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Integrated watershed management in Michigan: Challenges and proposed solutions

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ABSTRACT

Michigan's current water management system is highly decentralized and based more on jurisdictional than watershed boundaries. There is both environmental and economic justification to examine alternate water resource management approaches given the current system's potential for inefficiency and redundancy. Our research addresses a central question: How might an integrated watershed governance system be applied in Michigan, where jurisdictional authority and political will are fragmented both horizontally across agencies and vertically across scales? We identify the key challenges facing Michigan's current approach to managing water resources and then describe two alternatives, referred to as Integrated Watershed Commissions (IWCs), which would coordinate water resource management and decision making on a watershed basis. The first alternative represents a relatively radical departure from the state's current structure, an "unconstrained" vision for comprehensive watershed management, which is not bound by the state's present political and management limitations. The second alternative, a more conservative or "constrained" vision for watershed coordination, operates primarily within Michigan's existing governance structures, and therefore includes mostly incremental change. For each alternative, we propose watershed boundaries and management structures, and discuss possible benefits and caveats. We also identify plausible next steps that can be taken in the near future, short of IWC implementation, that may catalyze water management reform and enhance coordination and collaboration in managing water resources in Michigan.

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Introduction

Michigan's location in the heart of the Laurentian Great Lakes, which hold nearly 20% of the world's supply of surface freshwater, allows for access to abundant water resources. However, challenges managing Michigan's water resources are on the rise as a function of emerging micropollutants (Baldwin et al., 2016; Eriksen et al., 2013), nutrient runoff and harmful algal blooms (Michalak et al., 2013), increased urbanization and stormwater runoff (International Joint Commission, 2009), intensified agricultural practices (Kerr et al., 2016), large scale water withdrawals (Lautenberger and Norris, 2016), and failing or insufficient infrastructure (21st Century Infrastructure Commission Report, 2016). These complex challenges unfold across political and administrative boundaries, and their human and ecological impacts are often not well understood. Although the watershed has been recognized by many as the optimal unit for organizing integrated strategies to address complex water resource challenges (Beheim et al., 2010; Heathcote, 2008; Koontz and Newig, 2014), Michigan currently lacks a statewide strategy for integrating management structures at the watershed level.

Our research addresses a central question: How might an integrated watershed governance system be applied in Michigan, where

jurisdictional authority and political will are fragmented both horizontally across agencies and vertically across scales? In response, we propose Integrated Watershed Commissions (IWCs) as vehicles for coordinating management and decision making at watershed scales so that desired outcomes can be achieved for all users of Michigan's water resources. This commentary develops and evaluates the feasibility of two visions for IWCs: 1) an "unconstrained" approach representing idealized recommendations for applying an integrated watershed management system in Michigan, unburdened by present political and management limitations; and 2) a "constrained" strategy for statewide integrated watershed management while operating, for the most part, within Michigan's current governance structures. Our rationale for proposing IWCs is to account for water use and manage resources in a more coordinated fashion than Michigan's current system. In turn, this could produce a range of benefits, such as economic gains associated with enhanced ecological conditions, economic efficiencies because of improved management strategies, improved coordination among disparate units of government, and development of a baseline of Michigan's water resources that can serve as a reference to assess future changes and help guide management decisions. Our recommendations also include plausible next steps that can be taken in the near future, short of IWC implementation, which may catalyze water management reform and enhance coordination and collaboration in managing water resources in Michigan.

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Research approach

Information was collected from October 2015 to January 2017 through three mechanisms: 1) collaboration with an invited team of Michigan's water-related thought leaders and decision makers; 2) analysis of Michigan's current water governance system; and 3) exploration of water governance models. We summarize these three approaches below, with details provided (see [Appendix A](#)).

Project team collaboration

More than 80 individuals representing various sectors with an interest in water resources provided guidance and feedback throughout the research process. Participants included leaders from state and local government, intergovernmental planning agencies, nonprofit organizations, industry/user groups, and Michigan's research community. Project team members convened for two larger workshops and one smaller review meeting to: a) identify challenges in Michigan's current water management system; b) generate proposals for improving water management; and c) provide feedback on preliminary findings and recommendations. In addition, more than 40 additional individual and small group discussions took place either in person or via phone to discuss specific topics.

Analyzing Michigan's current water management system

An initial workshop was designed to generate feedback regarding: 1) initial views or reactions to the idea of managing Michigan's waters using a watershed-based approach; 2) recommendations for improving how water is managed in Michigan; and 3) aspects of the current system that should not be changed, and why not. Information gathered from this workshop and relevant follow up discussions resulted in the identification of key challenges in the current system related to the idea of managing water resources in Michigan on a watershed basis. These challenges served as a foundation for our two IWC proposals. In addition, Michigan's statutory framework for water governance was reviewed to guide the development of our recommendations for reform, and assess the policy and legal implications of proposed reforms.

