

Thinking outside the ‘water box’ in the Detroit River Area of Concern

by

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A thesis
presented to the University of Waterloo
in fulfillment of the
thesis requirement for the degree of
Master of Environmental Studies
in
Environment, Resources and Sustainability Studies (Water)

Waterloo, Ontario, Canada, 2017

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AUTHOR'S DECLARATION

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

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ABSTRACT

Despite sustained attention to water issues around the world—including attention to shortcomings in water governance—many long-standing water problems persist around the world. This may be because some of the sources or causes of water problems are external to the water sector. Water governance often is based on water-centric problem framings that do not take sufficient account of the role of external actors, institutions, and drivers. Recognition of this problem is growing, but identifying external connections and then addressing the critical ones is challenging for water managers.

This thesis tests a flexible diagnostic process that can be used by researchers and practitioners to identify external connections and evaluate their importance in specific water governance settings. The case study for this research is the Detroit River Area of Concern (AOC), located in both the United States and Canada. The river is important and used extensively by both humans and wildlife; as a result of the human uses, the Detroit River was listed as an Area of Concern. The objectives of this research include (1) applying a diagnostic approach to the Detroit River AOC to determine whether or not external connections are affecting progress on the Detroit River Area of Concern, and if so, what external connections are most relevant and important to address; and (2) proposing response strategies and actions for improving governance in the Detroit River Area of Concern and beyond. This research uses a “two-case” multiple case study research design, triangulating data gathered from 28 key informant interviews, review of 58 documents, and personal observations.

The findings of this study reveal that the Detroit River AOC was carefully and purposefully designed in a water-centric manner, in order to more easily manage the complexity of cleaning legacy pollution. As a result of this water-centric framing, people working on the Detroit River AOC have completed numerous high-profile projects on the river, and the river should qualify for delisting as an Area of Concern without having to address external connections. That being said, a water-centric perspective has caused challenges in the AOC, and these challenges illustrate that efforts should be made to engage external drivers, institutions, and actors in parallel to or after AOC delisting. Key external connections include global environmental changes such as climate change and the introduction of invasive species, the health of adjacent waterways, population and land use change, and changing incentives in the form of funding, regulations, and public perception. Practitioners have several options for addressing external connections both during and after delisting; these include thinking more proactively about “life after delisting” through a comprehensive visioning exercise, connecting with existing initiatives and networks in the area with the help of “boundary spanners,” strengthening binational ties, and clarifying the role of an Area of Concern.

Ultimately, this thesis contributes to furthering our understanding of external connections in water governance, with special focus on the Great Lakes Area of Concern program.

ACKNOWLEDGEMENTS

Thanks first to my advisor Dr. Rob de Loë, who I have been working with since May of 2014! From a Fulbright application to a Master's thesis, I have Rob to thank for helping me make sense of new topics, facilitating a smooth research process, sharing a wealth of Great Lakes and life advice, and snuffing out my imposter-syndrome concerns. To my committee member Dr. Bob Gibson, thank you for always providing a fresh perspective on my work and for your lighthearted tips regarding snappy titles and cartoons. Thank you also to Dr. Simon Courtenay who took the time to serve as my external examiner.

I am extremely grateful to many individuals on both sides of the Detroit River Area of Concern who welcomed me to the area, took the time to share their experiences, and included me in events like I was part of the team.

To the numerous funders that supported my research endeavors and my time studying and living in Canada, thanks for allowing me to pursue this opportunity. The generous support I received allowed me to worry less about financing my dreams ... so I could worry more about living them!

To Marie Puddister, thank you so much for the maps in Chapters Four and Five (Figures 3 and 4). I very much appreciated your consistently fast turnaround and your willingness to fix small details months after you created the maps!

To my colleagues in the Water Policy and Governance Group—and in SERS more generally, especially those of you who work in EV2 2067 “the fishbowl”—thanks so much for the laughs, hugs, potlucks, underground walks to Tim Horton's during the winter, and much more. You are what I'll miss most about Canada.

And finally, thank you to my family and friends back home in the States. You made the distance between Canada and home seem much shorter than it was, and one of my greatest wishes for the world is for everyone to feel as much love and support as I have throughout my Master's and my life.

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LIST OF ABBREVIATIONS

AOC	Area of Concern
BPAC	Binational Public Advisory Council
BUI	beneficial use impairment
IJC	International Joint Commission
GLWQA	Great Lakes Water Quality Agreement
PAC	Public Advisory Council
RAP	Remedial Action Plan
SCDRS	St. Clair – Detroit River System initiative
SES	social-ecological system

Chapter 1

Introduction

1.1 Problem context

Globally, freshwater resources are under pressure from human influences. These pressures result in contamination, unsustainable use, and increasing vulnerability. Despite decades of attention to these challenges, they remain unsolved (United Nations World Water Assessment Programme, 2012; Wheater & Gober, 2015). Increasingly, the inability to resolve these problems is being attributed to shortcomings in water governance, rather than a lack of scientific or technical capacity (Godden et al., 2011; Mollinga et al., 2007; United Nations World Water Assessment Programme, 2012).

There are several definitions of water governance; this thesis refers to water governance as the systems in place to make decisions and take action regarding water resources (de Loë, 2015; United Nations World Water Assessment Programme, 2003). These systems exist in political, social, economic, and administrative spheres and at all levels of society, and involve both public and private organizations as well as civil society (Tortajada, 2010b, p. 298; United Nations World Water Assessment Programme, 2003, p. 372). Water governance sets the rules for and therefore enables water management; this influence makes water governance of foundational importance for water resources (Pahl-Wostl et al., 2012, p. 23; Tortajada, 2010b, p. 299). Commonly identified and internally-focused shortcomings of water governance include failures of institutions (Araral & Wang, 2013), insufficient public participation, and issues with accountability, transparency (Pahl-Wostl et al., 2012; Rogers & Hall, 2003; Tortajada, 2010b) and leadership (Ingram, 2008).

While addressing the internally-focused shortcomings described above is valuable and important, this paper aligns with the viewpoint that doing so is not enough when all or some of the sources or causes of water problems are external to the water sector. Many scholars are beginning to realize that circumstances external to water governance significantly and increasingly are influencing decision-making related to water (Biswas, 2004; Rockström et al., 2014; United Nations World Water Assessment Programme, 2012). For instance, Röckstrom et al. (2014, p. 38) state that “local water management can no longer occur in isolation from social and environmental processes at the regional to global scales.” This is especially true as water problems become increasingly complex and intertwined with external sectors (Biswas, 2004, pp. 248-249; Wheater & Gober, 2015). Regarding decision-making, the United Nations World Water Assessment Programme has noticed that water managers are not making the most important decisions about water; instead, public and private actors in spheres outside the “water box” are making these decisions (United Nations World Water Assessment Programme, 2012, p. 19). Water governance needs to be situated within or connected to broader external goals (Muller, 2015), and this thesis intends to take an important step toward accomplishing this task.

While the need to address external connections in water governance is well-established, advice on how to accomplish this is limited. de Loë and Patterson (in press) provide a new diagnostic framework that attempts to assist researchers in this endeavor; however, it is essential that this diagnostic framework be tested. The Detroit River Area of Concern, located between the

United States and Canada, provides an opportunity to test this new diagnostic process rigorously. The Detroit River is a dynamic waterway used intensively by both humans and wildlife. Located between Lake St. Clair and Lake Erie and at the intersection of two major flyways, the river is important habitat for wildlife of all kinds (Hartig et al., 2005). Meanwhile, humans in both countries have utilized the Detroit River and surrounding lands for centuries. The settled area is especially known for international trade, industrial prowess, cultural heritage, and recreational amenities (Detroit River Canadian Heritage Rivers Application Team, 1999). Because many of these human activities are destructive to the river and the wildlife it supports, the Detroit River was listed as a Great Lakes Area of Concern in 1987 (Green et al., 2010). Currently—and in the midst of these human activities—individuals are working to restore the river to ecological health and remove or “delist” it from the Areas of Concern list. Therefore, a valuable opportunity exists to explore the extent to which external factors are affecting the Detroit River’s condition and the ability of the people involved to delist as an Area of Concern.

1.2 Purpose and objectives

This research seeks to complete a diagnostic process for identifying external connections and evaluating their importance in specific water governance settings, using the Detroit River Area of Concern as an exploratory case. The objectives of this research are as follows:

1. To apply a diagnostic approach to the Detroit River Area of Concern, in both the United States and Canada, to determine:
 - a. whether or not external connections are affecting progress on the Detroit River Area of Concern, and if so,
 - b. what external connections are most relevant and important to address; and
2. To propose response strategies and actions for improving governance in the Detroit River Area of Concern and beyond.

1.3 Thesis outline

This thesis consists of seven chapters. The first chapter provides context for the issue of external connections in water governance, and presents the purpose and objectives of this research. Chapter Two uses relevant literatures to provide an overview of external connections, diagnostic approaches, and the social-ecological systems framework; the diagnostic framework used in the study is presented at the end of the chapter. Chapter Three explains the research approach and methods for gathering and analyzing data. Chapter Four provides background information on the context of the Detroit River and of the Areas of Concern program. Chapter Five synthesizes and presents this study’s findings. Chapter Six summarizes these findings, offers case-specific recommendations, and shares lessons learned from both findings and recommendations. Chapter Seven discusses the contributions of this research along with limitations and opportunities for future work.

Chapter 2

Literature Review

Water governance, institutional analysis, and social-ecological systems literature were the main bodies of literature used to provide the foundation for this study of external connections in water governance. This chapter begins with a discussion of external factors in water governance, and then outlines characteristics of diagnostic inquiry, emphasizing the social-ecological systems framework. This foundation was used to design the diagnostic questions and steps used in this research, which is described at the conclusion of this chapter.

2.1 External connections in water governance

Addressing broader external connections in water governance—looking beyond traditional approaches or getting outside of the “water box” (United Nations World Water Assessment Programme, 2012)—requires water managers to adopt a more systemic or holistic approach. Before discussing recommendations and challenges associated with a more holistic approach, this section explores the meaning of “external connections” as well as limitations of the water community’s current approach to solving problems and addressing external connections.

2.1.1 External connections

A valuable way to think about external connections more generally is to liken them to what the Millennium Ecosystem Assessment (2003, pp. 15-16) describes as “exogenous drivers”: factors a particular decision-maker does not have control over and may not even be aware of. This is contrasted with “endogenous drivers,” factors within a decision-maker’s control. Whether or not a factor is exogenous depends on spatial and temporal considerations. Some problems are exogenous to certain decision-makers but not others; some exogenous problems can become endogenous over time (Millennium Ecosystem Assessment, 2003, pp. 15-16). Thus, some connections are more “external” than others, and rethinking governance could provide an opportunity for water managers to gain some control over currently exogenous factors.

It is valuable to recognize that external connections can affect water governance in both negative and positive ways. Often, external connections are thought of as factors that have worsened or will worsen water governance concerns. However, external connections can also be positive influences that could have been or could yet be mobilized to improve water governance outcomes. Both negative and positive external connections merit attention: water managers can strive to ameliorate negative connections and amplify positive ones.

It is also valuable to divide external connections into three broad groups of “drivers,” “institutions,” and “actors.” While the three groups interact and intersect, thinking of them under these headings makes accounting for them more straightforward (de Loë & Patterson, 2017). Following Levy and Morel (2012, p. 5), “drivers refer to the overarching ... forces that exert pressures on the state of the environment.” Many drivers influence water, yet occur outside of the water sphere; examples include climate change, land use change, economic development, intensification of agriculture, urbanization, population growth, and technological change (Asian

Development Bank, 2013; Food and Agriculture Organization of the United Nations, 2014; Gupta & Pahl-Wostl, 2013; Hoekstra, 2011; Rockström et al., 2014).

The institutions and actors that influence water governance closely align with the drivers discussed earlier. An institution is defined as “a cluster of rights, rules, and decision-making procedures that gives rise to a social practice, assigns roles to participants in the practice, and guides interactions among occupants of these roles” (Young et al., 2008, p. xxii). Institutions serve as formal or informal structure for creating and implementing decisions (United Nations Economic and Social Commission for Asia and the Pacific, 2009). Laws, regulations, and agreements are examples of formal institutions; norms and traditions are informal institutions. The operation of one institution can affect the successful operation of another in a phenomenon known as institutional interplay (Young et al., 2008, pp. xvi-xvii).

According to the United Nations (United Nations Economic and Social Commission for Asia and the Pacific, 2009), actors are individuals and groups, both formal and informal, who are involved in decision-making and implementing decisions made. Actors have different interests or “stakes” they seek to preserve during a decision-making process, and have varying access to resources and political power to pursue those interests (Ingram et al., 1984; Molle, 2009). Actors can influence water issues directly or indirectly, and may not be aware of their influence. Key actors include individuals representing governments, the private sector, academic and research organizations, Indigenous peoples and civil society (Mollinga et al., 2007; Tortajada, 2010a; United Nations World Water Assessment Programme, 2009).

Drivers, institutions, and actors come together to create problem situations where water outcomes are influenced by external connections. For instance, global trade is an external driver that affects decisions being made about water. Although water itself is not often traded in bulk, it is traded in “virtual form” through water-intensive agricultural and industrial goods (Hoekstra, 2009, p. 28). Trade provides water-scarce nations access to water-intensive goods (Allan, 2005; Hoekstra, 2009). In this case, institutions such as trade barriers affect water: removal of trade barriers further promotes the exchange of water-intensive goods, and imposition of trade barriers discourages the exchange of these goods (Hoekstra, 2011, p. 26). Actors making decisions about trade—from international organizations to private sector companies—thus also make decisions about water.

2.1.2 The limitations of traditional approaches

Individuals and groups working on water problems struggle to address external connections because they adopt a narrow, sectoral perspective (Kramer & Pahl-Wostl, 2014; United Nations World Water Assessment Programme, 2009, p. 4). This perspective centers on the issue of water, which “most water professionals consider, at least implicitly...to be very important, if not the most important resource” (Biswas, 2004, p. 253). Such characterizations of water describe the resource as “essential to sustainable development” (United Nations World Water Assessment Programme, 2009, p. 3) or “the bloodstream of the biosphere” (Rockström et al., 2014, p. 230). In this section, I argue that this narrow, water-centric tendency is a key reason why external connections are poorly addressed in water governance.

One outcome of a water-centric approach is that water governance is frequently based on hydrological boundaries or watersheds. These watershed-based approaches were designed to resolve issues of cooperation, transparency, limited public participation, and special interest

capture (Huitema et al., 2009, pp. 12-13). However, a key concern with this approach is that many water problems today extend beyond that of a watershed or basin (Araral & Wang, 2013; Molle, 2006). For example, in the United States, federal policies including Energy Independence and Security Act of 2007 spurred a large increase in corn production for biofuels, potentially worsening the hypoxic “dead zones” in the Gulf of Mexico (Dominguez-Faus et al., 2009) and in western Lake Erie (Michalak et al., 2013). The current focus on geographic boundaries has concealed concerns that exist outside of the boundary (Huitema et al., 2009, p. 13; van Meerkerk et al., 2013).

Additionally, water-centric approaches limit opportunities for external actors to participate in water governance. Water jurisdictions have difficulty coordinating with other sectors and issues (Muller, 2015; Tortajada, 2010a, p. 310). Often, water officials do not consider the relationship between water and other sectors, and external officials are not consulted at all (Biswas, 2004, p. 253). Watershed boundaries can also isolate the concerns of external actors, as “geographical contours of watersheds do contain hydrological causes and effects, but not social, economic, or other causes or effects” (Blomquist & Schlager, 2005, p. 105).

