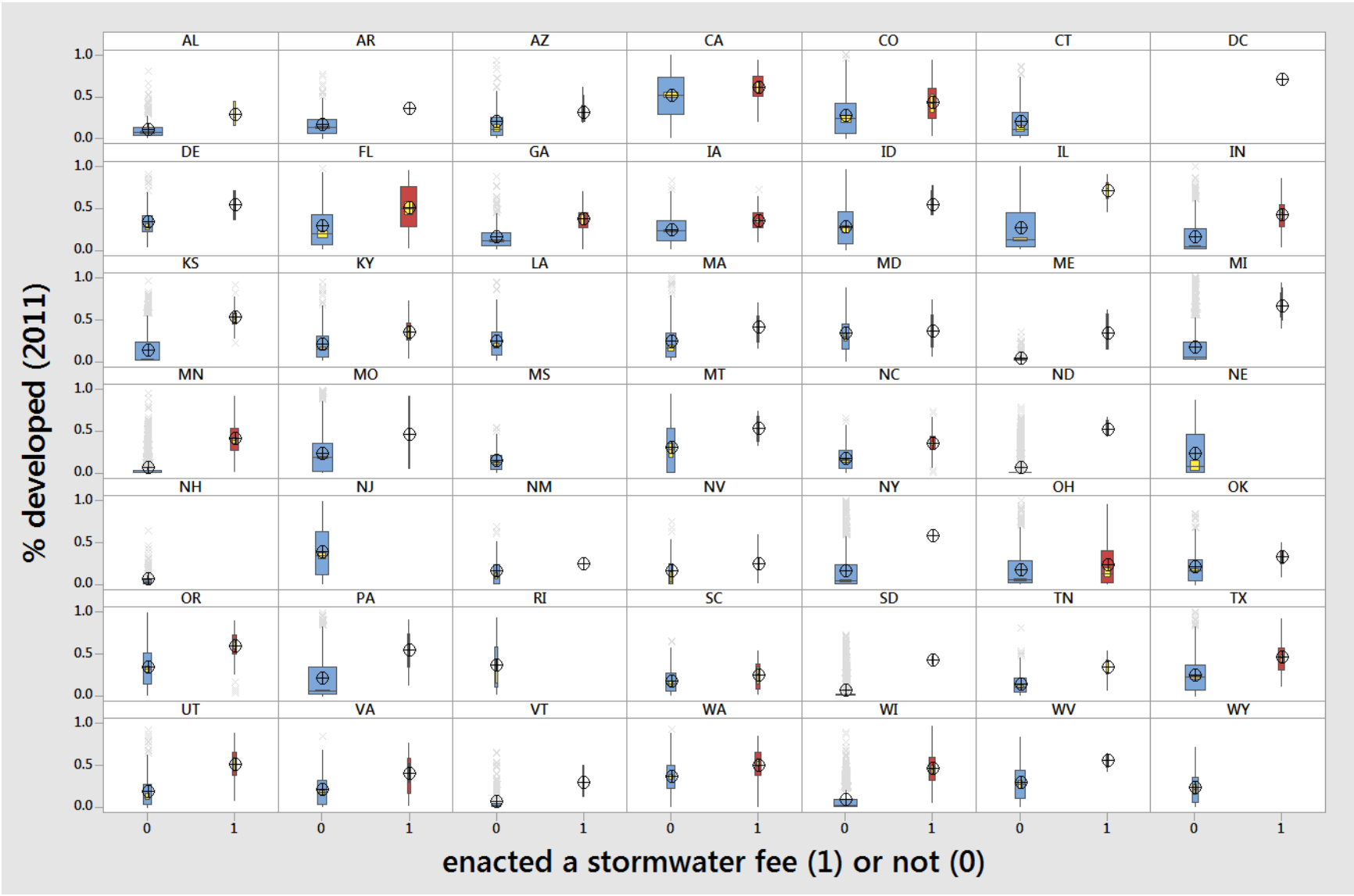


Figure B.15. Boxplot of percent developed land use by state and stormwater fee enactment. Box widths are proportional to sample size. Outlier (grey Xs) and mean (circular crosshairs) values marked, with 95% confidence intervals around median values (yellow boxes).

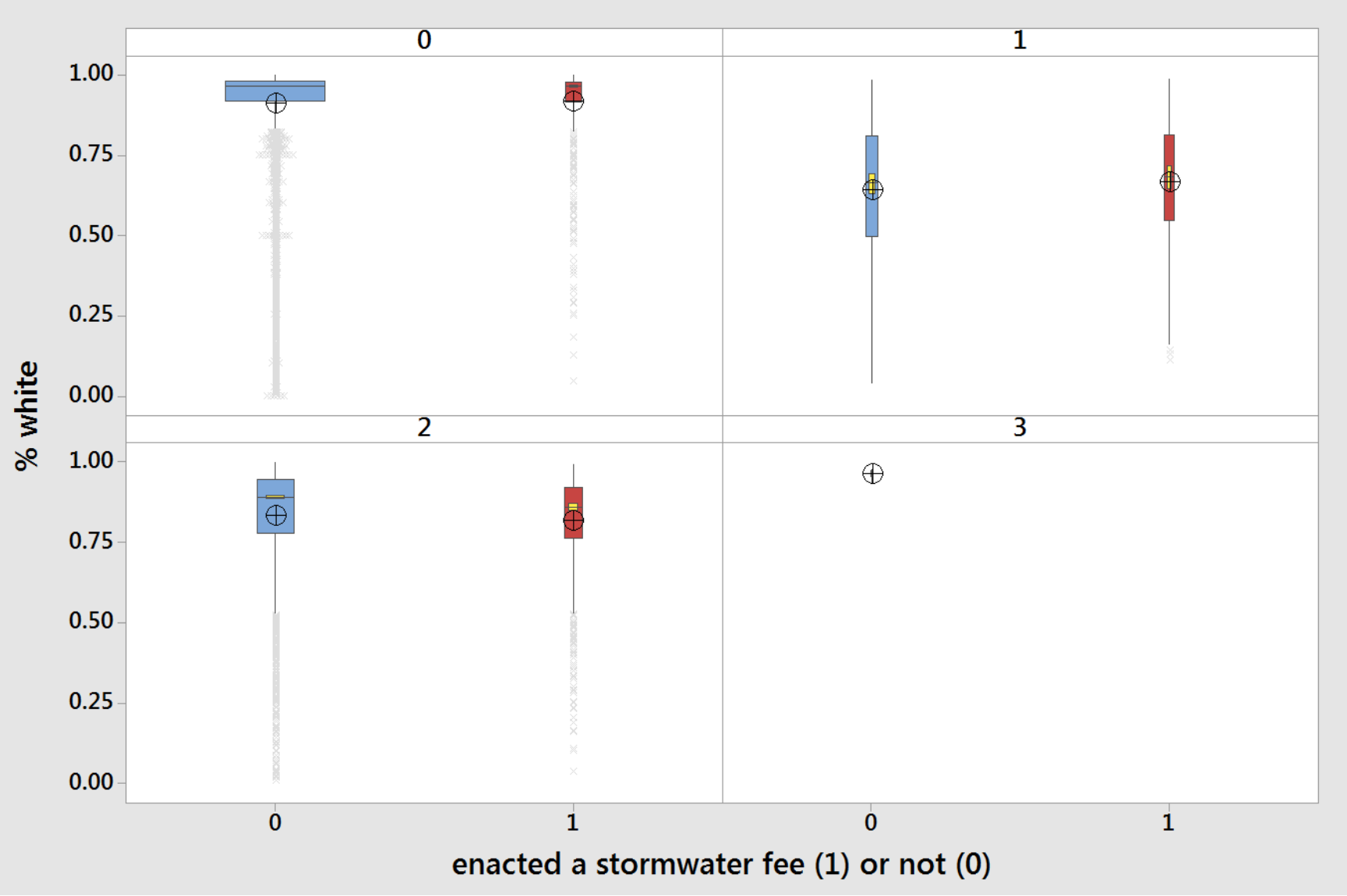


Figure B.16. Boxplot of percent white population by MS4 regulation phase (3 = Phase 2 waiver) and stormwater fee enactment. Box widths are proportional to sample size. Outlier (grey Xs) and mean (circular crosshairs) values marked, with 95% confidence intervals around median values (yellow boxes).

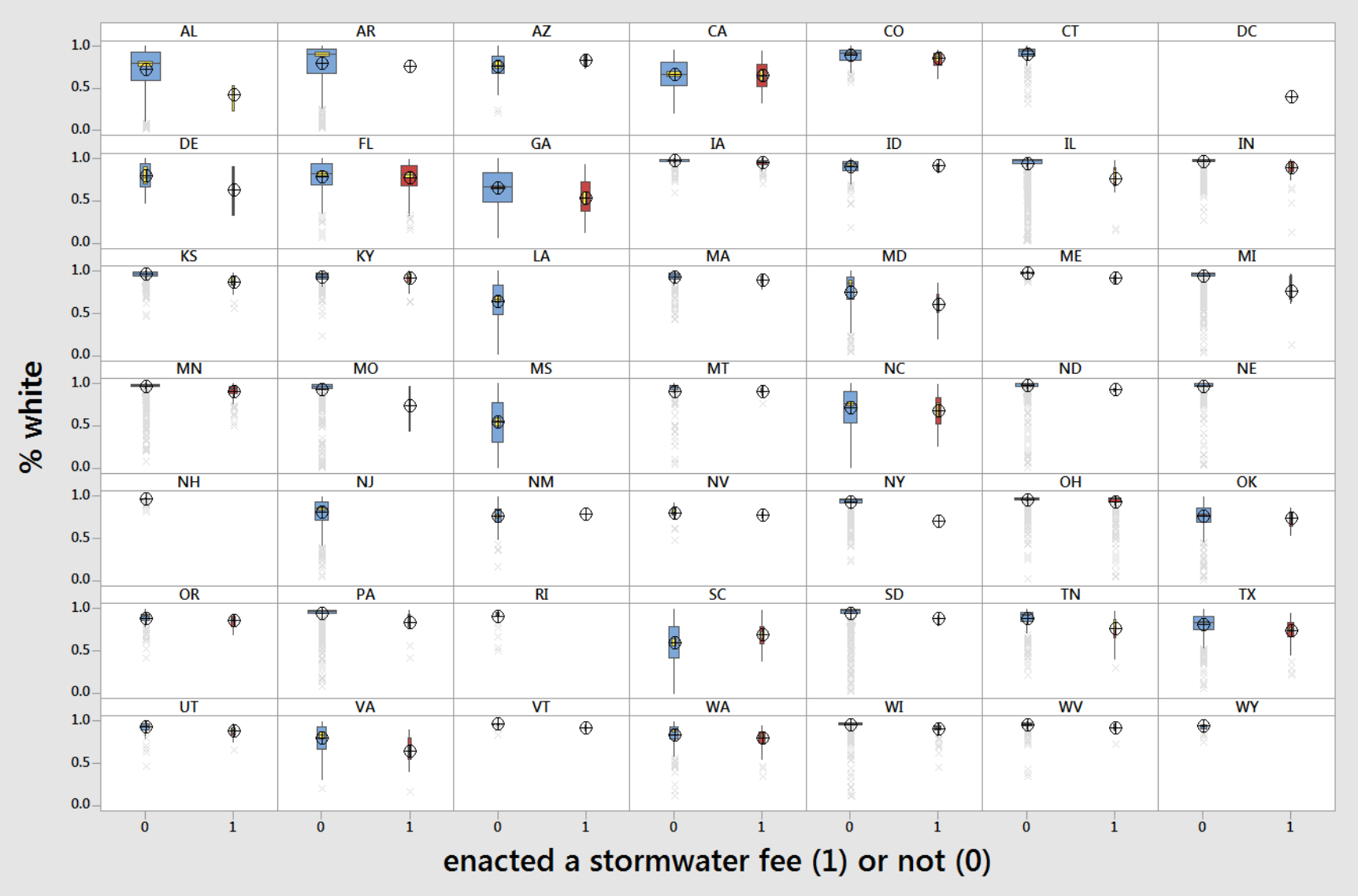


Figure B.17. Boxplot of percent white population by state and stormwater fee enactment. Box widths are proportional to sample size. Outlier (grey Xs) and mean (circular crosshairs) values marked, with 95% confidence intervals around median values (yellow boxes).