Exploring alternative models

Insights into designing a statewide integrated watershed management system for Michigan were gleaned by exploring model approaches used in other U.S. states and abroad. Watershed management strategies used in five states (CA, FL, MN, NE, WA), representing a range of approaches, were analyzed in detail for relative strengths, weaknesses, and suitability to Michigan's needs. Information on alternative models was collected mainly through literature reviews.

Challenges in Michigan's current water management system

Historically, impacts of water withdrawals and drainage have been viewed as localized issues in Michigan, resulting in a highly decentralized system that can present a range of coordination problems. Land has often been too wet for farming and building, and drainage needs have shaped a long tradition of common and statutory law that predates statehood ([Gregg, 1982](#)). This tradition was codified into a comprehensive legal framework in the mid-1950s through the Michigan Drain Code (PA 40 of 1956), establishing the county drain commissioner system used today, which is unique among U.S. states. Drain commissioners are elected public officials who manage primarily water quantity issues (e.g., flood control, stormwater) in waterways that are designated drainage districts. Drain commissioners can manage water resources only within the limitations of the Michigan Drain Code (PA 40 of 1956) and within the boundaries of the county in which they serve. Drainage districts that span more than one county are overseen

by an intercounty drain board, composed of drain commissioners from affected counties plus a representative from the Michigan Department of Agriculture and Rural Development (MDARD). Drain commissioners have extensive responsibilities in managing surface waters, and their work has major impacts on statewide public health, economic prosperity, and ecological function.

One key feature of the Drain Code is its focus on achieving efficient drainage. As a consequence, it seldom addresses other management strategies, such as water quality or conjunctive management of the hydrologically connected surface and groundwater systems. This legal framework is in stark contrast to how the hydrologic system actually functions. In addition, the drain commissioner system also faces a range of challenges related to institutional capacity, such as: financial and human resources vary widely across counties; some offices lack technology critical for science-based decision making, including geospatial technology and decision support tools; and drain offices can experience frequent turnover, with loss of important institutional knowledge.

At the state level, the Michigan Department of Environmental Quality (MDEQ) is the agency primarily responsible for a range of water management areas, including Michigan's water quality regulatory programs. Key agency responsibilities include implementing federal Clean Water Act and Safe Drinking Water Act requirements, management of wetlands, overseeing large quantity water withdrawals, and administering Great Lakes protection and restoration programs. Also at the state level, the Michigan Department of Natural Resources manages fisheries and state owned public land, among other functions. And as previously mentioned, the MDARD oversees and participates in the intercounty drains. Potential overlapping responsibilities and the lack of clear lines of authority with respect to managing the water can create challenges and impede integrated and interdisciplinary approaches to complex water resource issues. Water related permitting procedures can be extensive, confusing, and generate disincentives when demonstrating permit compliance is more costly than implementing improved management strategies. Although state agencies lead and participate in scientific monitoring activities, Michigan lacks a statewide, real time water quality and quantity monitoring and data management strategy for all surface and groundwater systems; developing such a coordinated strategy will make water management more efficient.

The lack of an integrated statewide water resource management strategy results in municipal governments managing water resources in isolation. Michigan has no statewide strategy for land use planning that can guide local priorities and goal setting. As a result, municipal land use decisions are inconsistently coordinated with regard to impacts on water resources, which can hinder efforts to address persistent environmental problems related to land use. Although Michigan has numerous nonprofit and intergovernmental planning organizations that coordinate watershed stakeholders for a range of environmental issues, they focus on their own catchment areas with limited coordination at the larger basin scale; hence, important decisions about water resources often continue to be made in geographic and administrative isolation.

Michigan's current water management system also faces several broad challenges affecting various levels of government and nongovernmental stakeholders. First, information and data gaps hinder science-based decision making and best management practices statewide. For instance, MDEQ collects information from public water suppliers and self-supplied users with the capacity to withdraw over 100,000 gal per day over any consecutive 30-day period, but knowledge of the state's water supplies and use trends is incomplete ([Seedang and Norris 2011](#); [Office of Great Lakes, 2016](#)). This information gap limits the capacity to identify possible conflicts in the future or plan appropriately. Insufficient data, along with a lack of refined hydrologic models, limit the development of decision support tools needed to diagnose and avoid impacts, scarcity, and other problems that emerge at local scales. Second, the system faces broad societal challenges. For example, participants in our project workshops widely asserted that the public often

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