Water scholars have offered numerous ideas and perspectives for addressing external connections, including integrated water resources management, water security, and the water-food-energy nexus (Bakker, 2012; de Loë & Patterson, 2017; Jønch-Clausen & Fugl, 2001; Ringler et al., 2013). However, as products of the water community, there are concerns that these perspectives are inherently water-centric and struggle to adequately engage actors outside of the water sector (Allouche et al., 2014; Biswas, 2004; de Loë & Patterson, 2017). For instance, when water professionals try to involve external actors, they usually invite external actors to participate in water decisions (United Nations World Water Assessment Programme, 2009, p. 4). However, this does not go far enough: outside of water, decisions are being made that impact water. If water managers are focused solely on water decisions, this goes unnoticed.

Additionally, water professionals expect external actors to change their behavior on the water sector’s terms, or “learn to recognize water’s role in obtaining their objectives and act accordingly” (United Nations World Water Assessment Programme, 2009, p. 3). This might involve activities such as placing water higher on the public agenda (Ingram, 2008, p. 8), demanding external actors consult water officials (Rogers & Hall, 2003, p. 25), and taking water into account in decision-making (United Nations World Water Assessment Programme, 2009, p. 4). This approach is problematic because external actors will likely not be interested in engaging with the water sector on its terms (Kramer & Pahl-Wostl, 2014; Muller, 2015). These actors may not share a strong interest in water and thus would be unwilling to change their activities in this way, at least in the absence of reciprocal commitments on the part of water actors.

2.1.3 Toward addressing external connections in water governance

While many people within the water community have recognized the need to link water with external drivers, actors, and institutions so that water problems can be addressed more effectively, contemporary perspectives to achieve this have fallen short. Therefore, new ideas and perspectives are necessary—especially ones that build on progress to date while moving beyond constraining water-centric assumptions.

Critics of contemporary ideas and perspectives emphasize a more holistic approach to water governance. They argue that water management should be integrated with broader development

goals (Muller, 2015), that water managers communicate with the private sector and civil society on these actors' own terms (Edelenbos & van Meerkerk, 2015; Rogers & Hall, 2003), and that water officials seek out opportunities to participate in non-water decision-making (Ingram, 2008; Mollinga et al., 2007). They also recommend shifting analysis from pre-defined watershed boundaries to "problemsheds" (Allan, 2005, pp. 184-185; Muller, 2015). Since problemsheds treat the boundaries of a problem as an open question, they shift the focus of water resources management "from what society should do for water to what water can do for society" (Muller, 2015, p. 689) and help to ensure that all constituencies affecting a water resource are involved with maintaining that water resource. To determine appropriate boundaries, managers must map out the complete problem setting. This could expose linkages and opportunities to connect with concerns external to water (Mollinga et al., 2007; Muller, 2015).

However, a more holistic approach to water governance comes with significant costs. Changing governance actors and institutions, and embracing innovative approaches, is risky for water managers because of deep path dependency (Godden et al., 2011, p. 3975). Typically there is little incentive to innovate—indeed, actors often resist changes in decision-making—because "it is easier to continue to do things in the same way than to make fundamental changes" (Ingram, 2008, p. 8). Transitioning to more holistic governance is especially risky, as water managers have to be willing to relinquish some control to "actors from other sectors who will have widely different vocabularies and worldviews" (de Loë & Patterson, 2017, p. 99). Additionally, the economic, institutional, and human transaction costs associated with a holistic approach are high (Edelenbos & van Meerkerk, 2015; Merrey, 2008; Muller, 2015). Engaging with external drivers, institutions, and actors requires significant levels of time and effort, which could be overwhelming for practitioners who are already stretched thin (Poirier & de Loë, 2010). The vast range of potential external connections in any given situation could also overwhelm decision-makers.

While these challenges cannot be eliminated entirely, some of them can be managed or mitigated, potentially facilitating better water governance. For one, moving to a more holistic approach to water governance may not make sense for all situations—different water problems need to be dealt with in different ways (Gupta & Pahl-Wostl, 2013), and some issues are amenable to water centrality. Water-centric perspectives can be appropriate "when the practical scope of causes, effects, and interests associated with a water issue are relatively clear, uncontentious, and bound by sector" (de Loë & Patterson, 2017, p. 93). Meanwhile, issues that cut across sectors and scales, and where disagreements about problems and solutions exist, favor a holistic approach (de Loë & Patterson, 2017).

For those issues where a water centric approach is not appropriate, strategically addressing external connections can help to make a holistic approach less overwhelming. A key goal should be to account only for the external connections that are most important to a given problem situation (de Loë & Patterson, 2017; Mitchell, 2004; Mollinga et al., 2007). Strategic targeting of external connections in a water governance problem situation requires a keen understanding of context, or a shift from "panaceas" or simplified solutions to personalized yet "clumsy" solutions (Ingram, 2008; Meinzen-Dick, 2007; Poirier & de Loë, 2010). The method of mixed scanning, where broader, higher-level decisions are combined with more incremental or short-term decisions, is one less-demanding way to consider external connections (Etzioni, 1967). Using a structured diagnostic approach is also a promising and useful approach, and one that is used in this document to analyze external connections in the Detroit River Area of Concern.

2.2 Diagnostic inquiry and the SES framework

2.2.1 Diagnostic inquiry

A “structured, context-specific approach” may help meet the challenges of implementing a holistic approach and altering water governance to account for external connections. This type of approach would enable researchers and practitioners to analyze their situation, identifying external connections along with feasible opportunities for change (Mollinga et al., 2007, p. 713; Pahl-Wostl, 2009). Diagnostic inquiry is designed to serve this purpose: it helps practitioners address context and develop appropriate solutions (Meinzen-Dick, 2007, p. 15200; Ostrom, 2007). Many goals and principles of diagnostic inquiry align with those of institutional analysis (Ingram et al., 1984). Because of this alignment, discussing the diagnostic approach and parallel values in institutional analysis adds to the theoretical foundation of this study and aids in creating the framework used for this study.

Diagnostic approaches, according to Cox (2011, p. 346), involve “asking a series of questions of a system at increasing levels of specificity based on the answers to previous questions. The answer to each question further unpacks the complexity of a problem, allowing an analyst to explore patterns of interactions that produce outcomes.” The goals of diagnostic inquiry are to determine the causes of a problem, devise theories about the problem through comparison with other cases, and to use both sets of information to formulate responses to the problem (Cox, 2011, p. 349).

Diagnosis begins with a thorough characterization of the problem setting and the nature of actors’ interests and resources, recognizing that the characterization will have implications on solutions offered and that it is dynamic and capable of change (Ingram et al., 1984, p. 326; Poirier & de Loë, 2010; Young et al., 2008, p. xv). While initially it was recommended that scholars simply be aware of uncertainty, more recently scholars have emphasized the importance of understanding uncertainty as part of the problem setting, recommending analysts consider “how governance has evolved in the specific context being analyzed and, if possible, how it is likely to evolve in the near future” (Poirier & de Loë, 2010, p. 237).

Diagnostic approaches are useful because they are designed to prescribe recommendations or solutions, which aligns well with this study’s final objective of proposing response strategies and actions for improving water governance. These solutions are the result of careful analysis, and are thus context-specific and appropriate for the problem at hand (Cox, 2011), feasible to implement under current conditions or potential “windows of opportunity” (Young et al., 2008, p. xvi), and cognizant of barriers to use (Ingram et al., 1984, p. 331). While diagnostic approaches provide context-specific solutions, they also recognize the importance of learning from other settings (Basurto et al., 2013, p. 1375). A key step in diagnosis is to compare cases to one another; comparisons are what give diagnosticians the ability to predict solutions (Cox, 2011, p. 350).

Diagnosis is common practice in the health care field, where doctors and other health professionals rely on their vast knowledge of the medical field to appropriately diagnose and treat a particular patient’s symptoms (McGinnis & Ostrom, 2014, p. 10). In the environmental field, a diagnostic approach has been applied to resources such as urban water systems (Ferguson et al., 2013), federal river basins (Garrick et al., 2013), irrigated agriculture, common property meadows, recreational fisheries, and energy systems (Hinkel et al., 2015).

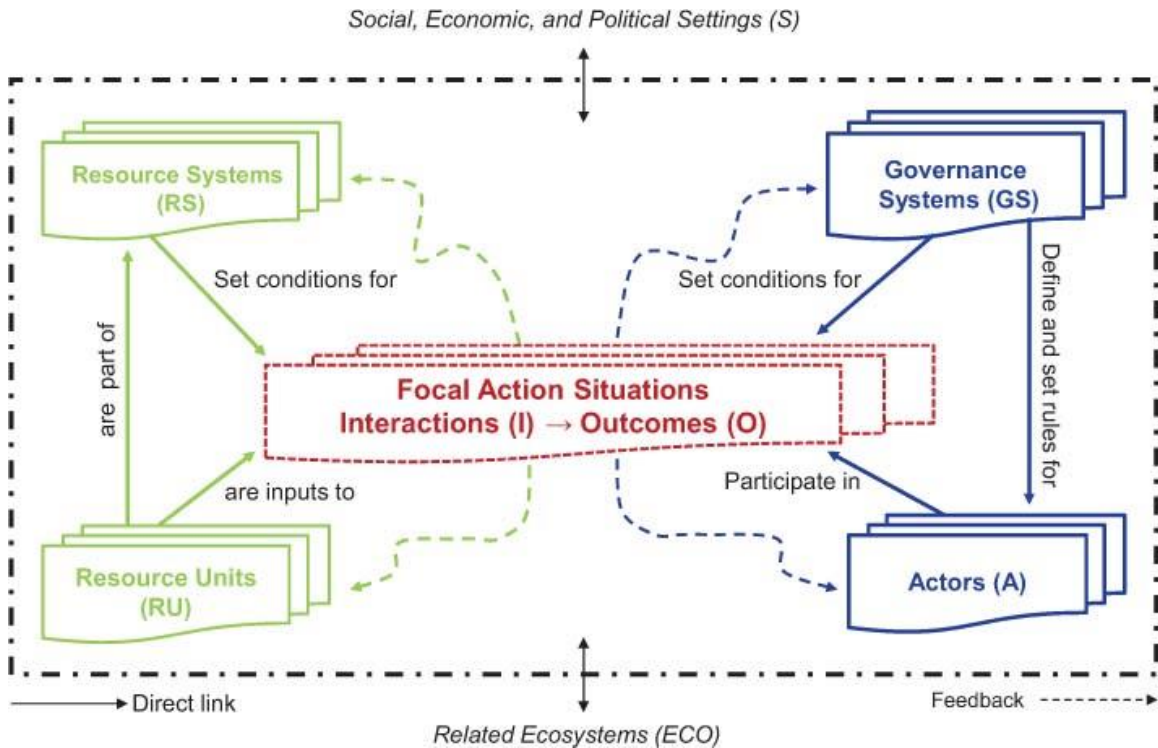
However, analysts have not yet used diagnosis to address external considerations. The diagnostic approach usually starts with broad questions and progressively moves to more specific ones, “spiraling inwards” and focusing internally to determine the cause of a problem (Cox, 2011, p. 358). To examine external or distal causes of problems, analysts would need to ask questions “spiraling outward” (de Loë & Patterson, in press). In some cases, such as doctors diagnosing individual patients, examining external connections might not be practical. While doctors may be aware that external forces (such as low socioeconomic status) are closely related to illnesses (such as heart disease), they often do not have the resources or capacity to intervene with these external connections (Cox, 2011, p. 360). If the problem were framed differently and/or a different analyst were examining the situation, considering external connections might make more sense. For issues of water governance, “spiraling out” could be appropriate, and there is an opportunity for analysts to fill the research gap and use diagnosis to examine external connections (de Loë & Patterson, in press).

2.2.2 The social-ecological systems framework

Frameworks are necessary to guide and structure diagnostic approaches (McGinnis & Ostrom, 2014). In the environmental field, Elinor Ostrom’s social-ecological systems framework (SES framework) intends to support diagnostic approaches (McGinnis & Ostrom, 2014; Ostrom, 2007, 2009). The goal of the SES framework is to help analysts map and understand the complexity of social-ecological systems (SESs), enabling them to ask appropriate questions, diagnose problems and recommend potential solutions (Ostrom, 2007, p. 15181). Because the SES framework offers a logic for addressing complexity, enables users to ask questions at increasing levels of detail, and facilitates collaboration and comparison due to its frequent use (Hinkel et al., 2015; Poirier & de Loë, 2010), it was seen as particularly valuable for organizing the diagnostic approach described at the end of this chapter. However, numerous alternative frameworks provide different lenses and options for examining external connections in water governance, and these alternative frameworks could illuminate or identify new considerations not included in the SES framework.

The SES framework decomposes a particular social-ecological system, or “focal SES,” into four conceptually broad first-tier components: actors (A), resource units (RU), resource system (RS), and governance system (GS). These components interact with each other in “action situations,” where interactions generate outcomes ($I \rightarrow O$) that affect the SES (McGinnis & Ostrom, 2014, p. 4). The role of exogenous influences is recognized through two secondary first-tier components, related ecosystems (ECO) and social, economic, and political settings (S) (McGinnis & Ostrom, 2014). These two components are located outside of the “focal SES” and do not participate in “action situations” but are affected by, and affect, the focal SES and the action situation (Ostrom, 2009, p. 420). Because of their location outside of the focal SES, and because diagnosis is not typically used to address exogenous influences, these components are less frequently examined or discussed (Thiel et al., 2015). A visual of how these variables are related to one another is presented in Figure 1.

Figure 1: SES framework with first-tier components (McGinnis & Ostrom, 2014, p. 3)



Each of these six first-tier components—RU, RS, GS, A, I→O, ECO, and S—has a large set of more conceptually specific second-tier variables, which are descriptive features associated with that particular component (McGinnis & Ostrom, 2014, pp. 2-4). These second-tier variables can continue to be further unpacked into lower and increasingly more specific tiers; exactly how they are unpacked depends on the research question and the type of SES (Ostrom, 2007, p. 15182; 2009, p. 420). Because there are so many second- and lower-tier variables, the framework is not intended for analysts to use all of the variables. Rather, analysts should clearly define variables that are relevant and important to them, using “existing field knowledge, previous research, or theoretical formulations” to select applicable variables (Nagendra & Ostrom, 2014, p. 67).

It is also important to recognize the types of resources the framework is best applied to. The SES framework was originally designed for common-pool resources: resources that exhibit high subtractability and low excludability (Hinkel et al., 2015, p. 3). Although the SES framework’s developers are unsure about how broadly it can be applied (McGinnis & Ostrom, 2014, p. 3), the SES framework has been applied to open-access or public goods (Fleischman et al., 2014), which exhibit low subtractability and low excludability (Hinkel et al., 2015, p. 3). For example, Epstein et al. (2014) used the SES framework to analyze depletion of stratospheric ozone, an open-access resource management issue. According to the authors, the same logic that drives destruction of common-pool resources also drives destruction of open-access resources such as the ozone layer, making it possible to apply the SES framework (Epstein et al., 2014, p. 341).

2.3 A diagnostic approach for water governance

The diagnostic approach presented here seeks to provide inquiry into connections both “internal” and “external” to water governance. This approach was developed and first presented in de Loë and Patterson (in press); this paper adjusts the order of the steps of the approach slightly, making the approach easier to understand and use. As stated earlier, this approach uses the SES framework as a starting point for diagnostic inquiry, but also draws from other literatures. This approach guided data collection and analysis (Chapter Three), and provided the basis for the reporting of results (Chapter Five) and recommendations (Chapter Six).

The approach consists of four steps, outlined below and illustrated in Figure 2. The first two steps of the diagnostic approach provide inquiry into connections and interactions “internal” to a water governance action situation. This involves defining the action situation as tightly as possible, and “spiraling inwards” to determine if a water sector perspective is appropriate. The final two steps of the diagnostic approach promote inquiry into connections and interactions “external” to a water governance action situation. This involves “spiraling outwards” to explore wider factors and interactions, reflecting and modifying action situation boundaries if necessary.