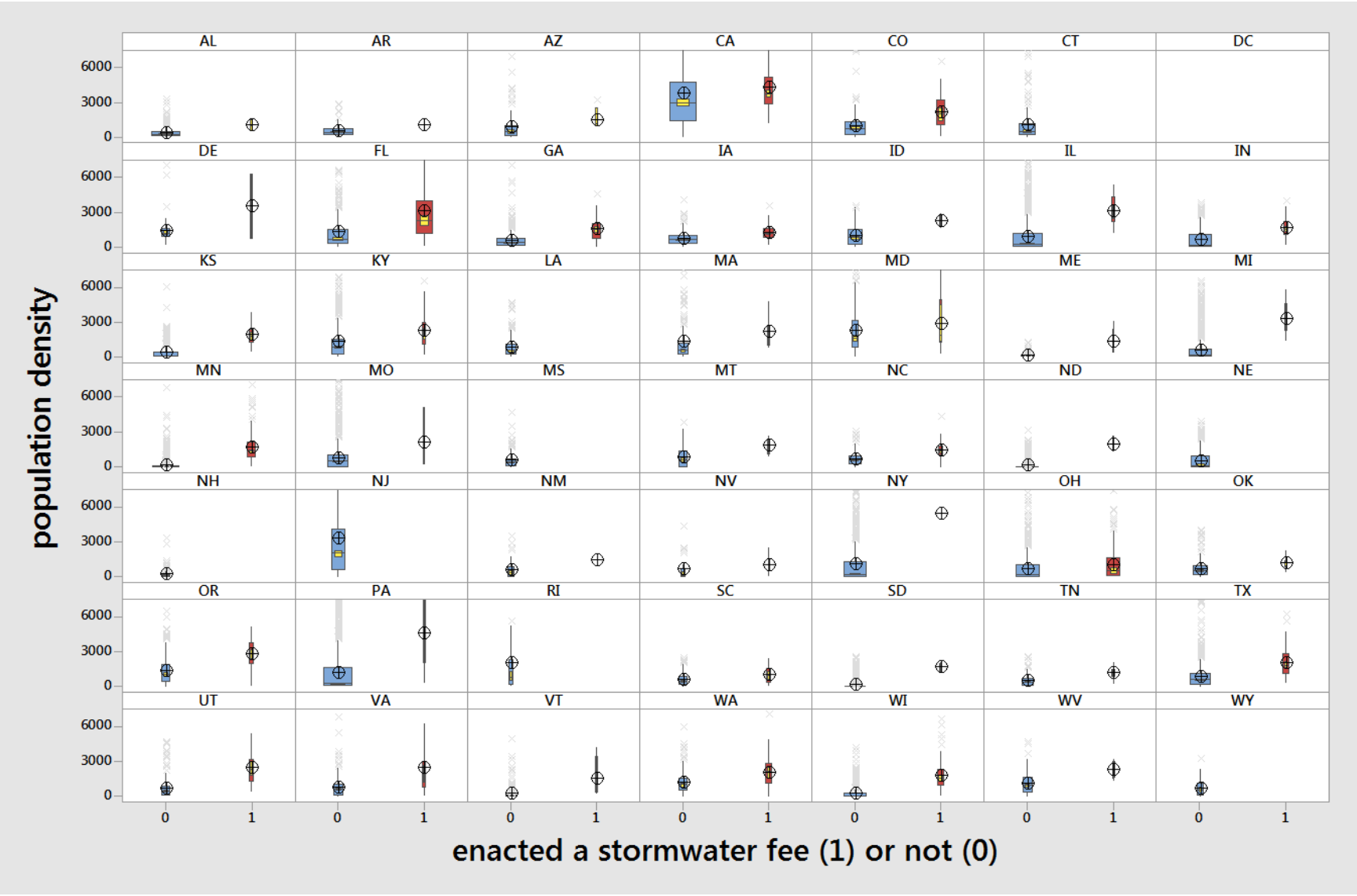


Figure B.18. Boxplot of population by state and stormwater fee enactment. Box widths are proportional to sample size. Outlier (grey Xs) and mean (circular crosshairs) values marked, with 95% confidence intervals around median values (yellow boxes). Y-axes truncated to visually emphasize separation between distributions.

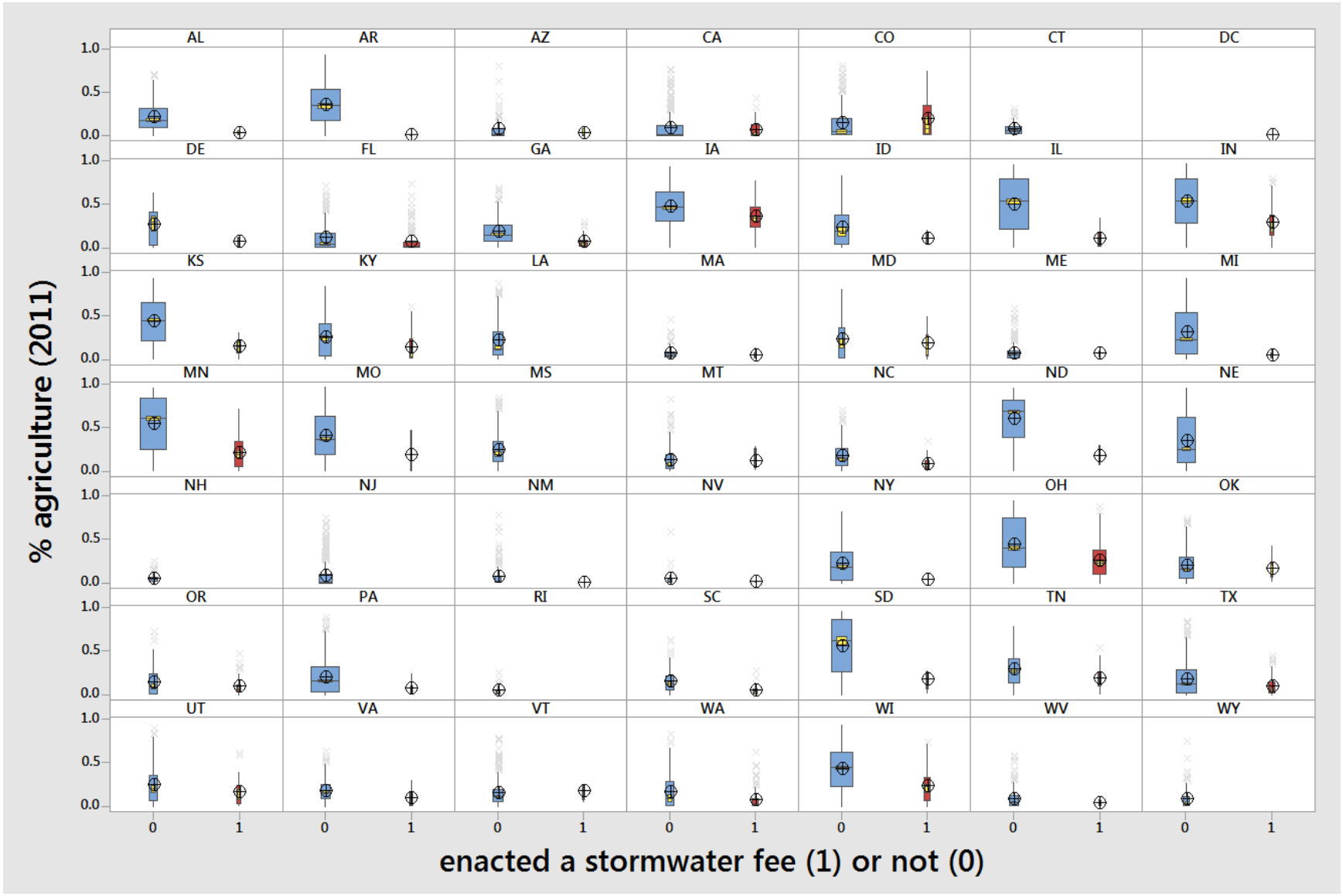


Figure B.19. Boxplot of percent agricultural land use by state and stormwater fee enactment. Box widths are proportional to sample size. Outlier (grey Xs) and mean (circular crosshairs) values marked, with 95% confidence intervals around median values (yellow boxes).

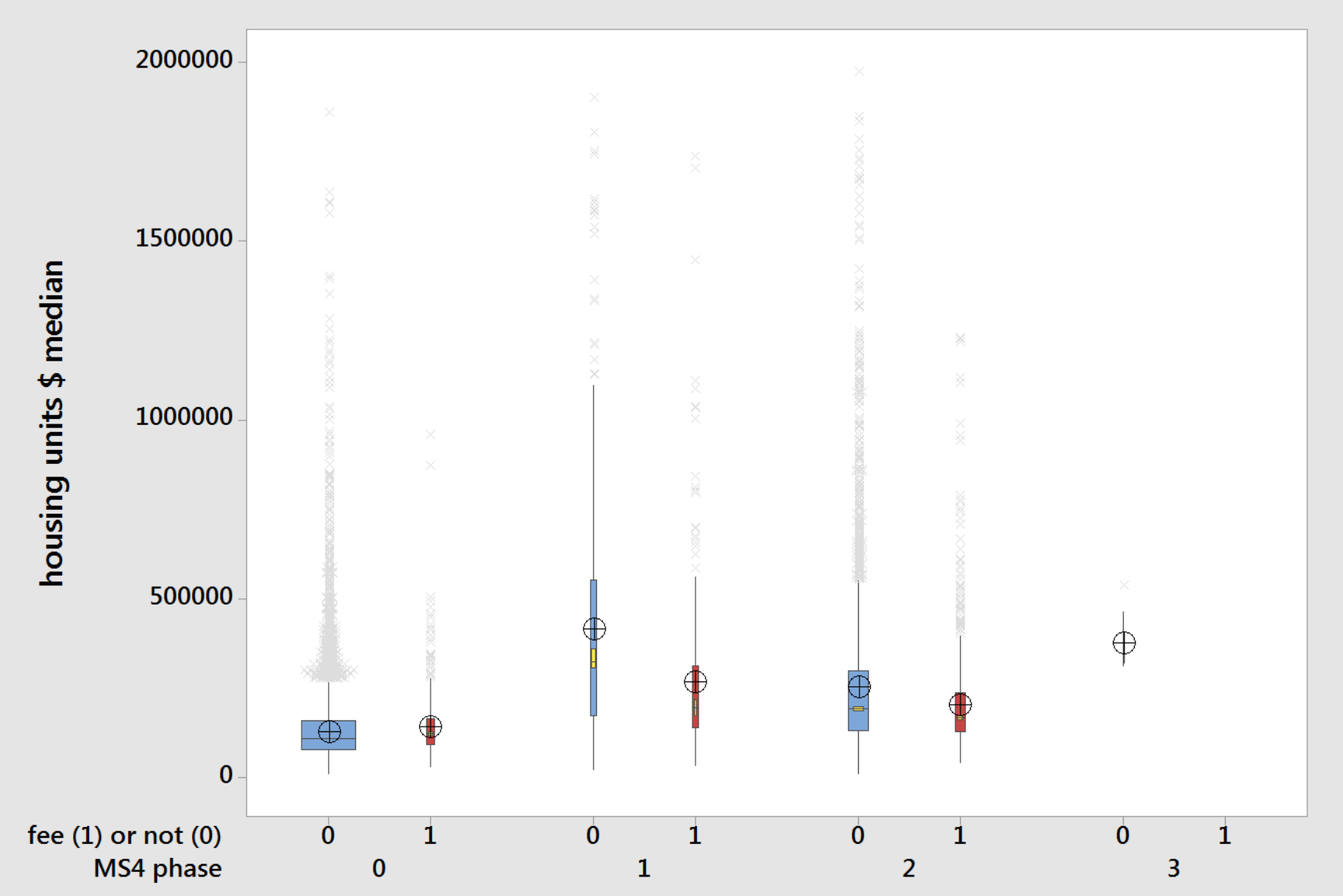


Figure B.20. Boxplot of median housing unit value by MS4 phase and stormwater fee enactment. Box widths are proportional to sample size. Outlier (grey Xs) and mean (circular crosshairs) values marked, with 95% confidence intervals around median values (yellow boxes).

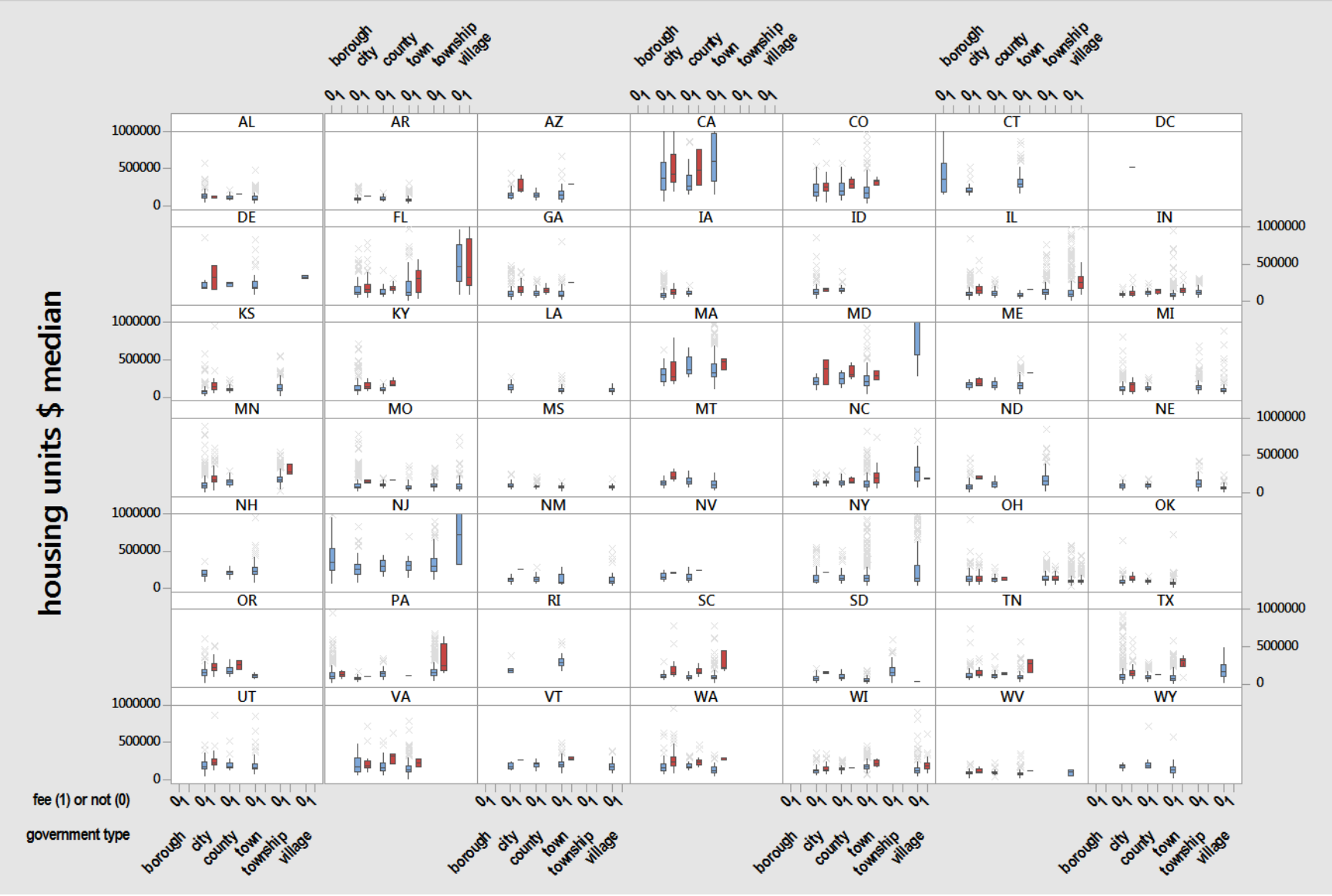


Figure B.21. Boxplot of median housing unit value by local government type and stormwater fee enactment. Charter township, municipality, plantation, city-county, and parish government types not shown for visual clarity.

B.4.2 When

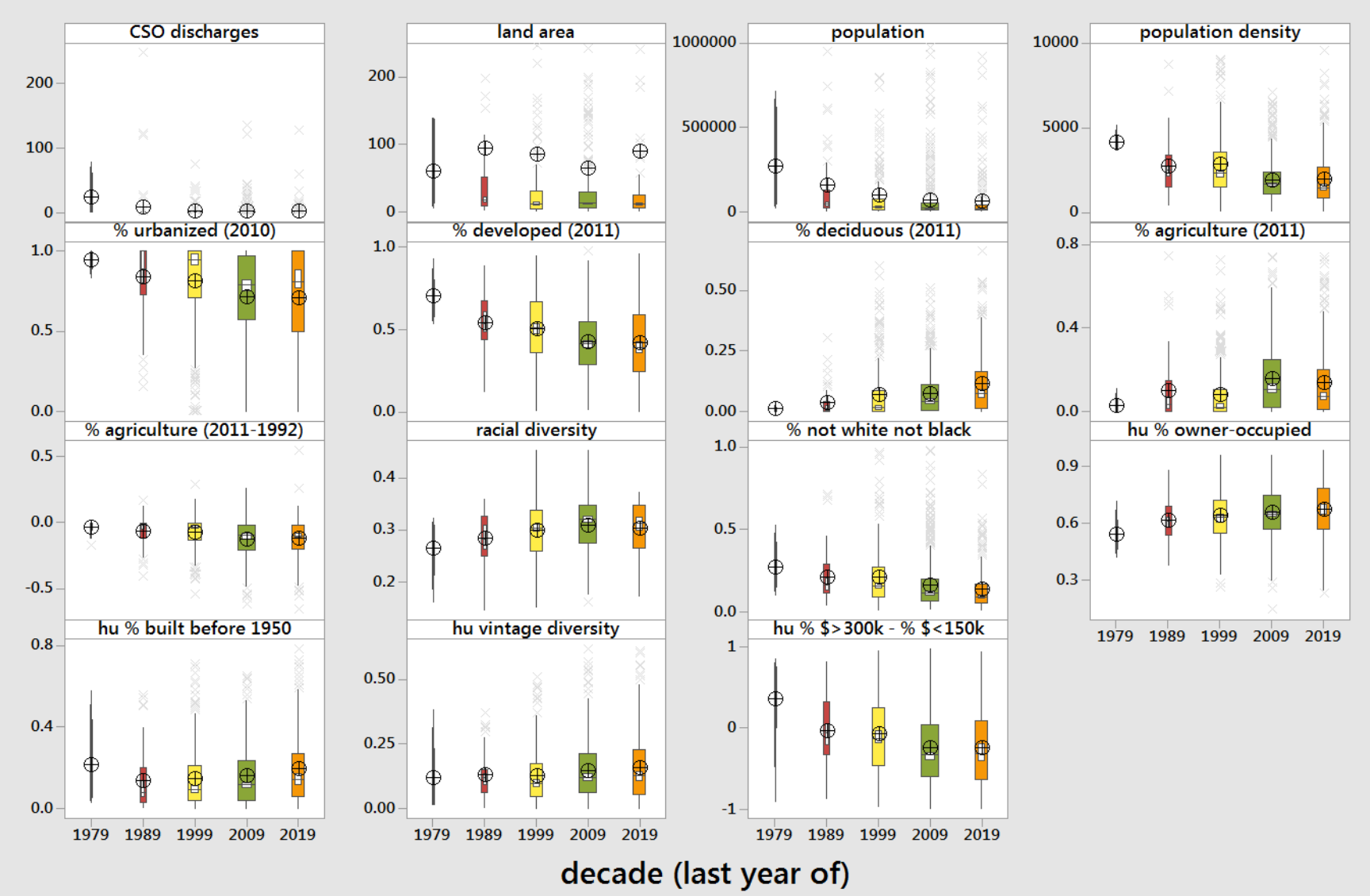


Figure B.22. Boxplot of continuous variables whose distributions exhibited the greatest separation among decades of stormwater fee enactment. Box widths are proportional to sample size. Outlier (grey Xs) and mean (circular crosshairs) values marked, with 95% confidence intervals around median values (white boxes). Y-axes truncated for land area, population, and population density to visually emphasize separation between distributions.

Table B.6. Pearson correlation coefficients for continuous variables selected for regression analysis on timing of stormwater fee enactment. Variables in grey text were eliminated due to high collinearity with other variables.

	# CSO discharges	land area	population	population density	% urbanized (2010)	% developed (2011)	% forested (2011)	% deciduous (2011)	% agriculture (2011)	Δ % agriculture (2011-1992)	racial diversity	% white or black	% not white and not black	housing units % owner-occupied	housing units % built before 1950	housing units vintage diversity	housing units median value	housing units % valued > $300k -% valued < $150k
# CSO discharges	1																	
land area	0.343	1																
population	0.549	0.457	1															
population density	0.256	-0.174	0.069	1														
% urbanized (2010)	0.222	-0.348	-0.077	0.563	1													
% developed (2011)	0.197	-0.305	-0.043	0.755	0.747	1												
% forest (2011)	0.029	0.181	0.033	-0.378	-0.336	-0.558	1											
% deciduous (2011)	0.128	-0.027	-0.046	-0.289	-0.179	-0.420	0.773	1										
% agriculture (2011)	-0.232	0.030	-0.063	-0.419	-0.572	-0.496	-0.085	0.051	1									
Δ % agriculture (2011-1992)	0.136	0.135	0.111	0.176	0.023	0.073	0.080	-0.105	-0.309	1								
racial diversity	-0.366	-0.122	-0.278	-0.174	-0.171	-0.136	0.020	0.146	0.259	-0.162	1							
% white or black	-0.104	-0.093	-0.255	-0.284	-0.165	-0.257	0.153	0.246	0.185	-0.132	0.615	1						
% not white and not black	0.078	0.099	0.269	0.396	0.157	0.280	-0.257	-0.315	-0.189	0.165	-0.367	-0.761	1					
housing units % owner-occupied	-0.252	-0.016	-0.157	-0.300	-0.205	-0.319	0.101	0.197	0.233	-0.166	0.406	0.311	-0.284	1				
housing units % built before 1950	0.169	-0.092	-0.041	0.119	0.000	0.131	0.028	0.108	-0.006	0.097	0.164	0.179	-0.221	-0.221	1			
housing units vintage diversity	0.144	-0.065	-0.076	-0.001	-0.103	-0.091	-0.002	0.025	0.140	-0.086	0.042	0.060	-0.060	0.121	0.332	1		
housing units median value	0.000	0.002	0.038	0.190	0.099	0.069	0.009	-0.071	-0.168	0.143	0.016	-0.213	0.139	0.153	-0.124	-0.061	1	
housing units % valued > $300k - % valued < 150k	-0.015	0.057	0.081	0.137	0.071	0.001	0.052	-0.060	-0.144	0.106	0.020	-0.222	0.125	0.240	-0.316	-0.096	0.804	1