The first step is to delineate and describe the initial focal “action situation” or problem setting, using the four core first-tier SES components as a guide for doing so. Relevant variables are identified and then characterized using practical experience, advice from experts, and literature review. In this first step, the action situation is delineated in a way that is consistent with existing policy framings. Focusing on how the problem is presently understood provides a pragmatic starting point for analysis, and can be corroborated by key informants more familiar with the problem setting (Checkland, 2000, p. S22). Additionally, using existing policy framings will hopefully reduce the often subjective and contestable nature of problem definition.

After the present understanding of the action situation is thoroughly outlined, the second step is to apply a series of diagnostic questions to the action situation, focused internally or “spiraling inwards” to inquire deeply about the action situation. The second step intends to expand upon the first step, digging deeper and reflecting upon the four core components categorized in the first step. Diagnostic questions promote critical and context-specific inquiry, and encourage in-depth and open-ended reflection. For instance, these questions might consider how resource units are allocated or maintained, which actors are most and least involved in making decisions, and which actors have the most power to influence the governance system. This process helps to ensure that the SES framework is not misused as a rigid checklist (Basurto et al., 2013, pp. 1373-1374). With this information, the analyst can then consider if the action situation is well-captured by variables and interactions confined within the water sector, or if there are wider factors likely to be important. If the action situation is appropriately bounded by a water sector perspective, analysis stops at this step; if a water perspective is not appropriate, the analyst continues to the third step of the approach.

The third step, much like the second, applies a series of diagnostic questions to the core action situation, but progressively “spiraling outwards” to explore important external variables and interactions as far as necessary to sufficiently explain outcomes of interest or identify key future risks to these outcomes. Questions in this step might consider whether external actors have a stake the resource, how the health of the resource is linked to broad drivers of change, and how the resource is valued by external actors. If diagnostic questioning reveals important external

connections or significant gaps in current efforts, a new action situation could emerge that looks different from the action situation initially identified. Analysis should then consider how the old is linked to the new. This includes understanding how the initial action situation is related to external actors, institutions, and drivers, or adjacent action situations (McGinnis, 2011), how these connections fit within the current policy and governance landscape, and whether or not the new action situation boundaries would help or hinder progress. Addressing these linkages helps to show opportunities and constraints related to both initial and new action situations, potentially opening up promising points for improved governance approaches (McGinnis, 2011, p. 73).

As stated earlier in the chapter, an advantage of most diagnostic approaches—including this one—is that their ultimate goal is to find feasible, realistic solutions that match the problem at hand (Young et al., 2008). Thus, the fourth step sets out to complete the diagnostic process, finding opportunities to engage with important external divers, institutions, or actors, either immediately or at strategic points in the future when contexts and conditions change (Heikkila, 2016). This final step also sheds light upon—and offer strategies to minimize—challenges and costs associated with addressing external connections, including path dependency, power relationships, and lack of information and time (Godden et al., 2011; Ingram, 2008; United Nations World Water Assessment Programme, 2012).

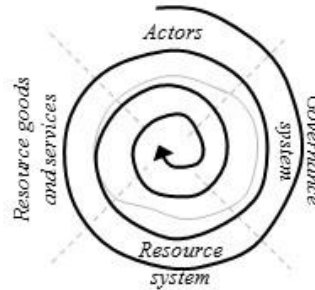
Figure 2: Illustration of diagnostic approach for identifying external connections influencing water governance (adapted from de Loë & Patterson, in press)*

STEP 1: Delineate the action situation through critical pragmatic judgment, in light of outcomes of concern and purpose. Frame the problem as “tightly” as possible at the outset.



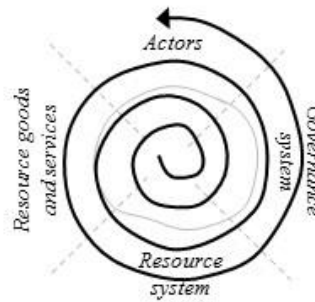
CHECK: Is the action situation delineated in a way that is sufficiently “tight” to provide a tractable starting point, but also aware of boundary choices that may need to be revised later?

STEP 2: Ask diagnostic questions to identify important “internal” factors and interactions: Begin with key variable categories looking inwards.



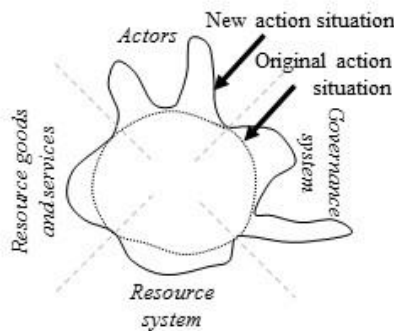
CHECK: Is the action situation well-captured by variables and interactions confined entirely within the water sector, or are there cross-sectoral linkages and/or other wider factors beyond the water sector that are also likely to be important?

STEP 3: Ask diagnostic questions to identify important “external” factors and interactions: Spiral outwards to explore wider factors and interactions as far as necessary to sufficiently explain outcomes of interest in the situation.



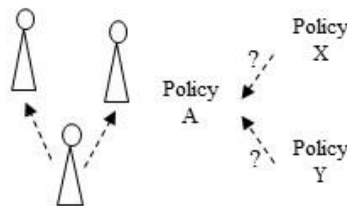
CHECK: Should analysis continue (assessing benefits and costs of analysis, as well as risks to water governance systems associated with both internal and external considerations)? Are there external connections that are important but cannot be addressed immediately? This check may be made several times as the analysis spirals outwards.

Critically reflect on the boundaries of the action situation and modify if necessary.



CHECK: Has the nature of the action situation changed (e.g., moving beyond the water sector to a cross-sectoral perspective), and how does this fit within the current policy and governance landscape? Can the action situation be viewed as a distinct ‘water’ situation, or is it part of a network of adjacent action situations? Do new boundaries help or hinder tractable progress on the issues at hand?

STEP 4: Identify opportunities to improve governance by better accounting for external connections influencing current or future activities, goals, and decisions (e.g., actors, institutions, and drivers linked to the action situation).



CHECK: What do the actors involved in the analysis have the power to feasibly do? What opportunities are there now or in the future to engage with critical external actors, policies, institutions, or drivers revealed by the analysis?

* The exact illustrated shapes of the “action situations,” as well as the illustrated pathways of the spirals, have no particular directionality or meaning.

2.4 Summary

While it is clear that external connections matter to water governance, the water community’s current efforts to engage with external drivers, institutions, and actors suffer from a water-centric perspective. There is tremendous opportunity for water practitioners to adopt a less water-centric stance and to more effectively account for external connections. This requires water managers to accept changing current decision-making processes and to potentially relinquish some power or control to actors with different worldviews. This also requires an ability to discern whether or not a water-centric perspective is appropriate for a given problem setting, and if not appropriate, what external connections are most important and feasible to tackle using a holistic approach to water governance.

Since diagnostic approaches are designed to examine context and recommend targeted solutions to challenges, developing a diagnostic approach for water governance will facilitate the process of addressing external drivers, institutions, and actors. The diagnostic approach presented in this chapter, and tested in subsequent chapters of this thesis, uses the well-known social-ecological systems framework to guide diagnosis, with the goal of identifying and prioritizing external connections in water governance. Compared to other diagnostic approaches, this approach offers especially compelling advantages due to its flexibility, its approachability for many different areas of specialization, and its step-wise approach from relative simplicity into deeper and larger complexities both inside and outside the “water box.”

Chapter 3

Methodology

This chapter describes the methods that were used to identify and evaluate external connections in the Detroit River Area of Concern. The following sections discuss the qualitative case study approach used for this study, criteria used to select the case study location, data sources and collection methods, and data analysis procedures.

3.1 Research approach

A qualitative case study methodology is used in this research (Gerring, 2007; Yin, 2003). A case study is a form of empirical inquiry in which one setting is studied intensely with the goal of understanding a larger group of similar settings (Gerring & McDermott, 2007, p. 688). Case studies are advantageous when a researcher is investigating contextual conditions (Yin, 2003) and needs to preserve the depth of analysis (Gerring, 2007). A case study also offers advantages for research of a novel or exploratory nature (Gerring, 2004). Because the diagnostic approach used for this research is heavily focused on context, and because diagnosing external connections in water governance is novel, a case study methodology was very appropriate for this research.

The United States and Canada have worked separately on the Detroit River Area of Concern since 1996. Additionally, the social, economic, legal, political and historical circumstances in each country are different. Thus, the two sides of the Detroit River Area of Concern are considered as distinct cases for this research; this separation is discussed further in Chapter Four. This study uses a “two-case” multiple case study research design (Agranoff & Radin, 1991; Yin, 2003). A multiple case study is preferred over a single case study because it provides the opportunity for comparison between units of analysis while still offering depth of analysis and a thorough understanding of context (Gerring, 2007; Yin, 2003). The results from multiple case studies are also considered more robust and generalizable than those emerging from a single case study (Yin, 2003). However, because the Detroit River is one system and the two countries are in such close proximity to one another, these cases are not entirely separate. American and Canadian actions on the Detroit River Area of Concern are linked, occasionally mutually influential, and are more directly comparable than two more fully separate cases.

Following replication logic, the first step in this research involves theory development through the creation of a research framework (Yin, 2003). Though research frameworks typically state a number of propositions, exploratory studies such as this one begin with a rationale and a direction instead of set propositions (Yin, 2003, pp. 22-23). This research uses the diagnostic approach described in Chapter Two as the research framework. After construction of the framework, data were collected from individual case studies. The results of each case are considered as information needing replication by the results of other cases—either yielding similar results or “contrasting results but for predictable reasons” (Yin, 2003, p. 47).

3.2 Case study selection

The choice of case study was made on the basis of the four criteria outlined below. The Detroit River Area of Concern was selected as the case study for this research for the following reasons:

- Due to personal research interests and to fulfill funding requirements, the case selected had to focus on a water management issue in the Great Lakes basin, involving both the United States and Canada. Since the Detroit River forms the boundary between Michigan, USA and Ontario, Canada, it meets this criterion (Esman, 2008, p. 4).
- In order to be suitable for the diagnostic approach used in this research, the case selected had to have a clear problem setting and be of a manageable size. The Area of Concern program meets this criterion, as it is locally focused and well-defined (Government of Canada & Government of the United States of America, 1987, 2012). There are four binational Areas of Concern in addition to the Detroit River: the St. Marys River, the St. Clair River, the Niagara River, and the St. Lawrence River (Great Lakes Commission, 2015).
- In order for practitioners to consider recommendations prescribed from this study, the case selected had to be a problem that was not yet resolved or not likely to be resolved in the next several years. In the Detroit River, both the United States and Canada provide a “target completion date” no sooner than 2019 (Chambers et al., 2016), with some sources anticipating completion as late as 2022-2023 (Tuchman, 2016) or 2025 (Environment Canada, 2014b). In each of the four other binational Areas of Concern, one or both countries provide target completion dates of 2019 or earlier, making it challenging to implement recommendations resulting from this document (Chambers et al., 2016).
- Finally, the case had to be located in an area where external connections were likely to be present. With centuries of rich and diverse uses on both sides of the border, the Detroit River is an especially likely candidate for external influences. These uses are discussed further in Chapter Four.

3.3 Data sources

Data triangulation was used to corroborate facts of the case study, and to ensure accuracy and validity (Yin, 2003, pp. 97-99). Three data sources were used for the study: document review, key informant interviews, and personal observations. Key informant knowledge, gathered through talking with people directly involved with the Area of Concern, provided specific information about how the program works in practice. Document review provided foundational knowledge and background information at the beginning of the study, offered details about external connections unavailable through other data sources, and allowed for verification of information from other sources. Personal observations increased understanding of the context in which the research took place and provided another opportunity to verify insights from other data sources.

3.3.1 Key informant interviews

Qualitative interviews, if completed successfully, are useful for gathering rich, detailed information on research questions while capturing the perspective of the key informants being interviewed (Bryman, 2001, p. 313). A total of 28 semi-structured interviews were carried out between June 2016 and January 2017. To ensure consistency between each country, interviewees with similar job descriptions were interviewed in both countries. Table 1 lists the types of individuals interviewed in both countries.

Table 1. Key informants interviewed

Title	Canadian side (C)	American side (A)	Other (I)	Total
Federal government	2	3†		5
Provincial /state government	2	3		5
Municipal government	3			3
Regional agency	3	1		4
Non-governmental organization	4†	4		8
Identifying information withheld			3	3
Total	14	11	3	28

† denotes that one of these individuals is the Chair of their respective country’s Public Advisory Council; both Chairs gave permission to be identified in this manner.

Interviewees were purposefully recruited based upon their knowledge of the Detroit River and/or involvement with the Detroit River Area of Concern (AOC). Informants were identified through member lists, organizational charts, and by identifying authors of key documents. Additional informants were identified during the interview process through snowballing, where informants recommended other potential interviewees. When no new potential actors or institutions involved in the Detroit River AOC were being indicated, and when no new information or themes were observed in the interview data, it was concluded that the organizations involved in the Detroit River AOC were sufficiently represented and that interviews could be completed.

Permission to conduct the interviews for this study was obtained by the Office of Research Ethics at the University of Waterloo. A formal recruitment letter was emailed to potential interviewees. This letter included basic details about the purpose of the research and the rights of the participants. Prior to the interview, interviewees received an information letter containing more details about the research purpose, the rights of the participants. Interviewees also completed a consent form before beginning the interview, indicating agreement to participate, approval of audio-recording during the interview, and the manner in which their statements should be cited should their insights be used in papers or publications.

Interviews ranged in length from ten minutes to one hour, with most lasting about 30 minutes. Interviews involved open-ended questions that were developed using the diagnostic approach presented in Chapter Two; an interview guide listing the interview questions is presented in Appendix A. Questions centered around topics such as how decisions are made in the Detroit River AOC, accomplishments and challenges related to the AOC, and happenings beyond the AOC. Questions followed a defined path set by the interview guide, permitting comparison between interviewees. However, interviews were tailored according to the perspective of the interviewee, and interviewees answered questions as they saw fit.

After each interview was completed, the audio recording was transcribed verbatim. Transcripts were returned to interviewees for review, in a process known as “member checking” (Birt et al., 2016; Carlson, 2010). Member checking is a method of data verification that enables interviewees to edit or clarify their responses (Birt et al., 2016; Carlson, 2010). In this study, completed transcripts were sent to interviewees prior to data analysis, and interviewees were asked to check the transcripts for accuracy and to provide feedback. While many interviewees

were satisfied with the transcript, several gave additional comments to elaborate upon what they said in the interview.

3.3.2 Document review

Documents associated with the Detroit River Area of Concern, Areas of Concern more generally, and potential external connections in the region were a second important data source. Review of AOC-related documents provided foundational knowledge at the beginning of the study and allowed for cross-checking and verification of information obtained during interviews. Meanwhile, review of broader documents provided supplementary information not available through other data sources, enabling richer descriptions of external connections identified through interviews or more specific documents. These broader documents were often collected toward the end of the study.

In total, 58 documents were reviewed for this research. They include government documents, non-government reports, newsletters, annual reports, and research papers. The majority of the documents were found online, while others were obtained from interviewees during the data collection period or shared through email. Of these, 18 documents discuss the Detroit River AOC specifically, three documents discuss the Detroit River but not specifically the AOC program, 17 documents discuss the AOC program but not specifically the Detroit River, and 19 documents discuss neither the Detroit River nor the AOC program but were important for understanding external connections affecting the river.

3.3.3 Personal observations

Personal observations were also made while traveling to the area. These observations were recorded through detailed notes and through digital photographs. The majority of the personal observations for this project were gathered through attendance at meetings and events. Attendance at Detroit River Public Advisory Council (PAC) meetings in the United States on July 25, 2016 and on January 23, 2017 permitted observation of how the American PAC functions. Attending the Great Lakes Public Forum in Toronto from October 4-6, 2016 provided understanding about Areas of Concern more generally, as well as how actions under other annexes of the Great Lakes Water Quality Agreement affect Areas of Concern. On October 26, 2016, attendance at the 6th Annual Detroit River Evening in Canada was an opportunity to hear from numerous Canadian officials about their efforts in the Detroit River AOC. Attendance at a Detroit River Public Advisory Council meeting in Canada on January 18, 2017 permitted observation of the Canadian PAC and comparison between the two councils, as well as an opportunity to present this research project to members and answer questions.