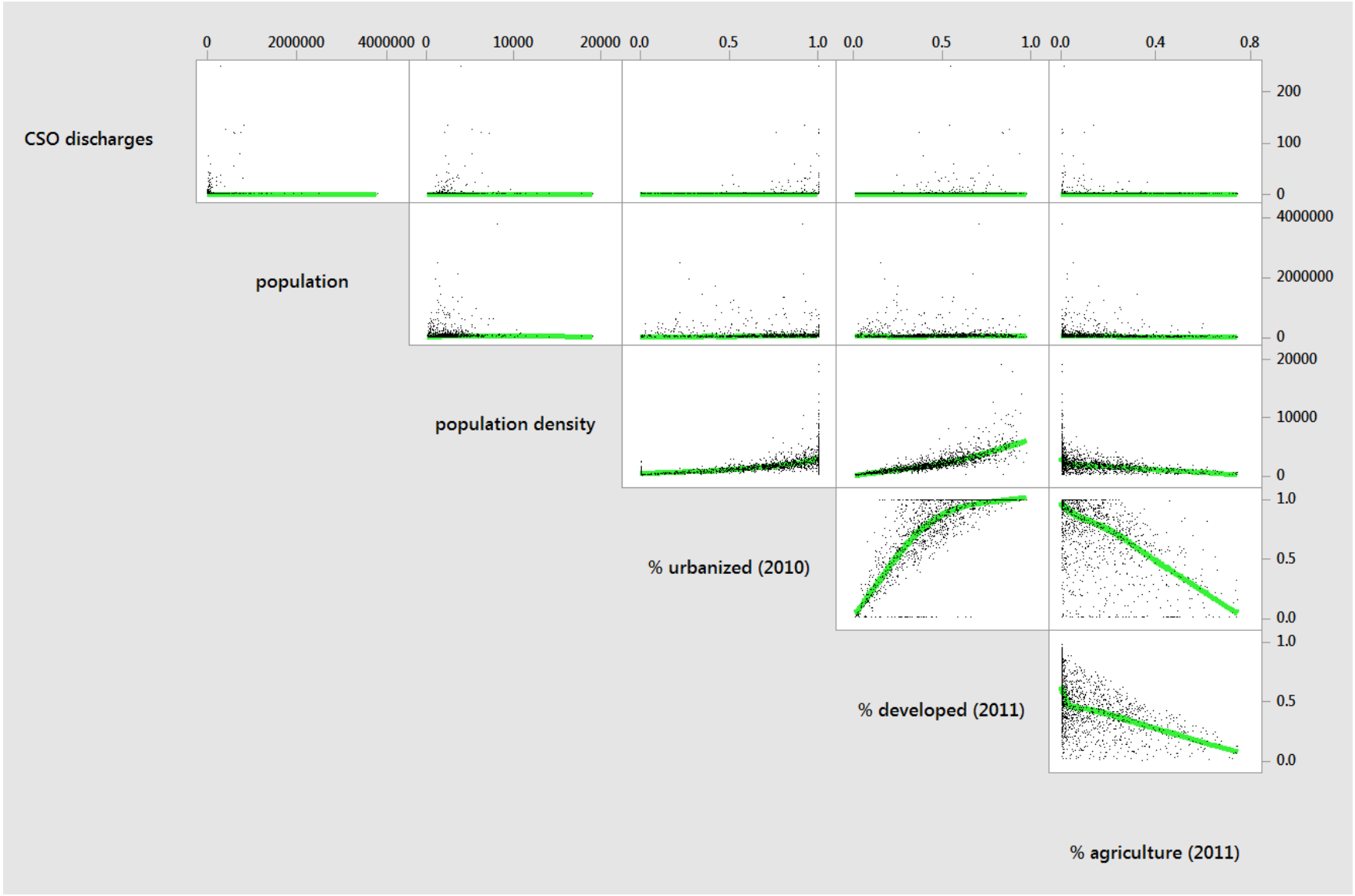


Figure B.23. Matrix scatterplot of the most highly correlated continuous variables selected for regression analysis on timing of stormwater fee enactment. Locally weighted smoothing curves shown in green.

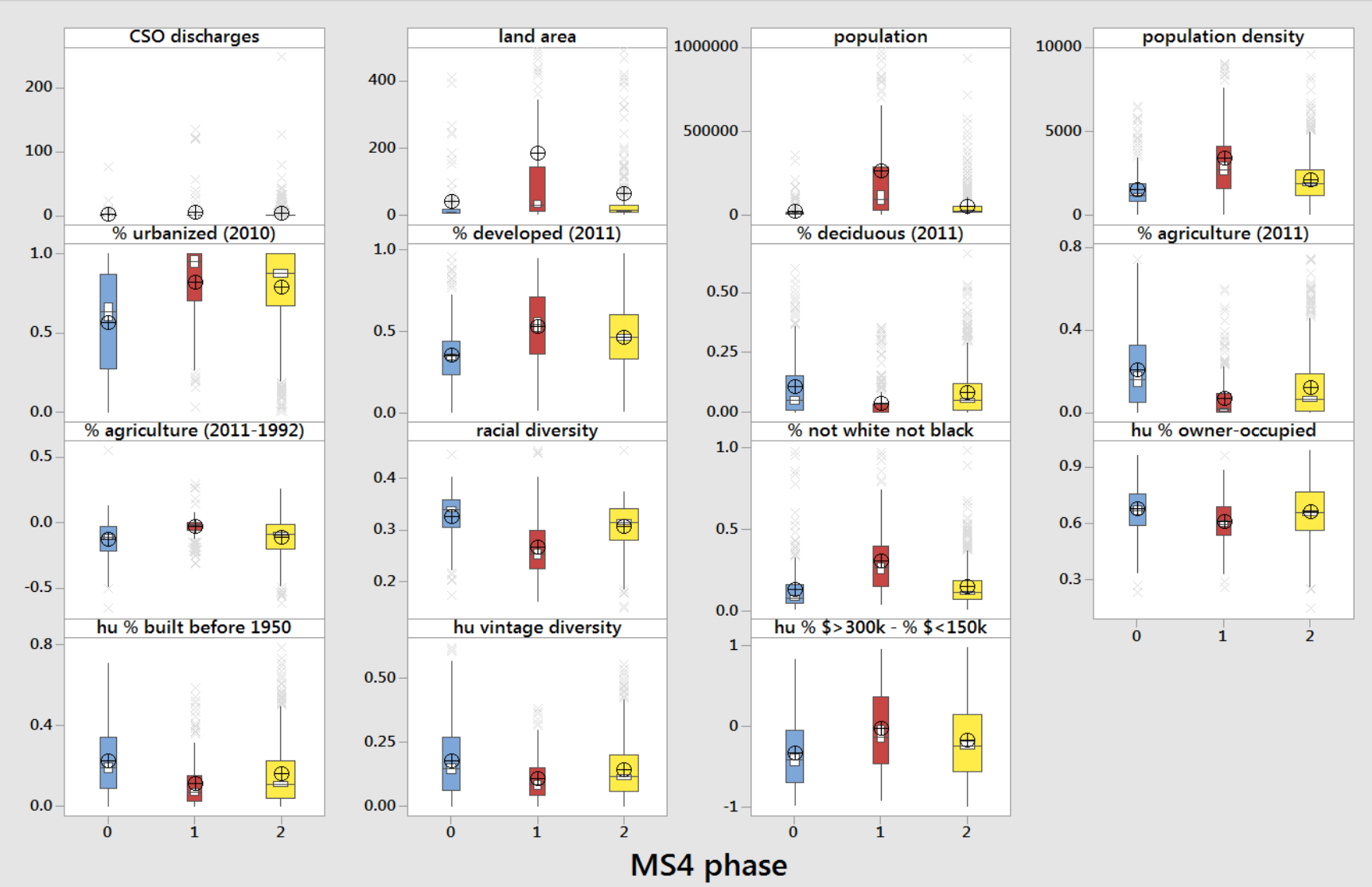


Figure B.24. Boxplot of continuous variables whose distributions exhibited the greatest separation among decades of stormwater fee enactment by MS4 regulation phase. Box widths are proportional to sample size. Outlier (grey Xs) and mean (circular crosshairs) values marked, with 95% confidence intervals around median values (white boxes). Y-axes truncated for land area, population, and population density to visually emphasize separation between distributions.

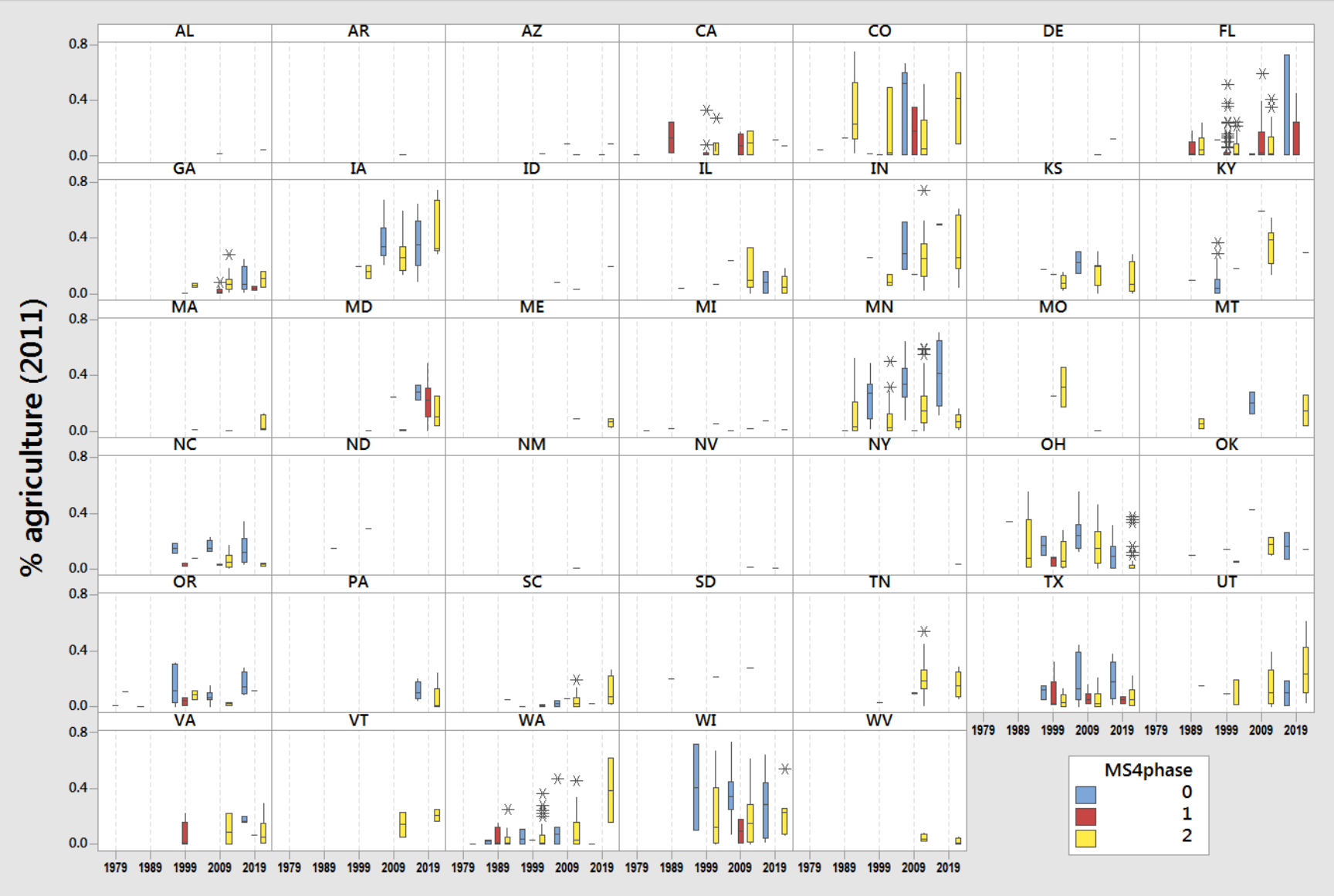


Figure B.25. Boxplot of percent agricultural land use by MS4 regulation phase, state, and decade of fee enactment.

Table B.7. Number of stormwater fees enacted each decade by MS4 regulation phase.

MS4 phase	1970 - 1979	1980 - 1989	1990 - 1999	2000 - 2009	2010 and after	total
0		5	67	119	83	274
1	2	21	109	70	25	227
2	4	48	168	411	185	816
total	6	74	344	600	293	1317

B.4.3 In what order within states

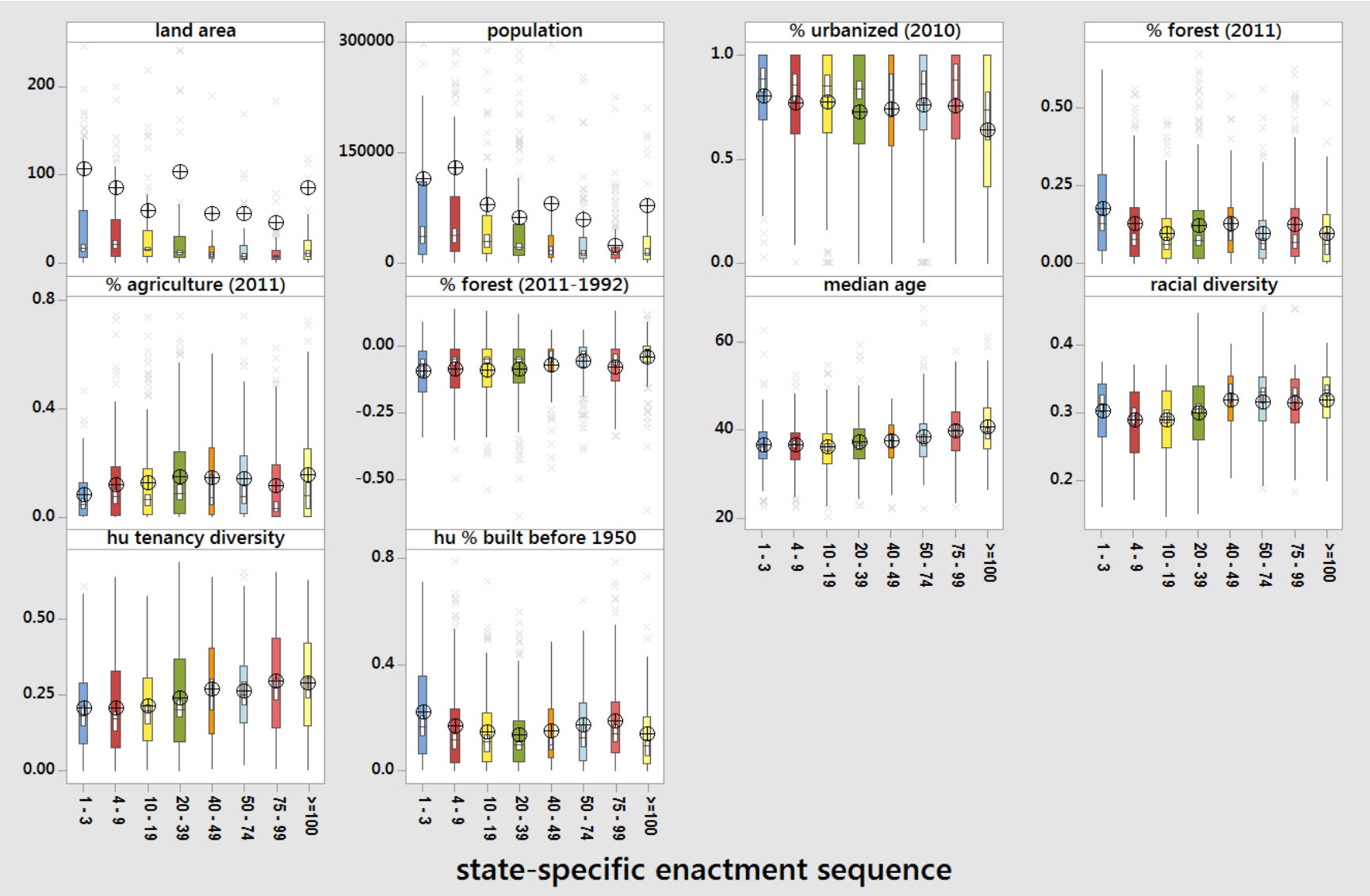


Figure B.26. Boxplot of continuous variables whose distributions exhibited the greatest separation among state-specific enactment sequence groups. Box widths are proportional to sample size. Outlier (grey Xs) and mean (circular crosshairs) values marked, with 95% confidence intervals around median values (white boxes). Y-axes truncated for land area and population to visually emphasize separation between distributions.

Table B.8. Pearson correlation coefficients for continuous variables selected for regression analysis on state-specific sequence of stormwater fee enactment.

	land area	population	% urbanized (2010)	% forest (2011)	% agriculture (2011)	Δ % forest (2011-1992)	median age	racial diversity	housing units tenancy diversity	housing units % built before 1950
land area	1									
population	0.457	1								
% urbanized (2010)	-0.348	-0.077	1							
% forest (2011)	0.181	0.033	-0.336	1						
% agriculture (2011)	0.030	-0.063	-0.572	-0.085	1					
Δ % forest (2011-1992)	-0.023	0.006	-0.090	-0.341	0.332	1				
median age	0.001	-0.110	-0.055	0.090	-0.168	-0.010	1			
racial diversity	-0.122	-0.278	-0.171	0.020	0.259	0.225	0.332	1		
housing units tenancy diversity	-0.043	-0.161	-0.179	0.099	0.229	0.088	0.317	0.380	1	
housing units % built before 1950	-0.092	-0.041	0.000	0.028	-0.006	0.059	0.030	0.164	-0.231	1

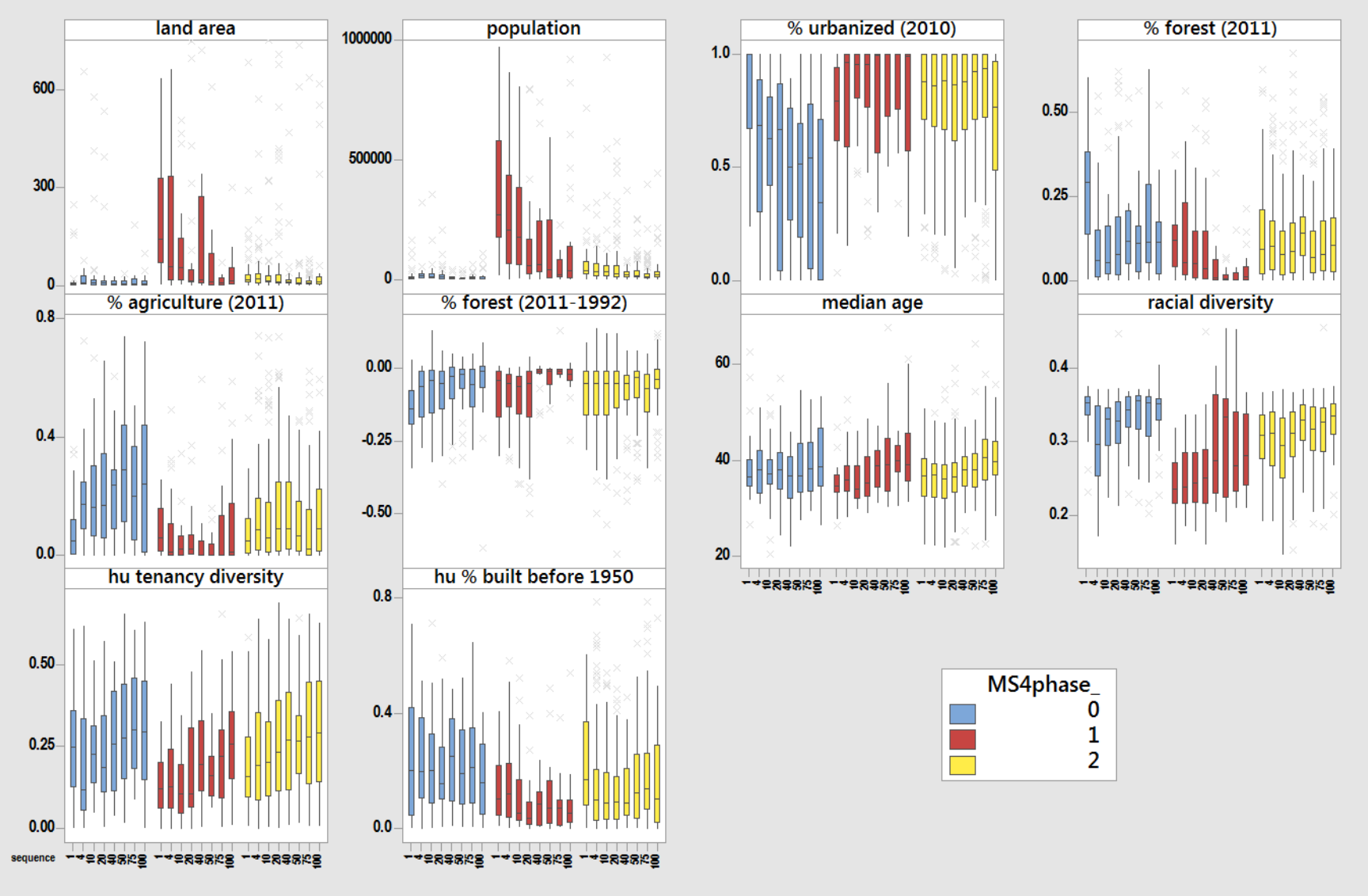


Figure B.27. Boxplot of continuous variables whose distributions exhibited the greatest separation among state-specific enactment sequence groups by MS4 regulation phase. Box widths are proportional to sample size. Outlier (grey Xs) values marked. Y-axes truncated for land area and population to visually emphasize separation between distributions.

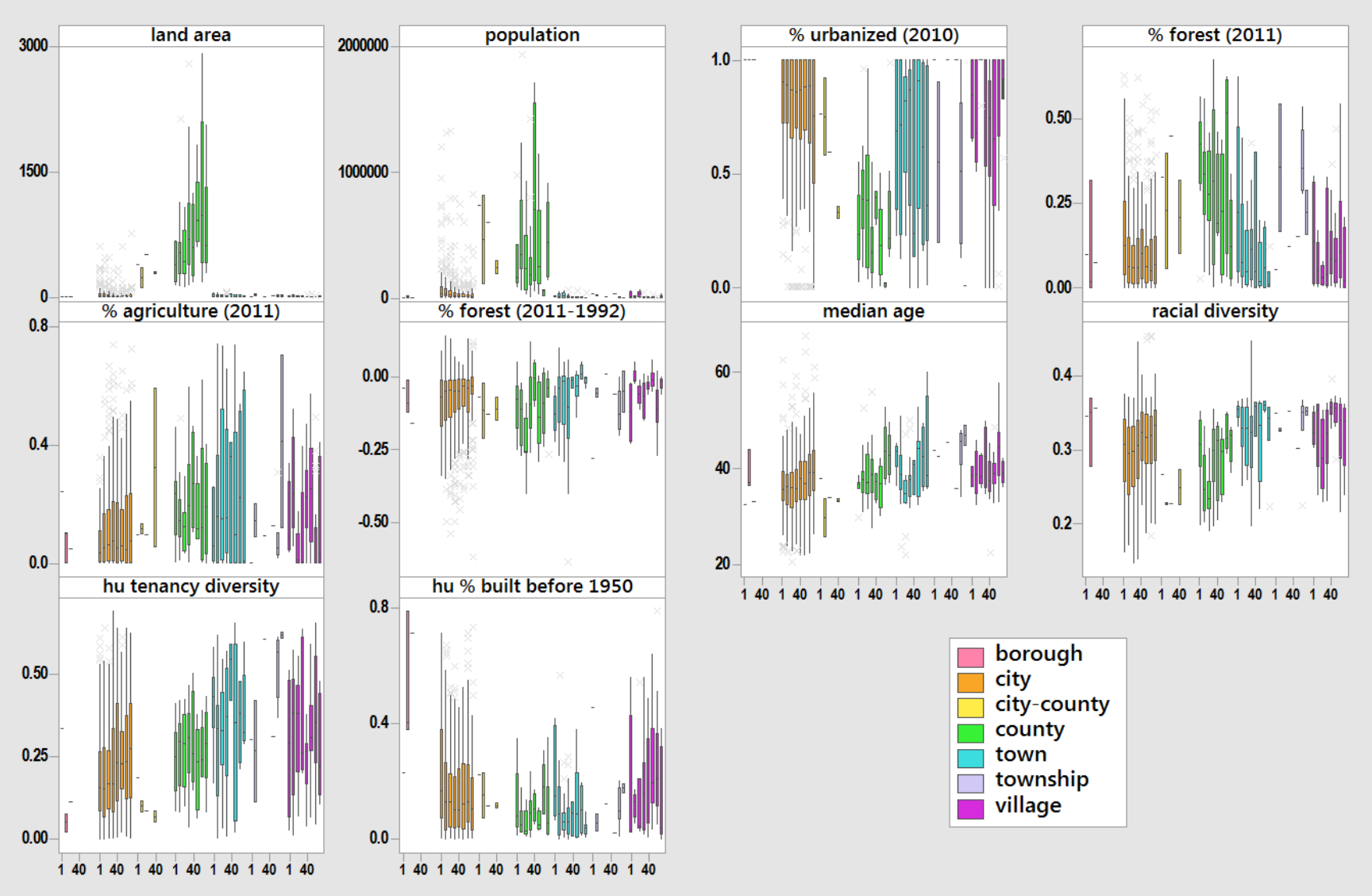


Figure B.28. Boxplot of continuous variables whose distributions exhibited the greatest separation among state-specific enactment sequence groups by local government type. Box widths are proportional to sample size. Outlier (grey Xs) values marked. Y-axes truncated for land area and population to visually emphasize separation between distributions.