Additional observations were made while traveling throughout the region and visiting points of interest along the Detroit River. Trips includes a boat tour on the upper Detroit River as well as visiting the Detroit River International Wildlife Refuge on Grosse Ile, Belle Isle, the Dossin Great Lakes Museum, the Ojibway Nature Centre, the Detroit Riverwalk, and the Windsor Riverwalk and Sculpture Park. These trips underscored the social and biophysical value of the river, and emphasized the importance of preserving and improving river habitat while providing access for human uses. These trips also contextualized the data gathered through document analysis and interviews.

3.4 Data analysis and reporting

The analysis and subsequent reporting of data from interview transcripts, document review and personal observations were completed in a multi-stage process. A coding guide, created using the diagnostic approach discussed in Chapter Two and the interview guide presented in Appendix A, guided coding, categorization, and evaluation of data. Appendix B presents the coding guide and provides additional insight into the analysis of data for this research.

Coding of interview transcripts, documents, and personal observations was completed using NVivo 10 software. In the first stage of coding, structural coding was used to segment the data into three broad themes, corresponding with the first three steps of the diagnostic approach. Structural coding is used to index and label data, separating large groups of text into predetermined concepts that form the basis for in-depth analysis later (MacQueen et al., 2008; Namey et al., 2008; Saldaña, 2009). Because the goal of the first coding stage was to create large, broad collections of data for further analysis in the second coding stage, structural coding was an ideal approach.

The three themes used in the first stage of coding include defining the action situation (step 1), assessing the action situation (step 2), and identifying new action situations (step 3). Inputs to the Detroit River AOC action situation, or details about the AOC process, were coded under step 1. Outcomes of the Detroit River AOC action situation, or results of the AOC process, were coded under step 2. Potential external connections existing outside of the AOC process were coded under step 3.

Within each of these broad themes, second and third stage coding was used to develop subcategories for specific aspects of the theme. Each theme was coded differently in these later stages. For the first theme, defining the action situation, protocol coding was used to align the data with the four main first-tier variables used in the social-ecological systems framework (Saldaña, 2009). For the second theme, assessing the action situation, magnitude coding was used to differentiate accomplishments from challenges (Saldaña, 2009). For the third theme, identifying new action situations, descriptive or topic coding was used to divide the data into numerous basic topics. Pattern coding was then used to consolidate these many topics into a smaller set of overarching topics (Miles & Huberman, 1994; Saldaña, 2009).

Because the diagnostic approach used in this research is relatively open-ended and inclusive in nature, the coding framework for this research was similarly open, and it was able to accommodate all findings without a need to retroactively adjust the approach. That said, the coding framework does impose a set of pre-determined categories in one instance—when first-theme topics are divided according to the variables used in the SES framework. While the diagnostic approach uses the SES variables loosely and no challenges occurred in this study, in future studies these pre-determined categories have the potential to obscure factors that are not well represented by the categories. Throughout this process, evidence was triangulated to ensure validity and consistency of findings across multiple sources (Yin, 2003).

After coding and triangulating the data, the data were synthesized and evaluated in order to draw conclusions about the importance of external connections in the Detroit River AOC. This synthesis and evaluation involved comparing the two case studies to one another, searching for commonalities and differences. An example of synthesis and evaluation for one component of the diagnostic approach is provided in Table 2. A narrative approach is frequently used to present

case study results (Yin, 2003); this research is no exception. The narrative follows the path of the diagnostic approach and the coding guide, providing evidence from triangulated data and using that evidence to develop arguments that are critical for drawing conclusions about the role of external connections in the Detroit River AOC. Given that the results of this research proved to be relatively similar across the two cases, the results are largely aggregate responses, distinguishing differences between the Canadian and the United States cases where differences were present. The results of this research are discussed in Chapter Five.

Table 2. Synthesis and evaluation for one component of the diagnostic approach

Step of diagnostic approach	Coding subcategory	
01 Defining the Detroit River Action Situation	Resource goods and services	
Data sources		
<p><i>Documents:</i></p> <ul style="list-style-type: none"> • Detroit River AOC Remedial Action Plans and related governing documents (Detroit River Canadian Cleanup, 2013; Detroit River Public Advisory Council Fish & Wildlife Technical Committee, 2014; Green et al., 2010; Michigan Department of Environmental Quality, 2015) • AOC assessment or explanation documents (Chambers et al., 2016; Citizens Environment Alliance, 1991) • Great Lakes Water Quality Agreement (Government of Canada & Government of the United States of America, 1987, 2012) 	<p><i>Interviews:</i></p> <p>Responses from government officials in the United States (2), government officials in Canada (3), NGO representatives in the United States (2), and NGO representatives in Canada (3) were particularly useful.</p>	<p><i>Personal observations:</i></p> <p>Observation of Public Advisory Council meetings on both sides provided additional context.</p>
Results		
<p>Beneficial use impairments (BUIs) are the primarily element guiding restoration activities on the Area of Concern. These impairments and their associated activities are very specific in their scope, which is a source of conflict in Canada but not in the United States.</p> <ul style="list-style-type: none"> • <i>Supported by responses of key informants:</i> Government officials in both countries, and NGO representatives in the United States, stressed the importance of BUIs and completing projects to remove those impairments. NGO representatives in Canada were skeptical of the BUIs, expressing concerns that the impairments did not cover enough issues to be useful. • <i>Supported by document analysis:</i> The Great Lakes Water Quality Agreements provide specific definitions of BUIs, while governing and assessment documents assert that the presence of BUIs differentiates AOCs from other waterways. Those governing and assessment documents written by governments stress the importance of limiting the scope of BUIs, and also of completing projects that are directly linked to BUIs. 		

Chapter 4

Case study context

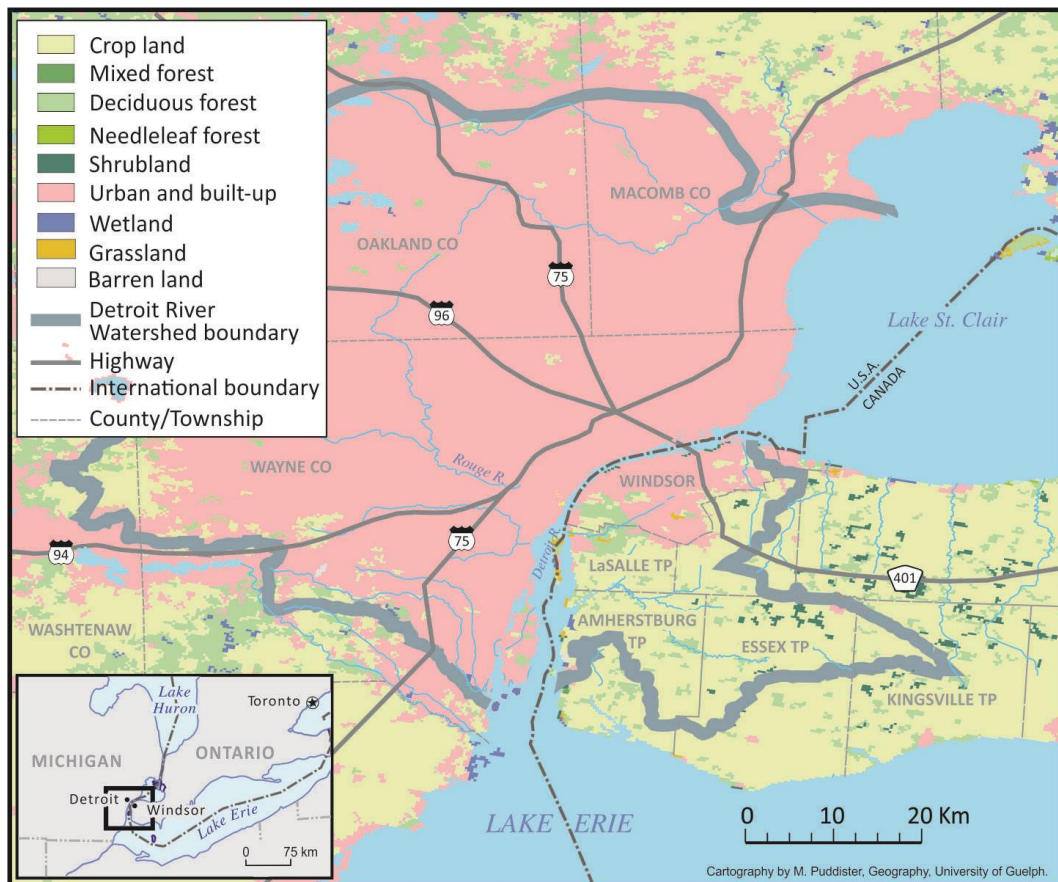
The goal of this chapter is to provide detailed background information on the context of this case study. The chapter begins by outlining the physical, environmental, economic, and cultural context of the Detroit River. A description of the Great Lakes Area of Concern program, and the Detroit River's listing as an Area of Concern, concludes the chapter.

4.1 The Detroit River

4.1.1 Physical and environmental context

The Detroit River is a 51 kilometer (32 mile) long strait or “connecting channel” linking Lake St. Clair to the western basin of Lake Erie and thereby linking the Upper and the Lower Great Lakes. It also forms the international boundary between the state of Michigan, USA and the province of Ontario, Canada (Detroit River Public Advisory Council Fish & Wildlife Technical Committee, 2014; Esman, 2008, p. 4; Green et al., 2010). Figure 3 presents a detailed map of the Detroit River and surrounding lands.

Figure 3. Detailed map of the Detroit River and surrounding lands



The Detroit River drains a watershed of 2090 square kilometers (approximately 807 square miles), approximately 75 percent of which is in Michigan (Michigan Department of Environmental Quality, 1996). Approximately 1813 square kilometers of the watershed is land that drains directly to the Detroit River or to its tributaries; the Detroit watershed on the American side of the river contributes an additional 277 square kilometers to the watershed (Michigan Department of Environmental Quality, 1996). There are five tributaries in the American watershed, the largest of which is the Rouge River, a separate Area of Concern. There are three tributaries in the Canadian watershed (Green et al., 2010, p. 10; Michigan Department of Natural Resources & Ontario Ministry of the Environment, 1991).

As a strait, the Detroit River looks and behaves quite differently from a typical river. Water from Lake Huron, arriving to the river through the St. Clair River and Lake St. Clair, comprises 95% of the Detroit River's flow (Detroit River Public Advisory Council Fish & Wildlife Technical Committee, 2014; Green et al., 2010). Additionally, water flows through the Detroit River very quickly, resulting in an average hydraulic retention time of only 21 hours (Green et al., 2010, p. 7). Water from the Detroit River accounts for approximately 80% of Lake Erie's total inflow (Michigan Department of Natural Resources & Ontario Ministry of the Environment, 1991) and 94% of the inflow to Lake Erie's western basin (Annex 4 Objectives and Targets Task Team, 2015).

There are thirteen major islands in the Detroit River on the Michigan side, and six on the Ontario side (Michigan Department of Environmental Quality, 1996). While a few of these islands are located near the upper reach of the river, the majority and largest of the islands are located in the lower reach of the river where they divide the flow of the river (Derecki, 1984).

The Detroit River is also home to an impressive variety of biota. Because the area sits at the convergence of the Mississippi and Atlantic Flyways, the Detroit River is an important migration corridor for waterfowl, butterflies, raptors, and other birds (Hartig et al., 2005, p. 131). Fish also live in the Detroit River or migrate to the Detroit River from Lake Erie, where wetlands provide spawning and nursery habitat (Detroit River Public Advisory Council Fish & Wildlife Technical Committee, 2014; Hartig et al., 2005). Finally, the Detroit River and adjacent lands are the permanent habitat of numerous amphibian, reptile, bird, and fish species, including many that are rare (Detroit River Public Advisory Council Fish & Wildlife Technical Committee, 2014).

4.1.2 Economic and cultural context

The Detroit River, and the communities that have grown along the river, contain a rich history that this thesis cannot begin to cover adequately. Aboriginal people used the Detroit River and the Great Lakes for settlement, resource gathering, and trade for many centuries prior to European settlement (Detroit River Canadian Heritage Rivers Application Team, 1999). European settlement of the Detroit River began in the 1700s (Detroit River Canadian Cleanup, 2009). Not unlike today, humans took advantage of the potential of the Detroit River and nearby lands in many ways. For instance, it served as an important strategic military site, a major transportation corridor, and as an industrial powerhouse (Colborn et al., 1990; Detroit River Canadian Heritage Rivers Application Team, 1999). Riverfront communities along the Detroit River especially flourished when they capitalized on their location to establish dominant industries in the area, including industries for furs, fish, farming, ships, gambling, alcohol, and automobiles (Detroit River Canadian Heritage Rivers Application Team, 1999). Interestingly, the Detroit River served

as a terminus of the American Underground Railroad, where escaped slaves found freedom in Canada (Detroit River Canadian Heritage Rivers Application Team, 1999); alcohol was also illegally smuggled across the Detroit River during the Prohibition era in the United States (Detroit River Canadian Cleanup, 2009), and Detroit was known as “the great arsenal of democracy” as a result of the city’s factories converting to produce war materials for Allied forces during WWII (Detroit Historical Society, 2017).

Currently, there are over 80 political jurisdictions on the Detroit River watershed (Detroit River Public Advisory Council Fish & Wildlife Technical Committee, 2014), most notably the metropolitan areas of Detroit, Michigan, with a population of over 4 million, and Windsor, Ontario, with a population of nearly 325,000 (Green et al., 2010, p. 10), both of which are located in the upper portion of the river. Land uses in the two countries are drastically different, mirroring the drastic differences in population between the two countries. Within the American watershed, land use is approximately 30 percent agricultural, 30 percent residential, 10 percent industrial, and 30 percent urban (Detroit River Public Advisory Council Fish & Wildlife Technical Committee, 2014). In contrast, land use within the Canadian watershed is approximately 64 percent agricultural or unclassified, 29 percent developed for urban or suburban and industrial uses, and 7 percent woodlands (Green et al., 2010, p. 10).

Present uses of the Detroit River are not dissimilar from historical uses following European settlement. The river provides drinking water to over five million people (Detroit River Canadian Heritage Rivers Application Team, 1999) and nearly 100 communities (Environment Canada & Ontario Ministry of the Environment, 2010). Numerous industries and municipalities are located in the area and discharge wastewater into the river (Environment Canada & Ontario Ministry of the Environment, 2010; International Joint Commission, 1997). However, these industries and municipalities—especially on the United States side—have suffered deep losses in part as a result of the 2008 economic recession (Nelles, 2011). As a recreational asset, the Detroit River is perhaps most well-known for its pleasure boating and its sport fishery, both of which bring in millions of dollars to local communities (Detroit River Canadian Heritage Rivers Application Team, 1999; Hartig et al., 2005; Hartig, 2003). Canoeing, kayaking, walking on riverfront trails, and sightseeing are also common recreational activities (Detroit River Canadian Heritage Rivers Application Team, 1998). Finally, the Detroit River also remains an important trade corridor. The Ambassador Bridge, which spans the Detroit River, is the busiest border crossing in North America (Detroit River Canadian Heritage Rivers Application Team, 1999; Green et al., 2010), with \$1.7 billion USD in goods crossing the bridge daily and 25% of all United States – Canada trade crossing the bridge annually (Detroit Future City, 2012). The Windsor-Detroit Tunnel, the Detroit-Windsor Truck Ferry, and the Michigan Central Railway Tunnel accommodate additional traffic (Office of the Premier, 2005), while a new bridge between Detroit and Windsor, known as the Gordie Howe International Bridge, is in development (Windsor-Detroit Bridge Authority, 2016). The river itself serves as an important international shipping and navigational route (Bennion & Manny, 2011).