B.5 OTHER SUPPORTING INFORMATION

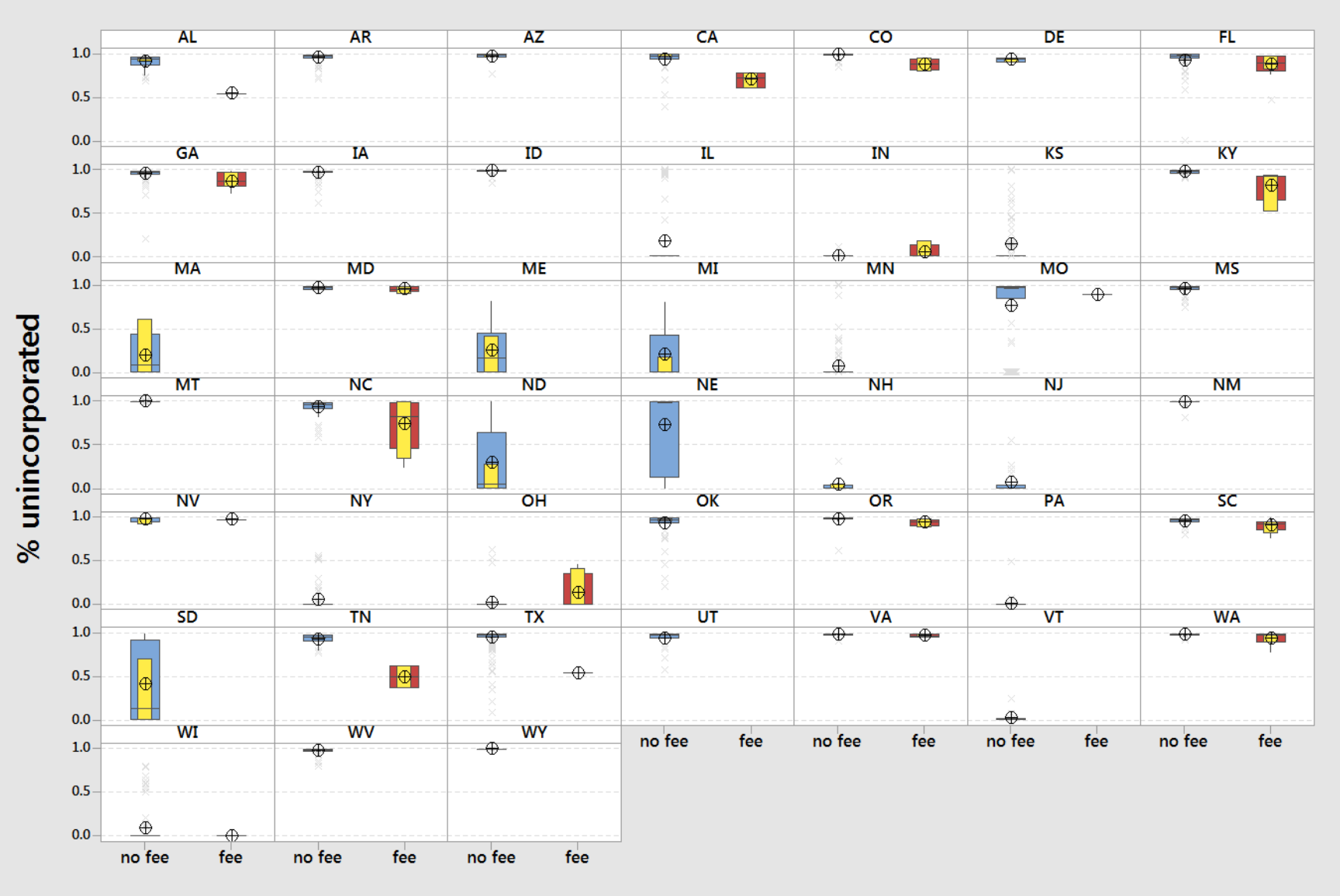


Figure B.29. Boxplot of percent unincorporated area in counties by state and stormwater fee enactment.
Outlier (grey Xs) and mean (circular crosshairs) values marked, with 95% confidence intervals around median values (yellow boxes).

APPENDIX C

FORM

C.1 INTERVIEW SCRIPT

Although I adjusted the interview questions somewhat to better tailor each interview to particular people and organizations, the following interview script outlines the main points I aimed to cover in each interview.

A bit about you

- What is your current role in your municipality?
- How long have you been serving in your current position here?
- What are your main responsibilities in this position?
- What – if any – positions have you held here previously?

- To what extent are you directly involved with decisions regarding stormwater and/or sewer management?

Your stormwater finances / fee

- Does your municipality currently assess a stormwater fee, or has your municipality ever assessed a stormwater fee? If so, to what extent were or are you involved with the design, deliberation, implementation, evaluation, or management of your municipality's stormwater fee? What led your jurisdiction to first consider a stormwater fee? To the best of your knowledge and memory, from where did the idea initially arise? If not, how does your municipality finance stormwater costs? Has your municipality ever considered such a fee, either independently or as part of a multi-municipal fee system?

- To the best of your knowledge, in the broader metropolitan region, has there been any multi-municipal collaboration or cooperation on stormwater fees specifically (e.g., on a county, watershed, or other basis), or stormwater and/or sewer management generally? If so, has your municipality been involved in any of those endeavors? In what capacity? How would you describe those efforts? Did your municipality voluntarily participate in these efforts? What forces, interests, or objectives drove those discussions? If not, why not?

- In the metropolitan region, have there been any other instances of inter-municipal collaboration or cooperation on other fronts (e.g., transportation, economic development)? If so, in what institutional forums did these efforts take place (e.g., councils of government, conservancy districts, watershed organizations, first suburbs consortia)? Did any of these other collaborative efforts influence your municipality's decision to participate or not participate in a multi-municipal stormwater fee system? If so, how?

- To what extent would you say the following factors influenced your municipality's decisions regarding stormwater financing / fees: political (intra-municipal and inter-municipal); physiographic (i.e., your municipality's position in your watershed); regulatory (e.g., MS4 permit requirements)? Any other kinds of factors that influenced your municipality's decision regarding stormwater financing / fees?

- If your municipality has a stormwater fee or participates in a multi-municipal stormwater fee system, how was the stormwater fee first received in your community? Has the reception changed over time? Has any opposition to the fee ever manifested? If so, how would you describe the nature, source, and effects of that opposition?

- Did your municipality – either directly or through another entity – conduct any sort of public outreach or public relations campaign prior to, concurrent with, or after enactment of the fee? If so, how would you describe the elements of this campaign (e.g., its leaders, its goals, its components, its effects)?

- In your opinion, has the stormwater fee been successful in your municipality? Do you foresee the fee continuing into the future? If so, why? If not, how could it be improved?

Conclusion

- That's all the questions I have for you. Is there anything else you'd like to add? Do you have any questions for me?

- Again, thank you very much for your generosity with your time and your willingness to participate in this interview.

- If you want a report on my research, I'll be in touch when as my dissertation progresses.

C.2 INTERVIEW TARGETS

The following tables provide further information on the people I interviewed for the stormwater fee form case studies (Table C.1) as well as the characteristics of each general-purpose subcounty government in the MSDGC/HCSWD service area (Table C.2), the NEORSD service area (Table C.3), and the ALCOSAN service area (Table C.4).

I conducted all interviews in person, except for the people representing the City of Cheviot and the Cincinnati Stormwater Management Utility, with whom I only had brief conversations over the telephone (Table C.1). Due to a lack of response or scheduling conflicts, I was unable to interview representatives of a few organizations I originally targeted, particularly MSDGC and the City of Cleveland. All but two of the interviews were with people who were directly employed by the organizations I targeted. In the NEORSD case, two of the interviews were with individuals directly employed by private engineering firms that were contracted with the targeted local governments (Table C.1). While I initially aimed to interview people directly employed by the targeted organizations, these interviews with consulting engineers provided unique perspectives, particularly because these firms had multiple local government clients across the region and were thus familiar with a variety of local perspectives on the NEORSD stormwater fee.

I recorded all the in-person interviews in the MSDGC and ALCOSAN case studies, but only two of five in-person interviews in the NEORSD case study (Table C.1). The unwillingness or reluctance to have interviews recorded in the NEORSD case study was primarily due to experiences people had with documented communications being discoverable and even subpoenaed during the litigation over the NEORSD stormwater fee.

Table C.1. People I interviewed.

case	organization		person(s)	interview		
	name	type	title	date	in-person?	recorded?
MSDGC	Evendale	village	Service Department Director	10 May 2016	Y	Y
	Hamilton County Storm Water District	special district	Program Director	11 May 2016	Y	Y
	Sharonville	city	Community Development Director	09 May 2016	Y	Y
	Wyoming	city	Assistant Public Works Director	12 May 2016	Y	Y
	Cheviot	city	Safety/Service Director	12 May 2016	N	N
	Cincinnati Stormwater Management Utility	city	Senior Engineer	13 May 2016	N	N
NEORSD	Oakwood	village	Village Engineer*	15 Mar 2018	Y	N
	Valley View	village	Civil Engineer** Principal** Civil Engineer**	15 Mar 2018	Y	N
	Independence	city	City Engineer	16 Mar 2018	Y	Y
	Northeast Ohio Regional Sewer District	special district	Watershed Team Leader	16 Mar 2018	Y	Y
	Strongsville	city	Law Director	16 Mar 2018	Y	N
ALCOSAN	Dormont Stormwater Authority	authority (borough)	Administrative Manager	15 Feb 2018	Y	Y
	Etna	borough	Borough Manager	16 Feb 2018	Y	Y
	Pittsburgh Water & Sewer Authority	authority (city)	Sustainability Manager Green Infrastructure Program and Policy Manager	26 Feb 2018	Y	Y
	Shaler	township	Township Manager	14 Feb 2018	Y	Y
	Whitehall	borough	Borough Manager	04 Apr 2018	Y	Y

* Chagrin Valley Engineering ** Donald G. Bohning & Associates

Table C.2. Select characteristics of general-purpose, subcounty governments in the MSDGC/HCSWD service area.

name	type	stormwater fee	area (mi^2)	population	population / mi^2	median income
Cincinnati	City	HCSWD	77.9	298,165	3,826	$34,002
Colerain	Township	HCSWD	42.8	58,640	1,369	$56,753
Green	Township	HCSWD	27.8	58,484	2,102	$68,714
Anderson	Township	HCSWD	30.4	43,553	1,434	$88,347
Fairfield	City	none	20.9	42,643	2,042	$55,803
Springfield	Township	HCSWD	16.4	36,364	2,219	$51,981
Delhi	Township	HCSWD	10.1	29,546	2,935	$67,605
Norwood	City	none	3.1	19,405	6,166	$36,075
Sycamore	Township	HCSWD	6.8	19,219	2,847	$64,311
Forest Park	City	independent	6.5	18,723	2,891	$48,865
Miami	Township	HCSWD	22.7	15,812	697	$70,241
Symmes	Township	HCSWD	8.3	14,726	1,770	$93,242
Harrison	Township		17.5	13,934	0	
Sharonville	City	HCSWD	9.2	13,581	1,470	$49,920
Loveland	City	independent	4.9	12,405	2,516	$66,384
Blue Ash	City	HCSWD	7.6	12,149	1,603	$65,991
Springdale	City	none	5.0	11,212	2,258	$49,757
Harrison	City	independent	4.9	10,479	2,130	$61,587
Montgomery	City	HCSWD	5.3	10,440	1,974	$101,675
Reading	City	none	2.9	10,354	3,580	$40,480
North College Hill	City	none	1.8	9,362	5,127	$39,328
Madeira	City	HCSWD	3.4	8,936	2,646	$86,612
Wyoming	City	none	2.9	8,427	2,929	$108,346
Cheviot	City	none	1.2	8,325	7,128	$37,841
Milford	City	independent	3.6	6,892	1,914	$131,667
Mount Healthy	City	HCSWD	1.4	6,061	4,311	$31,786
Indian Hill City	Village	HCSWD	18.6	5,808	313	$209,250
Deer Park	City	HCSWD	0.9	5,703	6,525	$50,015
Whitewater	Township	HCSWD	25.3	5,496	217	$42,173
Silverton	Village	HCSWD	1.1	4,779	4,298	$41,106
Columbia	Township	HCSWD	2.5	4,529	1,786	$58,197
St. Bernard	Village	none	1.5	4,361	2,821	$43,477
Amberley	Village	HCSWD	3.5	3,598	1,028	$112,115
Greenhills	Village	HCSWD	1.2	3,596	2,886	$55,000
Golf Manor	Village	HCSWD	0.6	3,595	6,252	$36,941
Lockland	Village	HCSWD	1.2	3,432	2,788	$32,695
Mariemont	Village	HCSWD	0.9	3,386	3,919	$92,837
Lincoln Heights	Village	HCSWD	0.8	3,368	4,491	$23,413
Cleves	Village	none	1.6	3,354	2,123	$58,021
Woodlawn	Village	none	2.6	3,300	1,284	$49,643
Evendale	Village	HCSWD	4.7	2,773	585	$105,625
Crosby	Township	HCSWD	19.8	2,754	139	$67,500
Newtown	Village	HCSWD	2.2	2,672	1,230	$72,105
Terrace Park	Village	HCSWD	1.2	2,254	1,920	$116,250
Elmwood Place	Village	HCSWD	0.3	2,173	6,769	$20,540
Glendale	Village	HCSWD	1.7	2,157	1,270	$96,840
Fairfax	Village	HCSWD	0.8	1,703	2,232	$55,066
Addyston	Village	HCSWD	0.9	970	1,141	$29,485
North Bend	Village	HCSWD	1.1	886	828	$77,083
Arlington Heights	Village	HCSWD	0.3	743	2,772	$41,354

Table C.3. Select characteristics of general-purpose, subcounty governments in the NEORSD service area.

name	type	county	12 gang	OHSC	area (mi^2)	population	population / mi^2	median income
Cleveland	City	Cuyahoga		+	82.5	396,815	4,812	$26,583
Parma	City	Cuyahoga		+	20.0	81,601	4,071	$51,383
Lakewood	City	Cuyahoga			6.7	52,131	7,787	$47,145
Euclid	City	Cuyahoga			11.5	48,920	4,253	$35,949
Cleveland Heights	City	Cuyahoga	–	–	8.1	46,121	5,674	$53,901
Strongsville	City	Cuyahoga	–	– –	24.6	44,750	1,822	$80,323
North Royalton	City	Cuyahoga	–		21.3	30,444	1,431	$66,189
Garfield Heights	City	Cuyahoga			7.3	28,849	3,960	$40,376
Shaker Heights	City	Cuyahoga		+	6.3	28,448	4,498	$79,519
Solon	City	Cuyahoga			20.5	23,348	1,141	$96,976
Maple Heights	City	Cuyahoga			5.2	23,138	4,479	$37,911
South Euclid	City	Cuyahoga		+	4.7	22,295	4,791	$59,734
Hudson	City	Summit			25.8	22,262	864	$126,618
Parma Heights	City	Cuyahoga		+	4.2	20,718	4,957	$44,564
Broadview Heights	City	Cuyahoga			13.0	19,400	1,488	$77,480
Brook Park	City	Cuyahoga		+	7.5	19,212	2,556	$48,813
Mayfield Heights	City	Cuyahoga			4.2	19,155	4,582	$45,875
Berea	City	Cuyahoga			5.8	19,093	3,287	$57,896
Twinsburg	City	Summit			13.8	18,795	1,365	$73,314
East Cleveland	City	Cuyahoga			3.1	17,843	5,764	$19,953
Fairview Park	City	Cuyahoga			4.7	16,826	3,595	$54,431
Middleburg Heights	City	Cuyahoga		+	8.1	15,946	1,978	$58,810
Lyndhurst	City	Cuyahoga	–	– –	4.4	14,001	3,153	$65,921
Brecksville	City	Cuyahoga	–	– –	19.6	13,656	697	$98,345
Warrensville Heights	City	Cuyahoga		+	4.1	13,542	3,277	$35,733
University Heights	City	Cuyahoga			1.8	13,539	7,436	$65,143
Olmsted	Township	Cuyahoga		+	9.7	13,235	1,367	$72,743
Bedford	City	Cuyahoga			5.4	13,074	2,424	$41,285
Beachwood	City	Cuyahoga	–	– –	5.3	11,953	2,262	$88,287
Seven Hills	City	Cuyahoga		+	4.9	11,804	2,406	$73,948
Macedonia	City	Summit			9.7	11,188	1,157	$86,061
Brooklyn	City	Cuyahoga		+	4.3	11,169	2,609	$45,102
Sagamore Hills	Township	Summit			11.2	10,964	977	$75,238
Bedford Heights	City	Cuyahoga	–	–	4.5	10,751	2,363	$37,692
Richmond Heights	City	Cuyahoga			4.4	10,546	2,370	$51,212
Bath	Township	Summit	–	–	22.4	9,702	433	$101,079
Willoughby Hills	City	Lake			10.8	9,485	875	$61,276
Olmsted Falls	City	Cuyahoga	–	–	4.1	9,024	2,187	$62,058
Highland Heights	City	Cuyahoga			5.2	8,345	1,619	$101,875
Columbia	Township	Lorain			25.7	7,167	279	$67,824
Independence	City	Cuyahoga	–	– –	9.6	7,133	741	$84,900
Richfield	Township	Summit			25.5	6,169	242	$94,500
Pepper Pike	City	Cuyahoga			7.1	5,979	837	$164,471
Northfield Center	Township	Summit			5.4	5,842	1,092	$86,346
Northfield	Village	Summit			1.1	3,677	3,403	$57,344
Oakwood	Village	Cuyahoga	–	–	3.4	3,667	1,069	$51,667
Mayfield	Village	Cuyahoga		+	4.0	3,460	873	$72,156
Orange	Village	Cuyahoga		+	3.8	3,323	869	$102,109
Moreland Hills	Village	Cuyahoga		+	7.2	3,320	460	$139,539
Twinsburg	Township	Summit			6.6	2,877	439	$81,136
Walton Hills	Village	Cuyahoga			6.8	2,281	336	$69,167
Gates Mills	Village	Cuyahoga			9.1	2,270	249	$132,167
Newburgh Heights	Village	Cuyahoga		+	0.6	2,167	3,717	$33,750
Valley View	Village	Cuyahoga		+	5.6	2,034	366	$86,071

name	type	county	12 gang	OHSC	area (mi²)	population	population / mi²	median income
Brooklyn Heights	Village	Cuyahoga		+	1.8	1,543	874	$64,722
Boston Heights	Village	Summit			6.9	1,300	189	$103,603
Bratenahl	Village	Cuyahoga			1.6	1,197	746	$82,500
Highland Hills	Village	Cuyahoga		+	2.0	1,130	575	$23,984
North Randall	Village	Cuyahoga			0.8	1,027	1,339	$35,288
Glenwillow	Village	Cuyahoga	–	–	2.8	923	332	$87,375
Woodmere	Village	Cuyahoga			0.3	884	2,646	$44,333
Cuyahoga Heights	Village	Cuyahoga		+	3.2	638	199	$49,286
Linndale	Village	Cuyahoga			0.1	179	2,209	$32,857

Table C.4. Select characteristics of general-purpose, subcounty governments in the ALCOSAN service area.

name	type	area (mi²)	population	population / mi²	median income
Pittsburgh	City	58.3	305,305	5,233	$42,450
Penn Hills	Township	19.4	42,073	2,173	$49,844
Mount Lebanon	Township	6.1	32,865	5,411	$86,422
Bethel Park	Municipality	11.6	32,222	2,766	$72,083
Ross	Township	14.5	31,004	2,139	$65,726
North Huntingdon	Township	27.3	30,735	1,127	$69,471
McCandless	Township	16.6	28,872	1,736	$80,265
Shaler	Township	11.2	28,599	2,558	$68,054
Monroeville	Municipality	19.7	28,250	1,433	$58,538
Plum	Borough	29.0	27,474	948	$71,204
Peters	Township	19.7	21,928	1,115	$109,713
West Mifflin	Borough	14.5	20,153	1,391	$50,273
Baldwin	Borough	5.9	19,794	3,369	$55,573
Penn	Township	30.7	19,752	643	$72,922
Upper St. Clair	Township	9.8	19,521	1,990	$110,417
Scott	Township	3.9	16,914	4,331	$63,620
Wilkinsburg	Borough	2.3	15,797	7,018	$33,905
South Fayette	Township	20.4	15,283	751	$79,527
North Fayette	Township	25.2	14,385	571	$71,394
Franklin Park	Borough	13.6	14,228	1,050	$121,661
Whitehall	Borough	3.3	13,873	4,177	$59,853
Robinson	Township	15.3	13,676	892	$82,706
Munhall	Borough	2.4	11,305	4,741	$48,978
North Versailles	Township	8.2	10,178	1,244	$42,478
Brentwood	Borough	1.4	9,550	6,605	$51,197
Swissvale	Borough	1.2	8,893	7,157	$40,391
O'Hara	Township	7.4	8,529	1,155	$87,917
Dormont	Borough	0.8	8,491	11,175	$58,875
Castle Shannon	Borough	1.6	8,288	5,196	$50,783
Bellevue	Borough	1.1	8,285	7,374	$41,073
Pleasant Hills	Borough	2.8	8,271	2,984	$68,453
Kennedy	Township	5.5	8,007	1,447	$66,353
Carnegie	Borough	1.6	7,944	4,913	$45,109
Collier	Township	13.6	7,755	570	$68,542
Indiana	Township	17.6	7,287	414	$89,663
West View	Borough	1.0	6,704	6,633	$57,078
Forest Hills	Borough	1.6	6,475	4,142	$63,563
Wilkins	Township	2.7	6,311	2,300	$53,345
Stowe	Township	2.3	6,289	2,737	$35,552
McKees Rocks	Borough	1.1	6,046	5,398	$29,431

name	type	area (mi²)	population	population / mi²	median income
Ohio	Township	6.9	5,937	865	$105,919
Crafton	Borough	1.1	5,899	5,164	$51,236
Fox Chapel	Borough	7.9	5,392	684	$148,553
Turtle Creek	Borough	1.0	5,292	5,463	$33,345
Bridgeville	Borough	1.1	5,117	4,671	$45,849
North Braddock	Borough	1.6	4,810	3,099	$28,565
Green Tree	Borough	2.1	4,749	2,289	$72,604
Avalon	Borough	0.7	4,666	6,753	$39,552
Millvale	Borough	0.7	3,714	5,488	$35,496
Sharpsburg	Borough	0.6	3,421	5,425	$32,431
Etna	Borough	0.8	3,415	4,296	$44,615
Mount Oliver	Borough	0.3	3,362	9,907	$33,750
Reserve	Township	2.1	3,307	1,602	$59,256
Ingram	Borough	0.4	3,294	7,590	$48,490
Pitcairn	Borough	0.5	3,259	6,456	$30,902
Homestead	Borough	0.6	3,142	4,882	$24,703
Edgewood	Borough	0.6	3,080	5,244	$73,250
Trafford	Borough	0.2	3,049	12,623	$49,345
Churchill	Borough	2.2	2,990	1,367	$88,605
Aspinwall	Borough	0.4	2,773	7,207	$66,108
Verona	Borough	0.6	2,590	4,343	$37,857
Emsworth	Borough	0.7	2,443	3,529	$55,399
Rankin	Borough	0.5	2,274	4,519	$25,117
East McKeesport	Borough	0.4	2,111	5,096	$41,081
Robinson	Township	21.2	1,977	93	$47,893
Baldwin	Township	0.5	1,972	3,899	$60,595
Wilmerding	Borough	0.4	1,911	4,460	$25,536
East Pittsburgh	Borough	0.4	1,844	4,760	$25,697
Braddock	Borough	0.6	1,841	2,852	$24,551
Ben Avon	Borough	0.5	1,774	3,871	$91,250
West Homestead	Borough	1.0	1,720	1,699	$49,219
Braddock Hills	Borough	1.0	1,674	1,752	$31,000
Blawnox	Borough	0.4	1,670	3,787	$39,929
McDonald	Borough	0.2	1,624	8,139	$43,571
Oakdale	Borough	0.5	1,508	3,216	$58,618
Heidelberg	Borough	0.3	1,314	4,641	$43,333
Whitaker	Borough	0.3	1,165	3,542	$39,167
Neville	Township	2.3	1,145	488	$44,375
Chalfant	Borough	0.2	798	5,018	$44,659
Wall	Borough	0.4	711	1,626	$45,000
Kilbuck	Township	2.6	632	243	$73,125
McDonald	Borough	0.3	503	1,563	$49,271
Rosslyn Farms	Borough	0.6	465	831	$128,750
Thornburg	Borough	0.4	449	1,032	$136,000
Ben Avon Heights	Borough	0.2	349	2,011	$148,750
Trafford	Borough	1.2	81	67	