4.1.3 Recognition

The natural resources and socioeconomic significance of the Detroit River have been acknowledged through various designations. Many of these designations recognize the river’s positive contributions to the region and to the world. In July 1998, then-President Bill Clinton named the Detroit River one of fourteen American Heritage Rivers. As part of the program,

American Heritage River communities received up to five years of federal assistance to protect the natural, cultural, and economic significance of their rivers ("President Clinton: Celebrating America's Rivers," 1998). In July 2001, the Canadian government named the Detroit River as a Canadian Heritage River, making the Detroit River the only binational heritage river in North America. This designation was primarily based on the river's cultural history and recreational values, rather than its natural features (Canadian Heritage Rivers System, 2017). In addition, the Detroit River International Wildlife Refuge, the first international refuge in North America, was established in December 2001 (Hartig et al., 2005). Today, the refuge contains nearly 6000 acres of habitat along the lower Detroit River and western Lake Erie shoreline (United States Fish and Wildlife Service, 2014a). Humbug Marsh in Michigan, a part of the refuge, was named a "Wetland of International Importance" under the Ramsar Convention in 2010 (United States Fish and Wildlife Service, 2014b), one of 34 such sites in the United States and the only one in Michigan (United States Fish and Wildlife Service, 2013).

Despite these many uplifting titles, much of the human development along the Detroit River has come at an environmental cost, resulting in the Detroit River receiving a negative title: the Area of Concern designation that is the focus of this thesis. Specifically, habitat loss and sediment contamination have resulted from decades of combined sewer overflows, industrial and municipal discharges, nonpoint source pollution, urban development, dredging, and shoreline modification; key contaminants include oils and greases, metals, and polychlorinated biphenyls (PCBs) (Essex Region Conservation Authority, 2014; Tewkesbury, 2012). The Detroit River was listed as a Great Lakes 'problem area' in 1973 and as an Area of Concern in 1987 (Green et al., 2010, p. 1; Weller, 1990).

4.2 The Great Lakes Area of Concern program

Public outcry over pollution throughout the Great Lakes basin prompted the signing of the first Great Lakes Water Quality Agreement (GLWQA) between the United States and Canada in 1972. While the original agreement focused on phosphorus over-enrichment, revisions to the GLWQA in 1978 approached the topic of toxic contaminants in the Great Lakes basin (Chambers et al., 2016; Citizens Environment Alliance, 1991; Hartig & Zarull, 1992a). The Area of Concern (AOC) concept originated in 1985 and was formally introduced in 1987 through amendments to the 1978 Great Lakes Water Quality Agreement (Chambers et al., 2016). It remains a feature of the most recent Great Lakes Water Quality Agreement, signed in 2012 (Government of Canada & Government of the United States of America, 2012).

An Area of Concern is a "geographic area designated by the Parties under the Great Lakes Water Quality Agreement where water quality and ecosystem health have been severely degraded by human activities at the local level" (International Joint Commission, 2017, p. 80). Areas of Concern are considered the most degraded sites in the Great Lakes basin (Environment and Climate Change Canada & United States Environmental Protection Agency, 2016). The 1987 GLWQA designated a total of 43 Areas of Concern: 12 in Canada, 26 in the United States, and five, including the Detroit River, shared by both countries (Environment Canada, 2014a). As of October 2016, seven Areas of Concern—three in Canada and four in the United States—have been delisted, or removed from the Areas of Concern list (Environment and Climate Change Canada & United States Environmental Protection Agency, 2016). Two Areas of Concern, both in Canada, have been designated as 'Areas in Recovery,' signifying that additional monitoring of

natural recovery must occur before full delisting (Environment and Climate Change Canada & United States Environmental Protection Agency, 2016).

4.2.1 Governance in Areas of Concern

Areas of Concern sites are selected, and the status of AOCs is assessed, based on the presence of one or more impaired beneficial uses, also known as beneficial use impairments or BUIs (Michigan Department of Environmental Quality, 2015). Similarly, Areas of Concern can be delisted once all beneficial use impairments have been redesignated. The 1987 and 2012 GLWQA list fourteen potential beneficial use impairments, listed in Box 1 (Government of Canada & Government of the United States of America, 2012, pp. 21-22).

Box 1: GLWQA definition of beneficial use impairments

“A BUI is a reduction in the chemical, physical or biological integrity of the Waters of the Great Lakes sufficient to cause any of the following:

- restrictions on fish and wildlife consumption;
- tainting of fish and wildlife flavour;
- degradation of fish and wildlife populations;
- fish tumours or other deformities;
- bird or animal deformities or reproduction problems;
- degradation of benthos;
- restrictions on dredging activities;
- eutrophication or undesirable algae;
- restrictions on drinking water consumption, or taste and odour problems;
- beach closings;
- degradation of aesthetics;
- added costs to agriculture or industry;
- degradation of phytoplankton and zooplankton populations;
- and loss of fish and wildlife habitat” (Government of Canada & Government of the United States of America, 2012, pp. 21-22).

In each individual Area of Concern, beneficial use impairments are identified and eventually redesignated through the creation, implementation, and updating of Remedial Action Plans (RAPs), plans which “embody a systematic and comprehensive ecosystem approach to restoring beneficial use” (Government of Canada & Government of the United States of America, 2012). The 1987 GLWQA required RAPs to be submitted and updated in three distinct stages (Government of Canada & Government of the United States of America, 1987). Stage 1 defines the nature of the pollution problems and identifies the relevant beneficial use impairments in the Area of Concern. Stage 2 identifies remedial measures to restore the Area of Concern, and Stage 3 is evaluates the improvement measures from Stage 2 once monitoring indicates that the Area of Concern has been restored (Citizens Environment Alliance, 1991; International Joint Commission, 2011). Although RAPs are no longer submitted in stages—the 2012 GLWQA moved to an inclusive process where updates are submitted as necessary—the components of the

RAP have not changed substantially since 1987 (Chambers et al., 2016). Because each Area of Concern has different environmental challenges and implementation actions, remedial action plans are locally driven (Green et al., 2010).

The federal governments, in cooperation with state and provincial governments, assume primarily responsibility for the designation of AOCs as well as the development and implementation of RAPs (Government of Canada & Government of the United States of America, 1987). However, other groups— including tribal, Métis and First Nations governments, municipal governments, local public agencies, and the public —are also often deeply involved in the process. Note that in the case of the Detroit River AOC, there is no involvement from Tribal, First Nations or Métis peoples. The closest First Nations reserve is Walpole Island First Nation, which is located on the northern side of Lake St. Clair (Ontario Ministry of Indigenous Relations and Reconciliation, 2017). The nearest tribal reservation on the US side is the Nottawaseppi Huron Band of the Potawatomi Indians, which is located approximately 180 kilometers west of Detroit in Fulton, Michigan (Michigan Department of Health and Human Services, 2017). In most Areas of Concern including the Detroit River, Public Advisory Councils (or PACs) provide an avenue for nongovernmental groups and the public to participate in Area of Concern activities (International Joint Commission, 2003).

4.2.2 Early history of the Detroit River AOC

Earlier chapters of this thesis have mentioned that the United States and Canada work separately on the Detroit River Area of Concern. However, the Detroit River Area of Concern was initially a binational effort. While the results of this thesis focus on the domestic, present-day arrangement of the Detroit River Area of Concern, this section summarizes the binational early history of the AOC.

Although Areas of Concern and Remedial Action Plans were not formally introduced until 1987, the Detroit River RAP process was officially initiated in October 1986 with the creation of a binational RAP Team representing federal, state, and provincial governments (Green et al., 2010; Michigan Department of Natural Resources & Ontario Ministry of the Environment, 1991). A binational Public Advisory Council (BPAC) was created in December 1987, with 20 representatives from the United States and 20 from Canada representing special interest groups and the public (Michigan Department of Natural Resources & Ontario Ministry of the Environment, 1991). Although the RAP Team gathered the data and wrote the RAP, the BPAC served an advisory role throughout the process, reviewing and commenting on the plan and disseminating information to the groups they represented. Four members of the BPAC joined the RAP team in 1988 to facilitate communication and represent nongovernmental interests (Michigan Department of Natural Resources & Ontario Ministry of the Environment, 1991). In 1991, the Michigan Department of Natural Resources and the Ontario Ministry of the Environment released a joint Stage 1 Remedial Action Plan, identifying eight beneficial use impairments on the Detroit River (Green et al., 2010; Michigan Department of Natural Resources & Ontario Ministry of the Environment, 1991).

Following the completion of the Stage 1 report, the two jurisdictions began developing a binational Stage 2 report; membership on the BPAC also grew, involving 25 representatives from each nation (Michigan Department of Environmental Quality, 1996). However, the government agencies were “unable to agree on implementation actions, responsibilities, and timelines” (Green

et al., 2010, p. viii) and fourteen members of the BPAC walked out of the process in protest, refusing to endorse the report (International Joint Commission, 1997, p. 9). Because not all of the participants accepted the report, it was released in 1996 as a RAP update report instead of a Stage 2 report (Green et al., 2010; Michigan Department of Environmental Quality, 1996). The report developed over 100 broad-based recommendations for the Detroit River AOC focused on habitat, contaminated sediments, point and nonpoint source pollution, combined sewer overflows, and environmental justice (Michigan Department of Environmental Quality, 1996).

Since the release of the 1996 RAP Update report, the United States and Canada have worked separately on Remedial Action Plan implementation efforts (Green et al., 2010) and are considered as separate case studies in the results section of this thesis.

4.3 Summary

With unique hydrological properties, natural features that support a variety of flora and fauna, and an exciting culture, economy, and history that continues to this day, the Detroit River is a lively and distinctive waterway. The Detroit River has been recognized for these distinctions, both positively and negatively. Of particular interest in this thesis is the negative Area of Concern label, one that the United States and Canada have been working to remove since the mid-1980s. The Detroit River's liveliness also offers opportunities for external drivers, institutions, and actors to affect the river, thus making it an excellent exploratory case study for research on external connections in water governance.

Chapter 5

Results

The findings that emerged from the data analysis discussed in Chapter Three are presented in this chapter. Three sections are used to organize the findings, correlating with the first three steps of the diagnostic approach described in Chapter Two and the three themes of coding described in Chapter Three. In accordance with the first step of the diagnostic approach, Section 5.1 presents the initial or focal action situation of the Detroit River Area of Concern using Ostrom’s “focal SES” variables as a guide. In the Detroit River AOC, the focal action situation is delisting the Detroit River from the Areas of Concern list. Section 5.1 also covers the first part of the second step of the diagnostic approach, “spiraling in,” to provide a thorough description of the action situation. Section 5.2 completes the remainder of the second step of the diagnostic approach: considering whether the action situation is well-captured by variables and interactions confined within the water sector, or if there are wider factors likely to be important. Section 5.3 covers the third step of the diagnostic approach, “spiraling out” to reveal important external variables and the emergence of new action situations.

As described in Chapter Three, this chapter presents the results of this research in a narrative fashion. Because the results of each analysis proved to be relatively similar for both cases, the results documented in this chapter are presented as aggregate responses rather than by individual case; key differences between Canada and the United States are noted only where differences are present.

5.1 The Detroit River AOC action situation

If action situations are where all the action takes place—where interactions transform inputs into outcomes—the four top-tier variables of actors, resource units, resource system, and governance system provide the basis for this action by affecting both interactions and outcomes (McGinnis & Ostrom, 2014; Ostrom, 2007, 2009). These four variables combine to form an action situation where (emphasis added) “*resource users extract [or damage] resource units from a resource system...according to rules and procedures determined by an overarching governance system*” (McGinnis & Ostrom, 2014, p. 3). Therefore, this section builds a description of the action situation by discussing each top-tier variable, in the order that the literature suggests.

5.1.1 Actors and their networks

The SES framework contains two first-tier variables related to the social system: governance system and actors (Leslie et al., 2015). These variables are colored blue in Figure 1. In the framework, actors are the narrower social variable: they participate in action situations and work within the rules of the governance system (McGinnis & Ostrom, 2014). This section discusses the actors involved in the Area of Concern on both sides of the border, and the networks among various actors.

The Detroit River Canadian Cleanup (DRCC, formerly Detroit River Canadian Cleanup Committee or DRCCC) oversees efforts on the Canadian side of the Detroit River AOC (Green et al., 2010, p. 4). The DRCC is a highly organized network of actors that formed in 1998 to give

structure to the implementation process on the Canadian side (Respondents C14, I2). The DRCC consists of two main groups: a Steering and Implementation Committee accompanied by four expert work groups, and a Public Advisory Council (PAC). A full-time Remedial Action Plan coordinator, housed in the Essex Region Conservation Authority, ties everything together by providing support to both groups, facilitating communications between the groups and the media, and reporting progress (Green et al., 2010, p. 6).

The primary role of the Steering and Implementation Committee, which consists of senior managers, is “to provide overall coordination and direction for the implementation of the RAP” (Green et al., 2010, p. 4; see also Respondent C4). The four expert work groups complete various projects that move the Remedial Action Plan forward (Green et al., 2010; Respondents C4, C14). The Canadian Public Advisory Council “[provides] a venue for the public to input into the Canadian Detroit River RAP process” (Green et al., 2010, p. 4) and works independently from the DRCC’s committees and work groups. The PAC plays both advisory and advocacy roles, and its members set their own agenda according to their interests (Respondents C7, C9, I2). However, this independence from the rest of the DRCC and the RAP process can cause PAC members to have difficulty understanding the nuances of the RAP process (Respondent C14).

Within this formal structure, two government agencies – Environment and Climate Change Canada and the provincial Ministry of the Environment and Climate Change – are perceived as the most involved by Canadian interviewees (Respondents C5, C8, C9, C14). These two agencies fill both co-chair positions for the Steering and Implementation Committee, fill at least one co-chair position on each work group (Detroit River Canadian Cleanup, 2017a), and provide supervision and compensation for the RAP coordinator. Other federal and provincial agencies, municipalities, the Windsor Port Authority, the University of Windsor, and various industries also participate on the DRCC’s committees and work groups. Meanwhile, the PAC is a volunteer-run group, and members typically represent local environmental groups such as the Essex County Field Naturalists, the Citizens Environment Alliance, the Little River Enhancement Group, and Friends of Canard River. Actors that are considered missing from Area of Concern discussions in Canada include elected officials (Citizens Environment Alliance & Downriver Citizens for a Safe Environment, 1997; Jackson, 2006), the local health department, and the Ontario Ministry of Agriculture, Food and Rural Affairs (Respondents C8, I2). Canadian interviewees also stress the need for more extensive participation from municipal officials, industries, and the public (Citizens Environment Alliance & Downriver Citizens for a Safe Environment, 1997; International Joint Commission, 1997; Respondents C4, C5, C7, C8, C10, I2).

On the American side of the Detroit River, a structured network of actors does not exist and actors are organized less formally than on the Canadian side. The Environmental Protection Agency, Michigan Department of Environmental Quality, and the Public Advisory Council are most involved with coordinating and completing projects (Respondents A5, I2; personal observations). Unlike the Canadian Public Advisory Council, the US PAC works very closely with government agencies and others, and serves as a key player directly involved in the RAP process (Respondents A4, A8, I2). Since the early 2000s the Friends of the Detroit River, a nonprofit that is located in the lower Detroit River, has served as the fiduciary of the PAC: the group applies for grant funding and pursues RAP-related studies and projects under the auspices of the PAC. However, the PAC is open to all interested individuals and organizations, and PAC meeting attendees also include municipal officials, environmental educators, and consultants. Actors outside of these three principal groups, including other federal and state agencies,

municipal governments, and regional organizations, participate as necessary on specific projects. Actors perceived as missing from discussions on the American side include municipalities and the general public, especially the subsistence fishing community (Citizens Environment Alliance & Downriver Citizens for a Safe Environment, 1997; International Joint Commission, 1997; Respondents A2, A6, C10).

While actors and their networks are mostly country-specific, some binational networks still exist in the Detroit River Area of Concern. A formal network exists through the Four Agencies Letter of Commitment, signed in 1998 by Environment Canada (as it was known then), Michigan Department of Environmental Quality, Ontario Ministry of the Environment, and the United States Environmental Protection Agency (Environment Canada et al., 2012). These governmental agencies meet on a regular basis through the senior-level Managers Committee and a work group, where they “discuss domestic work plans and priorities, [identify] opportunities for binational collaboration, and [address] challenges before there is a conflict” (Chambers et al., 2016, p. 19). Occasionally the two countries work together on specific items, such as the spawning reef created on Fighting Island (Vaccaro et al., 2016) and the St. Clair – Detroit River System (SCDRS) Initiative program that aims to take a regional approach to research and ecosystem management (St. Clair - Detroit River System Initiative, 2017a; Respondent C1). Finally, despite the dissolution of the Binational Public Advisory Council and the vast differences between the two countries’ Public Advisory Councils, the two Public Advisory Councils still maintain informal ties, with representatives attending one another’s meetings and sharing information. However, this informal arrangement was viewed as weaker than a formal, binational protocol (Respondents A6, C4, C13).

5.1.2 Resource units

The SES framework contains two first-tier variables related to the ecological system: resource units and resource system (Hinkel et al., 2014). These variables are colored green in Figure 1. In the framework, resource units are a narrower ecological variable. They are part of or contained in resource systems, and are inputs to the action situation (McGinnis & Ostrom, 2014).

For both sides of the Detroit River AOC, the resource units of interest are the beneficial uses that have become impaired. According to the Michigan Department of Environmental Quality, beneficial use impairments (BUIs) are “a tool for describing effects of the contamination, and a means for focusing remedial actions” (2015, p. 3). The binational Stage 1 report in 1991 was the first document to characterize BUIs in the Detroit River; both countries revisited BUI characterization after they began working separately in 1996. A list of currently impaired and restored BUIs in both countries, as well as the initial characterization of BUIs for the Detroit River AOC, is presented in Appendix C. Presently, the United States has two restored beneficial uses and nine impaired beneficial uses yet to be restored (Michigan Office of the Great Lakes, 2016a). Canada has three restored beneficial uses, seven impaired beneficial uses yet to be restored, and one beneficial use requiring further assessment (Detroit River Canadian Cleanup, 2017b).

Actors in the Detroit River Area of Concern restore beneficial uses sufficiently to justify removal of BUIs by completing specific projects, often referred to as “remedial actions” or “management actions.” Management actions are designed to address local and legacy issues and are evaluated using rules known as “delisting criteria” (Chambers et al., 2016; Detroit River

Canadian Cleanup, 2013; Green et al., 2010; Michigan Department of Environmental Quality, 1996, 2015). More information on delisting criteria is provided in Section 5.1.4 of this document. Depending on the beneficial use impairment to be removed, management actions can include construction work, such as habitat or sediment restoration, research studies, and monitoring (Detroit River Canadian Cleanup, 2013; Respondent A5).

Because the beneficial use impairments, delisting criteria, and management actions in Areas of Concern are very specific, there are limits to what can be addressed through the beneficial use impairment removal process. One interviewee provided several examples of such limits:

Beach closings, the impairment is called beach closings so people think of beaches and recreation. But if you look at our criteria what we're looking at is: have combined sewer overflows been separated? is there human borne pathogens getting into the river affecting people's recreation? But we're not necessarily talking about making it available or improving the river, water trails or things like that. Those are things that other people are working on and it's really really good work, but those aren't necessarily things that are being addressed under specific beneficial use impairments. So another example is the fish and wildlife habitat BUIs, it's the loss of fish and wildlife habitat and the degradation of fish and wildlife populations. Those are addressed together through implementation of habitat restoration projects. Now those habitat restoration projects can have recreational benefits and public use benefits but we're looking at them and we're focusing on habitat for fish and wildlife, the critters, not necessarily the people though the people will have benefits. (Respondent I1)

On the Canadian side of the Detroit River AOC, actors disagree about the usefulness of the BUI concept. Some people, mostly from non-governmental organizations who work indirectly on BUI removal, expressed concern about the limited focus of BUIs. For instance, one Canadian non-governmental representative was unsure if "all of those beneficial uses would cover everything if we were ... looking at the Detroit River as just one component of a larger ecosystem" (Respondent C10; see also Respondent C12). Since these individuals are interested in issues that are broader and less tangible than what BUIs were meant to address, they often put pressure on the those directly involved to pursue more complex and comprehensive management actions (Chambers et al., 2016; Respondents C8, C14). This call is also echoed by the International Joint Commission (International Joint Commission, 1997, 2011), as they stress the Great Lakes Water Quality Agreement's overarching yet vague commitment to an ecosystem approach for restoring AOCs.

Individuals directly responsible for removing BUIs in Canada, largely from government agencies, remain keenly focused on removing BUIs and resist the pressure to broaden their work. These government officials also interpret the Great Lakes Water Quality Agreement differently, stressing the clearly-written lists of beneficial use impairments and remedial action plan requirements that are integral to delisting. While these officials acknowledge the concerns of their nongovernmental partners, they regard the concerns as "scope creep," direct the concerned party to other programs taking place in the region, and continue to work within the limits of the BUI removal process (Chambers et al., 2016; Respondents C8, C14). This perspective is evident in the comments of two Canadian interviewees, one working in federal government and one working in provincial government:

My main interest is in finding a means by which those impaired beneficial uses can be restored to achieve the criteria that have been established in the Canadian Detroit

River Remedial Action Plan ... And all of those beneficial uses are addressed in the Detroit River Remedial Action Plan. So, and there may be other uses of the river that people are interested in or are important to some people but from my perspective it all comes down to the Water Quality Agreement. And by and large for Areas of Concern we're really dealing with historical stuff, the impacts and pollutants that happened a long time ago. (Respondent C5)

You get a lot of different environmental groups that see this program as their, their way to get funding to do all kinds of work and it's, and the biggest challenge is trying to keep people focused on okay, we have these fourteen BUIs we really have to focus on to try to fix up the problems, do the assessments, see if we've made the change and then, you know, work towards delisting. The people over the years because I think the program's gone on for so long, see this program as it's their one, one stop shop for doing all kinds of different things, right? They bring different issues into the process, they bring things that really haven't, don't fit into the AOC program the way it was originally identified. And so it's trying to keep this scope creep out of, out of something like this. (Respondent C8)

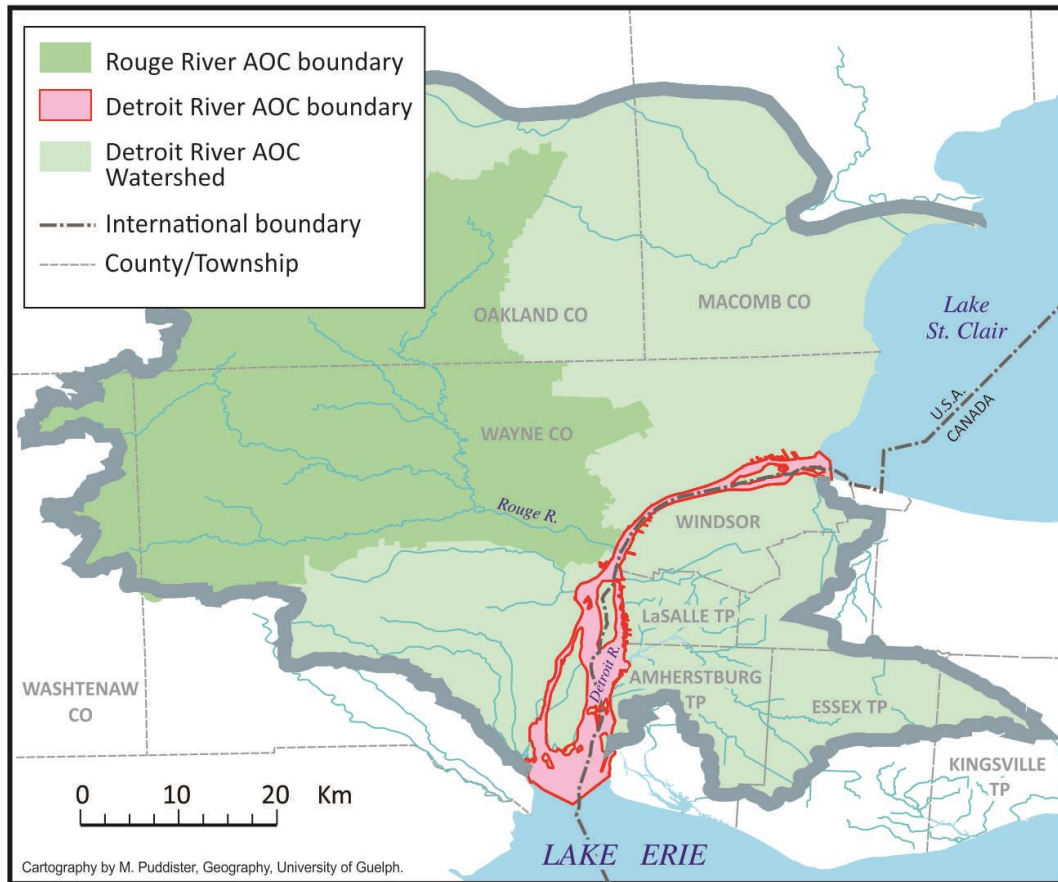
On the American side of the Detroit River, this disagreement is less pronounced, even though the BUI concept and removal processes are similar on both sides of the river. Actors in the United States are content with focusing on the specific beneficial use impairments and management actions. This is likely because on the American side, the nongovernmental organizations involved in the Area of Concern are much more directly involved in the BUI removal process through the PAC.

5.1.3 Resource system

In the SES framework, a resource system is a broader ecological variable that is characterized by ecosystem types and biophysical processes (Leslie et al., 2015, p. 5979). Resource systems set conditions for action situations (McGinnis & Ostrom, 2014).

In this study, the resource system is the Detroit River Area of Concern itself. When the Detroit River Area of Concern was initially characterized in 1991, the Area of Concern boundary was defined as the entire river "from Windmill Point at Lake St. Clair to the Detroit Light at Lake Erie" (Michigan Department of Natural Resources & Ontario Ministry of the Environment, 1991, p. 93), a description the American side of the Detroit River still uses in more recent documents (Tewkesbury, 2012). On the Canadian side, the AOC is referred to more simply as "the Canadian portion of the Detroit River proper" (Green et al., 2010, p. 7). Figure 4 presents a map of the Detroit River AOC boundary relative to the watershed boundary.

Figure 4. Map of the Detroit River AOC relative to its watershed



The role of the Detroit River Area of Concern's watershed has a less stable history. In 1991, the Detroit River watershed was considered as a "Source Area of Concern" or SAOC in the Stage 1 Remedial Action Plan (Michigan Department of Natural Resources & Ontario Ministry of the Environment, 1991, p. 93). According to this document, an SAOC is defined as "an area within which remedial actions could include: a) removal or containment of pollutants in the environment, or b) control of pollutants within or at the point of discharge. The Source Area is not necessarily restricted by river basin boundaries and should include the entire sewer service area of all [publicly owned treatment works] within the Area of Concern" (Michigan Department of Natural Resources & Ontario Ministry of the Environment, 1991, p. 14). While a detailed description of the SAOC is provided in this Stage 1 Remedial Action Plan, the term is not used in any Detroit River documents after that time.

On the Canadian side of the Detroit River Area of Concern, the watershed is considered as a source of impairment and as the focus of a few implementation actions (Green et al., 2010). According to a Canadian interviewee, "We would only go up into the [tributaries], from our perspective, to do work if ... we can link an impact to a beneficial use to upstream activities" (Respondent C8). Examples of previous projects that have occurred in the Canadian watershed include wetland restoration, buffer strips, tree plantings, and various best management practices on agricultural lands (Detroit River Canadian Cleanup, 2013; Green et al., 2010).

On the American side of the Area of Concern, projects are currently focused on the Area of Concern itself, while watershed inputs are seldom considered or discussed (Detroit River Public Advisory Council Fish & Wildlife Technical Committee, 2014; personal observations). This approach lies in contrast to the approach used in several other Michigan AOCs, where the watershed is considered as part of the Area of Concern itself (Michigan Department of Natural Resources and Environment, 2010; Respondents A7, I1). Although interviewees on the American side recognize that the Detroit River AOC is a “contrived watershed or area” (Respondent A7), they justify this choice because of the Detroit River’s unique hydrology as a strait and the resulting infeasibility of addressing watershed inputs:

We kind of always have to reinforce this, but problems in St Clair and Detroit ... don’t come from the watershed. Most other AOCs, problems come from the watershed, that dendritic type looking leaf-shaped watershed. The Detroit River and St Clair, ninety-five percent of the water comes through from Lake Huron. So what we have, the problems that we have associated with those two are right along, like directly associated with the river. But in the Rouge, by contrast, that’s a typical watershed and so we need to be concerned about what might be happening way up in the headwaters or in different parts of the Rouge because it all, what’s washing off the land or whatever has more of an impact. (Respondent A5)

You know, with a real watershed you have a problem, you can look upstream to solve it. Well in Detroit you really can’t do that ... People in Detroit telling people up in Sarnia what they had to do was just not gonna fly. (Respondent A7)

5.1.4 Governance system

In the SES framework, the governance system is the broader social variable: governance systems set rules for actors and set conditions for action situations (McGinnis & Ostrom, 2014). Although a governance system consists of both rules and networks within which actors operate (Leslie et al., 2015), this subsection focuses on rules because networks were discussed along with actors in section 5.1.1.

Delisting criteria, and the documents that define them, are the main set of rules governing the Detroit River Area of Concern; external programs that support AOC work provide a secondary set of rules. Early guidelines—such as the numerous recommendations presented in the 1996 RAP Update report—proved to be too imprecise for delisting the Area of Concern. Thus, not unlike the BUIs and management actions discussed earlier in this chapter, current rules are designed to be clear, specific, and feasible.

On the Canadian side of the Detroit River Area of Concern, people involved in the AOC rely on locally developed delisting criteria to guide their restoration efforts. Between 1999 and 2006, the Detroit River Canadian Cleanup produced a series of unofficial delisting criteria and BUI assessment documents. However, these documents were problematic because “it was found that some of the criteria were difficult to measure, some set targets that would be virtually impossible to achieve, and others included issues and factors not directly related to the impairment of the beneficial use” (Green et al., 2010, p. 22). These deficiencies prompted the creation of a full, official stage 2 Remedial Action Plan in 2010 which contained revised delisting criteria and BUI assessments. The 2010 RAP assessed the status of each BUI in the Canadian Detroit River AOC, provided “measurable, achievable and scientifically-defensible” delisting

criteria for those deemed impaired, and highlighted successful AOC-related projects (Green et al., 2010, p. 22).

Additionally, the DRCC wrote a *Pathway to Delisting* document in 2013 to further focus the Canadian RAP team on priority needs identified by the DRCC. The *Pathway* is a continually updated work plan that “[identifies] the remaining actions necessary to delist the Canadian side of the Detroit River” (Detroit River Canadian Cleanup, 2013, p. 2). For each beneficial use impairment, the *Pathway* provides a detailed list of actions to be completed, a timeline for each action, and the responsible parties. Data collection, compilation, assessment, and review are priority actions for nearly all of the use impairments; the completion and implementation of a habitat plan is an additional action required for the “Loss of Fish and Wildlife Habitat” BUI. The *Pathway* also includes a list of general goals and long-term goals that are “recognized as important but are not necessarily required to re-designate a BUI or delist the AOC” (Detroit River Canadian Cleanup, 2013, p. 19). Examples of general and long-term goals include RAP coordination, public involvement and outreach, advocacy work, encouraging the reduction of stormwater pollution, and implementing an integrated watershed management plan (Detroit River Canadian Cleanup, 2013, pp. 18-19).