C.3 INTERVIEW CODING FRAMEWORKS

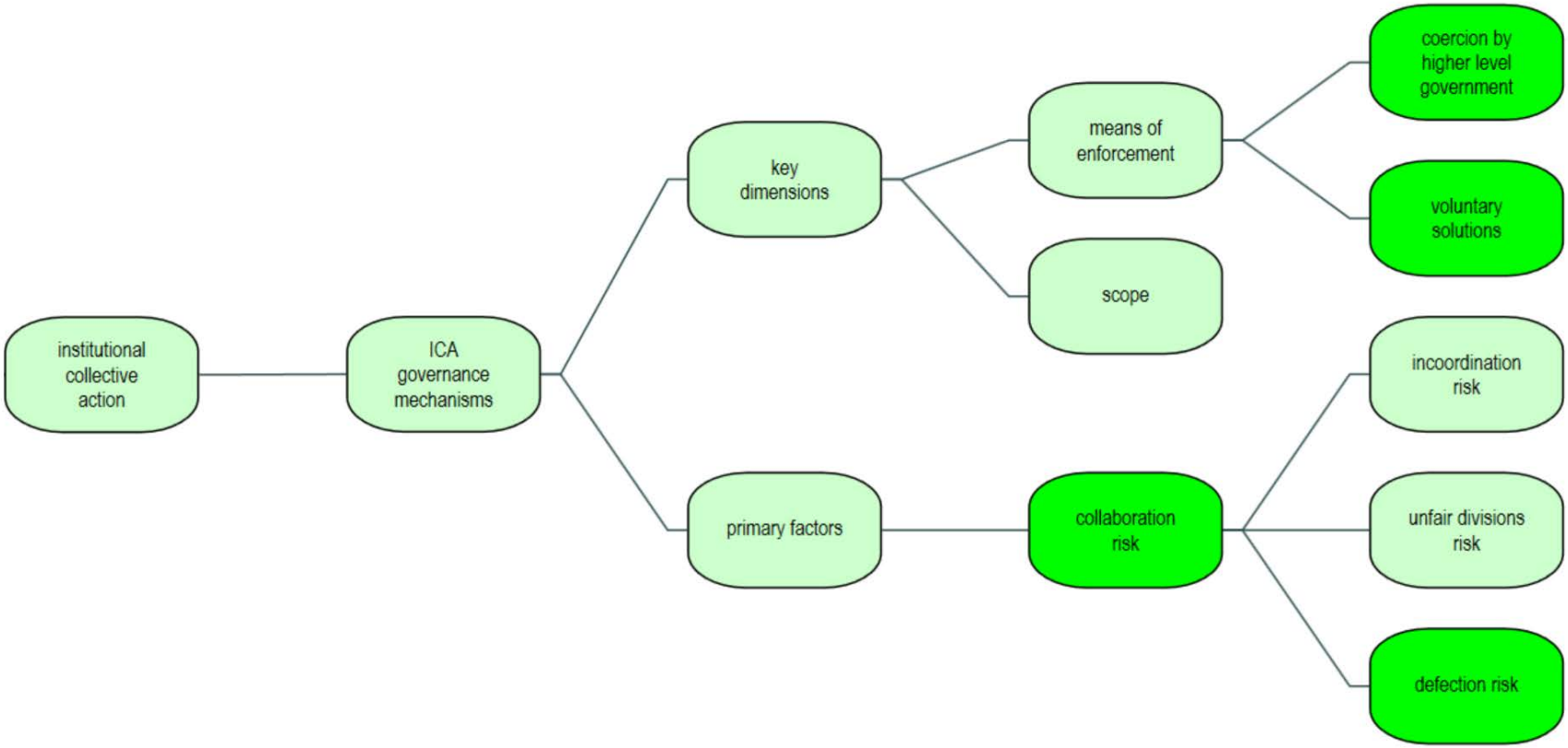


Figure C.1. Coding framework for the institutional collective action framework.

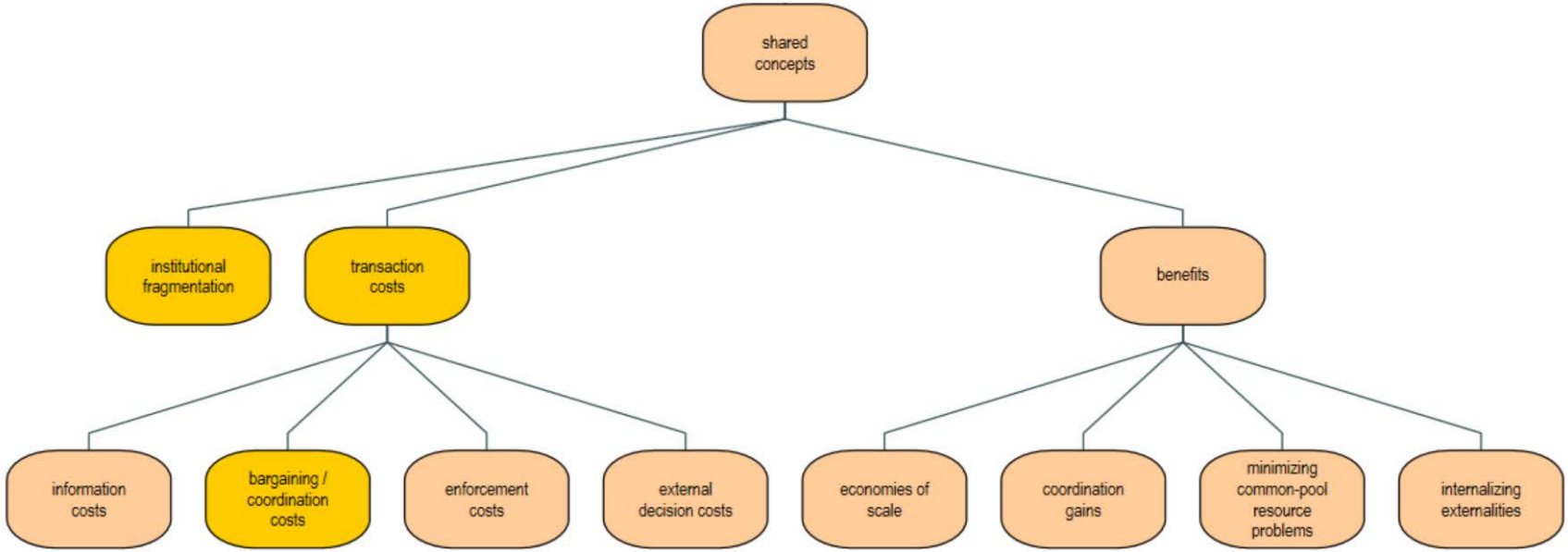


Figure C.2. Coding framework for concepts shared among the institutional collective action, ecology of games, and local public economy frameworks.

C.4 ADDITIONAL INTERVIEW CODING RESULTS

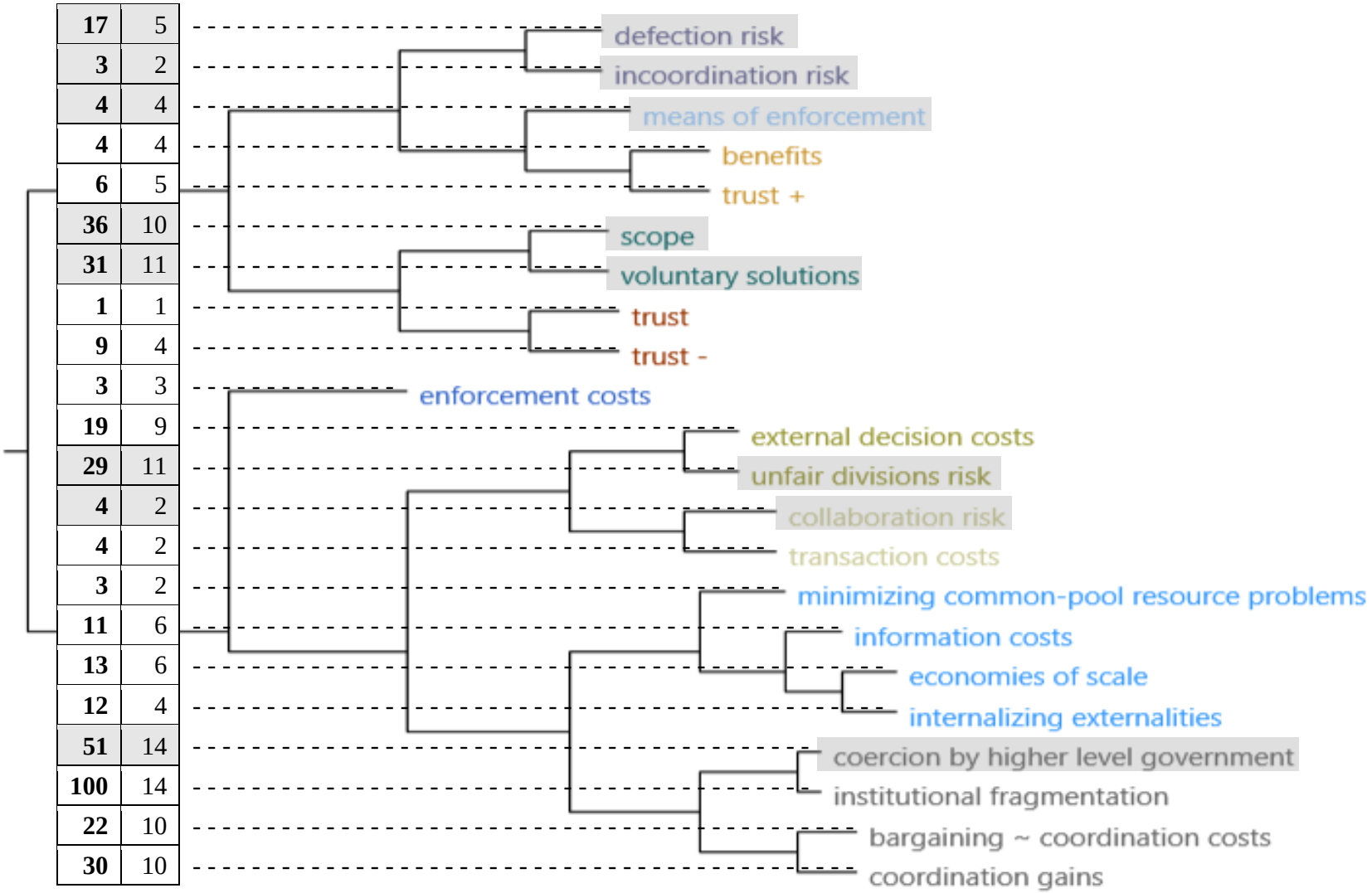


Figure C.3. Dendrogram of coded concepts for the form case studies. Concepts clustered by Pearson correlation coefficient based on number of times each concept was coded to each piece of evidence. Grey highlighting indicates concepts specific to the institutional collective action framework. Numbers indicate the number of times each concept was coded across all interviews (left column) and number of interviews in which each concept was coded (right column).

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