On the American side of the Detroit River AOC, the people involved went in a different direction, relying largely on statewide—rather than local—delisting criteria to guide the majority of their restoration efforts (Respondents A5, I1). While the International Joint Commission (IJC) and US Policy Committee created general guidance documents on the process of delisting in 1991 and 2001, respectively, these efforts “were not specific enough for...determining restoration of individual BUIs” (Michigan Department of Environmental Quality, 2015, p. 4). This lack of specificity prompted the state of Michigan to develop the first version of the *Guidance for Delisting Michigan’s Great Lakes Areas of Concern* in 2006. The *Guidance*, most recently updated in 2015, contains feasible and measurable criteria for restoring each beneficial use impairment, along with rationale for the criteria and instructions for evaluating restoration actions (Michigan Department of Environmental Quality, 2015). Similar to Canada’s *Pathway* document but developed at the state level, the *Strategy for Delisting Michigan’s Areas of Concern*, was completed in 2010 by the Michigan Department of Natural Resources and Environment (Michigan Department of Natural Resources and Environment, 2010). As a companion document to the *Guidance*, the *Strategy* uses an “action tracking table” to list priority actions needed to remove BUIs in each of Michigan’s Areas of Concern (Michigan Department of Natural Resources and Environment, 2010).

As a result of Michigan’s extensive statewide system, less emphasis is placed on producing locally-developed documents such as Remedial Action Plans, and the American Detroit River AOC has little in terms of local rules or criteria (Michigan Department of Environmental Quality, 1996). In 1996, when the Detroit River RAP update report was released, the American side intended on providing news on progress within the Area of Concern to the public and to the IJC through biennial RAP updates (Michigan Department of Environmental Quality, 1996). This practice seems to have fallen out of favor, as the most recent of these biennial updates publicly available online was completed in early 2008 (Esman, 2008).

More importantly, local documents are produced when the statewide system requires their creation. For instance, removing the “Loss of Fish and Wildlife Habitat” and “Degradation of Fish and Wildlife Populations” BUIs requires local AOC communities to create a habitat plan

(Michigan Department of Environmental Quality, 2015; Respondents A3, A5). The habitat plan requires communities to develop a “defined list...[of] feasible projects that can happen, based on “opportunities at the local level and what the values are of that community in terms of what they want and what’s available” (Respondent A3). Thus, a habitat plan for the Detroit River AOC, listing fourteen specific projects required for BUI removal, was completed in 2009 and revised in 2014. Twelve of the fourteen projects are being completed on land managed by local, state, or federal government agencies; two of the projects are on land owned by industrial or private landowners (Detroit River Public Advisory Council Fish & Wildlife Technical Committee, 2014). Actors on the American side are also currently working on a sediment plan that will address the Michigan statewide delisting criteria for the “Degradation of Benthos” BUI, using the same structure and format as the habitat plan (Respondents A2, A5, I1).

Since the AOC program is not law and delisting criteria are therefore non-regulatory in nature, actors within the Detroit River AOC often look to external regulations or programs to support their work and to raise the profile of the AOC. When possible, both countries use regulatory requirements or other programs to underpin their delisting criteria (Respondents A5, A6, A8, C5, C11)—sometimes so much so that actors find it difficult to discern what progress can be attributed to the Area of Concern program vis-à-vis these other programs (Respondent A5). Prominent examples include the Province of Ontario’s Ontario Water Resources Act and Environmental Compliance Approval Process (Detroit River Canadian Cleanup, 2013; Respondents C8, I2) and the United States’ Clean Water Act and National Pollutant Discharge Elimination System program (Aiello, 2011; Respondents A5, A6, A8). Both countries also rely on existing monitoring programs to assess the fulfillment of delisting criteria (Detroit River Canadian Cleanup, 2013; Green et al., 2010; Michigan Department of Environmental Quality, 2015; Respondent C4). Finally, several funding programs have helped to support restoration in Areas of Concern like the Detroit River. For instance, in Canada the Detroit River AOC has benefitted from multiple funding sources, including Environment Canada’s Great Lakes Sustainability Fund, federal infrastructure funding, provincial Canada-Ontario Agreement funding, and the provincial Great Lakes Guardian Community Fund (Chambers et al., 2016; Respondents C3, C4, C5, C13, C14, I2). Two large federal funding programs—the Great Lakes Legacy Act and the Great Lakes Restoration Initiative (GLRI)—provide even greater investments on the American side. Restoring Areas of Concern is one key objective of the massive GLRI, created in 2010 (Environment and Climate Change Canada & United States Environmental Protection Agency, 2016; Great Lakes Interagency Task Force, 2014). From 2010 to 2015, the GLRI has invested \$1.9 billion USD in Great Lakes projects; of that, over \$600 million USD has been spent on Areas of Concern (Chambers et al., 2016). Unsurprisingly, the GLRI has dramatically increased the pace of remediation for United States Areas of Concern, including on the Detroit River (Environment and Climate Change Canada & United States Environmental Protection Agency, 2016; Great Lakes Commission, 2015; Respondents A3, A4, A5). The Legacy Act, created in the early 2000s, specifically focuses on cleaning contaminated sediments. The first Legacy Act sediment project was completed on the Detroit River AOC in a highly contaminated area known as Black Lagoon.

5.2 Assessment of the Detroit River AOC action situation

Conditions on the Detroit River have improved steadily over the last three decades, in large part, according to interviewees, because of efforts to delist the Detroit River as an Area of Concern

Respondents A4, A5, C6). For instance, numerous habitat projects have been completed in both countries, mainly on public lands; particularly notable projects include two binational spawning reefs on Fighting Island and several interconnected habitat projects on Belle Isle in the United States (Environment and Climate Change Canada & United States Environmental Protection Agency, 2016; Respondents A5, A8, C3; personal observations). Other important projects include wastewater infrastructure upgrades totaling \$212 million CAD in the Canadian municipalities of Windsor and Amherstburg, shoreline naturalization on the Canadian shore, and sediment cleanups and characterization in the United States. Outside of project work, in recent years the AOC program has funneled financial resources and technical expertise to the Detroit River and actors have done a good job working together (Respondents A2, A3, C5, I2). Commonly cited “internal” challenges in the Detroit River AOC program include the slowness of the process (Respondents A6, A7, C1, C8), insufficient public outreach and understanding (Botts & Muldoon, 2008; Citizens Environment Alliance, 1991; Citizens Environment Alliance & Downriver Citizens for a Safe Environment, 1997; International Joint Commission, 1992; 1997; Respondents A2, A6, C2, C4, C10, C14), and uncertainty about ‘life after delisting’ (Respondents A2, A4, C14, I1).

An additional challenge in the Detroit River AOC may be the water-centric scope of the program. As section 5.1 indicated, the process of delisting the Detroit River AOC—the focal “action situation” for this case study—is very carefully bounded in its scope. With a boundary smaller than that of the watershed, projects that focus solely on water quality enhancement, and the vast majority of actors representing water and environmental organizations, the Detroit River is framed in a water-centric manner. Although a water-centric framing is present in both countries, it is most pronounced in the United States, where the boundary is especially confined and where there are few formal opportunities for actors to indirectly or independently contribute to the AOC (while the PAC provides such opportunities on the Canadian side).

Interviewees cite the original intentions of the AOC program under the GLWQA as justification for why the Detroit River AOC continues to be implemented in such a narrow, water-centric fashion. The AOC program is a process devoted to delisting: the objective of the program is not to make AOCs pristine or perfect, but to “improve [the AOC] river or water body to the point where it’s no worse than [non-AOC rivers or water bodies]...which is sort of a low bar” (Respondent A6; see also Great Lakes Commission, 2015; Respondents A2, A3, A7, A8, C1, C8). Interviewees also stress that the AOC program is meant to tackle the legacy pollution issues that led to AOC designation in the late 1980s and is not meant to address modern contaminants (Respondents A11, C1, C2, C5, C10, I1) and that the program is designed to be short-term (Michigan Department of Environmental Quality, 2015; Respondents A6, C4). The complexity of the Detroit River AOC is an additional reason why AOC officials have maintained a narrow scope. While some AOCs have elected to broaden their focus beyond the GLWQA’s narrow requirements – the Toronto and Region AOC, for instance, is taking a watershed planning approach (Jackson, 2006) – the Detroit River is “one of the tougher AOCs” (Respondent A4) and actors find themselves overwhelmed with activity under their current approach (Respondents C14, I1).

Thus, as a matter of design, the “focal action situation” of the Detroit River AOC is well-captured by variables and interactions confined within the water sector. Actors could certainly satisfy the requirements of the GLWQA, and delist the Detroit River as an Area of Concern, without considering wider factors. This narrow focus might even be appropriate to ensure that the

reasons for AOC designation are solved and not cast aside (Botts & Muldoon, 2008; Jackson, 2006). That being said, the Detroit River is more than just an Area of Concern. The frustrations revealed in the previous section (e.g., disagreements about “scope creep,” mentions of missing actors from outside the water sector, and heavy reliance on regulatory and funding programs) indicate that there are wider factors that do affect the Detroit River, and that are not being captured under the action situation of the Detroit River AOC. In other words, these frustrations indicate that the problems in the AOC cannot be resolved adequately or efficiently through the activities currently accepted in the scope of the RAP. Addressing external connections would contribute to improved conditions on the river, and may help to ameliorate the challenges of funding, interest, and uncertainty associated with life after delisting. Thus, even though external connections are not a top priority for the Detroit River AOC program proper, it may be valuable for actors to examine these external connections either in parallel to or after delisting.

5.3 The Detroit River beyond the AOC: identifying external connections

While a water-centric problem framing may be appropriate for delisting the Detroit River as an Area of Concern, shortcomings and disagreements associated with the AOC program point to numerous external connections that could be affecting the river during and after delisting efforts take place. Therefore, this section of the thesis identifies and evaluates the importance of some key external connections

In any water governance situation, including this one, the potential range of external connection is vast (Tortajada, 2010b). The four key external connections that are emphasized in this thesis were selected because they were the most frequently discussed in key informant interviews—and as a result, are the topics that are likely the most important and salient for water managers in the Detroit River AOC. Documents and personal observations were used to corroborate the presence of these key external connections, and to provide additional details not available through key informant interviews.

This section examines external drivers, their corresponding institutions and actors, and their relationship to current work on the Detroit River AOC. External connections are organized from largest scale to smallest scale.

5.3.1 Large-scale environmental change

Numerous interviewees recognized that several regional- to global-scale environmental issues outside the scope of the AOC program could impact the health of the Detroit River, including climate change, invasive species, and non-AOC chemicals. While these issues are not designed to be tackled under the AOC program (Green et al., 2010), they could impact the health of the river and the biota the river supports. Although environmental issues do not vary significantly across the international boundary, the way these issues are managed is likely to be country-specific.

The impacts of global climate change are likely to affect many of the delisting targets AOC officials are currently looking towards (Botts & Muldoon, 2008; Respondent C11). For instance, dropping water levels in the Great Lakes basin could affect nearshore habitat projects on the Detroit River, increasing precipitation intensity will cause more water to run off land surfaces, and fish breeding patterns could change (Abdel-Fattah & Krantzberg, 2014a; 2014b; Respondents C8, C11; personal observations). Thus, climate change mitigation and adaptation efforts could

benefit the Detroit River. While the 2012 Great Lakes Water Quality Agreement has a climate change impacts annex (Government of Canada & Government of the United States of America, 2012; Respondents C4, C5, I1), it focuses largely on improving research and scientific endeavors, leaving it up to others to apply that science and manage for climate change impacts (Abdel-Fattah & Krantzberg, 2014b; Government of Canada & Government of the United States of America, 2012). Fortunately, many groups are beginning to think about managing climate change impacts (Abdel-Fattah & Krantzberg, 2014b; Respondents A8, C7). Because climate change could influence habitat projects, AOC officials are increasingly considering how to make projects more resilient to the impacts of climate change Respondents A3, A5, C11). Additionally, the state of Michigan, the province of Ontario, and the city of Windsor all have climate action plans (Michigan Climate Action Council, 2009; Ontario Ministry of the Environment and Climate Change, 2016; The City of Windsor, 2012), and a group is currently working on developing a climate action plan for the city of Detroit (Detroit Climate Action Collaborative, 2015a; Respondent A10). However, prioritization of environmental improvement, including climate adaptation actions, could be a challenge for local municipalities (Respondents C10, C12).

Invasive species are a second large-scale environmental challenge that could “fundamentally change the food web, species distribution, habitats and water chemistry and have also been implicated in the reproductive failures of some fish species” (Abdel-Fattah & Krantzberg, 2014b, p. 11; see also Michigan Office of the Great Lakes, 2016b). Zebra mussels, quagga mussels, round gobies, and Phragmites have already begun to impact the Detroit River ecosystem (Hartig et al., 2009; Respondents A4, C1; McCoy et al., 2014; Michigan Office of the Great Lakes, 2016b), while the introduction of Asian carp and the impacts of climate change threaten to worsen the problem (Abdel-Fattah & Krantzberg, 2014b; McCoy et al., 2014; Michigan Office of the Great Lakes, 2016b). Within the AOC, actors have invasive species management in mind when pursuing projects and the American side has completed an invasive species focused project on Belle Isle (Respondents A8; C1). Outside of the AOC numerous groups in the region are looking at invasive species management, including the Michigan Water Strategy, the Southeast Michigan Council of Governments, the US Fish and Wildlife Service, the Nature Conservancy, Fisheries and Oceans Canada, the Ontario government, and the Aquatic Invasive Species Annex Subcommittee of the GLWQA (Environment and Climate Change Canada & United States Environmental Protection Agency, 2016; May, 2015; Michigan Office of the Great Lakes, 2016b; Ontario Ministry of Natural Resources and Forestry, 2017; Respondents C4, C14, I3).

Because the AOC program is concentrated on legacy chemicals originating from local sources, chemicals that fall outside of this description provide an additional environmental challenge that could impact the Detroit River. For instance, the atmospheric deposition of metals into the Detroit River is not covered under the AOC program (United States Policy Committee, 2001; Respondents C8, C10) despite characterization as a serious problem in early RAP documents (International Joint Commission, 1997; Michigan Department of Environmental Quality, 1996; SEMCOG the Southeast Michigan Council of Governments, 1999) and persisting air quality challenges in the region (Hartig, 2003; Hartig et al., 2009). Additionally, more modern-day “emerging chemicals” not covered under the AOC program include microbeads, pharmaceuticals, perfluorinated chemicals such as perfluorooctane sulfonate (PFOS); new chemicals will almost certainly present new challenges in the future (Respondents A9, C14, I1). Similar to legacy chemicals, atmospheric and emerging chemicals accumulate in fish and

wildlife, causing fish consumption advisories that will outlive AOC delisting efforts (Respondents A9, C13). With massive sport and subsistence fishing communities along the Detroit River, human health impacts associated with fish consumption advisories are especially concerning (International Joint Commission, 1997; Kalkirtz et al., 2008; Matheny, 2017; Respondent A9; personal observations). With regard to actors and institutions, the most recent Great Lakes Water Quality Agreement provides a chemicals annex (Government of Canada & Government of the United States of America, 2012), but there are concerns that the annex is not well communicated and is not locally focused (Respondents C14; I1). In the United States, the Michigan Department of Community Health has interacted with fishing communities through health studies and outreach efforts; health-related agencies are not involved on the Canadian side of the river (Respondents A9, I2).

5.3.2 Upstream and downstream waterways

At a regional scale, the role of upstream and downstream waterways is an important external connection—especially given the Detroit River’s unique hydrology and fast flow. The river receives a considerable amount of water and pollutants from upstream waterways and contributes a considerable amount of water and pollutants to downstream waterways. Similar to the large-scale environmental issues discussed earlier, the challenge of upstream and downstream waterways is a binational one.

Upstream inputs to the Detroit River AOC are quite extraordinary, as two Areas of Concern directly discharge into the river. Because over 95% of the total flow of the Detroit River entering from Lake Huron via Lake St. Clair and the St. Clair River – an AOC of its own – upstream inputs actually contribute the largest loads of pollutants to the Detroit River (Michigan Department of Natural Resources & Ontario Ministry of the Environment, 1991). Meanwhile, the most significant tributary to the Detroit River, the Rouge River, is also an Area of Concern (Michigan Department of Natural Resources & Ontario Ministry of the Environment, 1991). Some ties are maintained between the Detroit River AOC and these other Areas of Concern, including the St. Clair Detroit River System (SCDRS) Initiative linking the Detroit River AOC to the St. Clair AOC and a new partnership grant linking the American side of the Detroit River AOC to the Rouge River AOC (Respondents A8; C1). Both adjacent AOCs are making progress, and their success can only help the Detroit River. However, it is likely that these adjacent AOCs, and the ties that connect the Detroit River AOC to adjacent AOCs, are similarly narrowly focused by design. Therefore, external connections outside the scope of adjacent AOCs are likely present and unaccounted for, potentially impacting the Detroit River. This is almost certainly the case on the St. Clair River AOC, as the AOC boundary and approach are comparable to the Detroit River AOC and many actors work on both the Detroit and St. Clair River AOCs (Jackson, 2006; Respondents C13, I1).

Immediately downstream of the Detroit River is the western basin of Lake Erie, an area that is currently receiving considerable attention due to algal blooms and hypoxia resulting from phosphorus over-enrichment (International Joint Commission, 2014). Approximately 94% of the western basin of Lake Erie’s total inflow of water comes from the Detroit River. This flow contributes 41% of the annual total phosphorus load to the western basin (Annex 4 Objectives and Targets Task Team, 2015) along with high loads of heavy metals (Colborn et al., 1990). Despite this, phosphorus is not a problem in the Detroit River AOC – the water moves too quickly for algae to bloom – and therefore is not a focus of restoration work (Green et al., 2010;

Respondents C2, C14). Additionally, with more severe phosphorus dischargers elsewhere in the region, most of the Detroit River watershed is not considered a top priority for phosphorus reduction efforts in the western Lake Erie basin (Annex 4 Objectives and Targets Task Team, 2015). That being said, Michigan plans on reducing phosphorus loadings at two wastewater treatment plants located on the Detroit River (Michigan Department of Environmental Quality, 2016), while Ontario has proposed focusing on implementing green infrastructure, agricultural best management practices, and public education (Canada-Ontario Agreement Partners, 2017).

The Detroit River is also tied to Lake Erie through the Lake Erie Lakewide Action and Management Plan (LAMP), with the Lake Erie LAMP set to be completed in 2018 (Lake Erie Partnership, 2016). Federal government officials on both sides of the Detroit River AOC stress that the Detroit River will be part of Lake Erie's LAMP and will serve a key role after AOC delisting, both to ensure continued monitoring on the Detroit River and to address broader problems the AOC is not designed to cover (Detroit River Canadian Cleanup, 2013; Green et al., 2010; Michigan Department of Environmental Quality, 2015; Respondents A2, A5, C4, C5). However, there is little clarity regarding the connection between delisted AOC communities and their LAMPs, causing currently delisted AOC communities to struggle with involvement in LAMPs and raising concerns for a similar fate when the Detroit River delists (Chambers et al., 2016; Mandelia, 2016; Respondent A1).

5.3.3 Development and land use change

At the local or watershed level, many key informants mention that changes in local development and land use, as informed by population and economic shifts, may be an external connection that will impact the Detroit River. Because land use changes vary across the international boundary, this section both contrasts and compares land use concerns in both countries.

Local development and land use was a factor that was discussed in several early Remedial Action Plan documents. For instance, the International Joint Commission emphasized the importance of economic and social considerations in two Detroit River AOC assessment reports (International Joint Commission, 1992, 1997), and the 1996 RAP update report presented numerous recommendations related to local development with governments leading implementation of said recommendations (Michigan Department of Environmental Quality, 1996, pp. 31-32). However, in current RAP documents and actions, development or land-use related references are scarce. Canada's Stage 2 RAP offers two recommendations related to municipal land planning, with the Public Advisory Council being the sole actor responsible for implementing these recommendations (Green et al., 2010, pp. 142-143). The United States side makes no reference to addressing such issues, likely because the American side focuses remedial efforts on the AOC itself and not the watershed (see section 5.1.3). Additionally, as stated earlier in the chapter, while municipalities and industries are driving development efforts their involvement with the AOC program and AOC actors is minimal (Citizens Environment Alliance & Downriver Citizens for a Safe Environment, 1997; Respondents A2, A6, A10, C7, C10, C14).

Although the Windsor-Essex region of Canada—where the Detroit River is located—experienced a loss in population in the late 2000s and early 2010s as a result of an economic recession, projections anticipate the area will overcome the losses from the recession and will experience modest yet steady growth of population, employment, and housing demand (Antoniw, 2012; Canada Mortgage and Housing Corporation, 2016; Hill, 2017; Lapointe Consulting Inc.,

2008; Ontario Ministry of Finance, 2016). As a result, continued development of the region, along with anticipated growth and change in industries such as agriculture, has the potential to affect the Detroit River (Antoniw, 2012; Canada Mortgage and Housing Corporation, 2016; The City of Windsor Planning Department, 2015; Respondents C4, C5, C8, C12). The Canadian Public Advisory Council is especially concerned about the future of a property known as Ojibway Shores, which is the last remaining natural shoreline on the Canadian side of the Detroit River (Respondents C2, C9, C12; personal observations).

The American side of the Detroit River suffered dramatically from the recession of the late 2000s, and projections anticipate that the area will not fully rebound from this loss in population and jobs (SEMCOG the Southeast Michigan Council of Governments, 2012). While population and employment will increase through 2040, this growth will be subdued, and it is expected that neither population or employment will reach 2000 levels (SEMCOG the Southeast Michigan Council of Governments, 2012). Therefore, instead of pressures from urban or agricultural intensification, both documents and interviewees mention concerns of aging water and wastewater infrastructure and revitalizing vast quantities of vacant and underutilized land (Detroit Future City, 2012; McCoy et al., 2014; Respondents A1, A8, A9, C2). While numerous non-AOC organizations have been promoting green infrastructure and ecological landscapes throughout the area, which will help improve water quality on the Detroit River, the process of revitalization is expected to take time (Detroit Future City, 2012; United States Environmental Protection Agency, 2016; Respondents A1, A10, I3).

An especially promising trend in both countries is increased interest in recreation and tourism activities along riverfront lands – activities that benefit from clean waterways (Respondents A8, C8). While the Canadian side of the Detroit River already has an extensive network of greenways and riverfront trails (Respondents A1, I2), the City of Windsor and economic development organizations in the area have expressed interest in promoting the area as a tourist destination (Antoniw, 2012; The City of Windsor, 2007, 2016). On the American side, high-profile recent developments on the riverfront, such as the Detroit Riverwalk and the Detroit River International Wildlife Refuge’s new visitor center, are increasing recreational and tourism opportunities (Respondents A1, A9, A10). An emerging greenways initiative (Respondent A1), along with a commitment from the state of Michigan to leverage waterfront areas as economic assets (Michigan Office of the Great Lakes, 2016b), will continue this development trajectory. Finally, the new Gordie Howe International Bridge will contain a multi-use pedestrian and cycling path, providing a unique recreation opportunity while also connecting the two countries (Butler, 2017)—while at the same time potentially introducing new sources of contamination via construction of the bridge.

5.3.4 External motivations

As noted in section 5.1.4, because the Detroit River AOC program is not a regulatory program, it benefits enormously from external motivations to complete restoration work—including funding opportunities, complementary environmental regulations and programs, and public perception. External motivations occur at scales from local to national, often vary across the international boundary, and are interactive and co-dependent rather than separate.

By far, the most concerning external motivation for interviewees in both countries is funding. With no secure budget for Areas of Concern such as the Detroit River, actors in the

AOC rely on external partners to fund restoration work. Some of the biggest strides on the Detroit River AOC have occurred with the assistance of these external opportunities: for example, Canada's wastewater upgrades were a result of federal infrastructure funding and the GLRI in the United States has spurred the completion of several large sediment and habitat projects (Respondents A2, A5, C4, C14, I2). Additionally, funding is required to retain staff who implement the AOC, to hire consultants to complete restoration projects, and to sustain Public Advisory Council activities (Respondents A2, A3, A6, C13).

In the near term, numerous data sources demonstrated awareness that reduced funding commitments, as a result of changing external motivations, would significantly slow progress on the Area of Concern (International Joint Commission, 1997). This threat is especially pressing on the American side, where actors continually write grants to receive government funding for restoration projects (Respondents A8, A9) and where "uneven" government funding throughout the lifetime of the Detroit River AOC has caused booms and busts in progress (Respondent I2). Many American interviewees recalled governmental funding cuts in the late 1990s that resulted in staff reductions, lack of project implementation, and a floundering Public Advisory Council (Botts & Muldoon, 2008; Respondents A3, A4, A6); thanks in large part to the federal GLRI, this trend reversed around 2010 (Respondents A2, A5, I2). While the November 2016 federal election in the United States had not yet taken place during the interview phase of this research, a few interviewees nonetheless predicted that a new executive and legislative branch of the federal government could have different political priorities and could impact the future of the GLRI (Respondents A5, A6, C10). These predictions turned out to be true: in May 2017, President Donald Trump's budget proposal eliminated funding for the Great Lakes Restoration Initiative, prompting outcry from individuals working on Areas of Concern. The future of the GLRI is still unclear, as Congress must still adjust and vote on the budget (Blakely, 2017). Non-governmental funding is also a concern in the United States, as the Legacy Act requires a cost-share partner in order to complete sediment projects (Respondents A3, A5).

In Canada, securing funding has been a consistent struggle throughout the lifetime of the Detroit River AOC. Because of limited federal funds, the Canadian model is that the federal government only covers up to one-third of the cost of a project, with the provincial government usually covering another one-third and municipal governments, conservation authorities, and industries covering the remainder (Jackson, 2006; Respondents C5, C12, C14). For these lower levels of government, obtaining "matching funds" is incredibly difficult (Respondents C7, C14), and some documents have called for more federal and provincial investment in the Detroit River AOC and in Great Lakes projects more generally (Crane, 2012; International Joint Commission, 1997; Jackson, 2006). There are also concerns that disparities in funding between the United States and Canada could hamper binational cooperation (Crane, 2012, p. 41).

In the long term, the delisting of the Detroit River as an Area of Concern could significantly impact the AOC's ability to secure funding for continued improvements—and therefore could severely impact the AOC's ability to access expert resources and maintain community interest. These phenomena are already happening in Areas of Concern that have been delisted (Great Lakes Commission, 2015; Mandelia, 2016; Respondent I2). However, with the Detroit River AOC years away from delisting, a clear picture of "life after delisting" for the Detroit River has not yet surfaced. On the Canadian side, the funding that is used to support the Detroit River Canadian Cleanup will presumably stop once the river is delisted, causing the DRCC to dissolve. Because the Detroit River Canadian Cleanup supports the Canadian Public Advisory Council, it is

likely that the PAC will similarly dissolve unless PAC members elect to transform into a nonprofit entity (Respondents C2, C14). Federal government organizations have pledged to continue devoting resources to monitoring delisted AOCs, although they may be less intensely involved in the area (Respondents C4, C5, I2). In the United States, the Public Advisory Council and some individuals are expected to continue involvement post-delisting (Respondents A2, A4, A6), but interviewees did not state whether or not governments plan on continuing involvement. As an already-established nonprofit group, Friends of the Detroit River is well-positioned to continue on with a focus on monitoring, cleanups, and environmental education (Respondents A2, A4). However, with nearly one-third of GLRI funds devoted to Areas of Concern (Great Lakes Commission, 2015) and with Legacy Act funding provided exclusively to Areas of Concern (International Joint Commission, 2003; Statewide Public Advisory Council for Michigan's Great Lakes Areas of Concern Program, 2015), a delisted Detroit River will likely lead to more difficulties for organizations trying to fund these activities.

In addition to funding, regulations and programs provide additional sources of motivation for the Detroit River AOC. For instance, interviewees in both countries noted that regulations related to point source discharges significantly contributed to success in the AOC, and regulations related to endangered species have also affected the AOC (Hartig et al., 2009; Respondents A5, C1, C5). Tightening environmental regulations related to the AOC, or better integrating regulations with the AOC program, could provide more impetus for environmental remediation. Conversely, loosening environmental regulations related to the AOC, or severing ties between regulations and the AOC program, would have the opposite effect. Similar to regulations, the strengthening or weakening of more informal programs related to the Detroit River could affect the AOC. For instance, monitoring and research programs conducted outside of the AOC program have been important contributors to delisting beneficial use impairments on the Detroit River AOC (Green et al., 2010; Michigan Department of Environmental Quality, 2015); after delisting, monitoring and research programs will help ensure that the Detroit River AOC does not experience "backsliding" (Respondents A1, A4, C2, C4). Additionally, interviewees noted the positive Heritage River and International Wildlife Refuge designations discussed in Chapter Four have helped to facilitate cooperation and the exchange of ideas across the international boundary (Respondents A1, A7, C12, I2).

Finally, stakeholder pressure provides an importance source of bottom-up motivation on the Detroit River AOC. In Areas of Concern more generally and in the Detroit River AOC specifically, public engagement is understood to be a determining factor of success both during and after delisting (Mandelia, 2016; Michigan Department of Environmental Quality, 2015; Respondents A1, C1, C11, C13). Public engagement in the Detroit River Area of Concern itself has been an ongoing challenge for actors on both sides of the border (International Joint Commission, 1997; Respondents A2, A6, C4, C10); this challenge is largely an internal one. However, improved public perception of the Detroit River and of the environment is at least partially an external trend that has the potential to influence public engagement on the AOC. Public perception of the Detroit River itself is mixed: while some individuals maintain a negative perception of the river, continued restoration work and improved access to the river is causing many locals to think more positively of the river (Respondents A4, C2, C7, C11). However, public awareness of environmental issues more generally has improved over time, due to a variety of factors both internal and external. As more people recognize the importance and value

of a clean environment, they become more respectful of the river and interested in efforts to clean it up (Respondents A8, C4, C7, C8).

Chapter 6

Discussion

The objectives of this research were to identify and evaluate the importance of external connections on remedial activities in the Detroit River Area of Concern, and to propose recommendations for better incorporating external connections into water governance on the Detroit River and beyond. The first objective was accomplished by “looking inward” to ascertain whether or not a water-centric governance perspective was appropriate for the Detroit River Area of Concern, and if not appropriate, subsequently “looking outward” and determine what external connections are most important and feasible to tackle with a holistic approach to water governance. This chapter accomplishes the second objective of this research. It synthesizes the results presented in Chapter Five, uses these results to offer case-specific recommendations to water managers on the Detroit River Area of Concern, and explores the relevance of these findings and recommendations in the landscape of water governance beyond the Detroit River AOC.

6.1 Summary of key findings

In order to determine whether or not a water-centric orientation was appropriate for the Detroit River Area of Concern, a detailed analysis of the Detroit River AOC action situation was completed and several key findings emerged.

One finding was that a water-centric perspective is certainly present in the Detroit River AOC action situation, making the Detroit River AOC similar to water communities around the world. For instance, the literature on water communities more broadly argues that networks of water professionals struggle to engage with external connections because they adopt sectoral perspectives (de Loë & Patterson, 2017; Kramer & Pahl-Wostl, 2014; United Nations World Water Assessment Programme, 2009). This argument holds true in the Detroit River AOC, where a tight network of water-focused actors implements delisting efforts in both the United States and Canada. For instance, environment-focused federal, state, and provincial government agencies provide leadership roles in both countries. Though the contributions of each country’s Public Advisory Council are very different, the councils are similar in that they contain individuals deeply concerned about water. As is common in the water sector, actors in the Detroit River AOC currently interact with external sectors by inviting them to participate in AOC meetings and events, a practice that is commendable but insufficient.

The literature also states that hydrological boundaries, such as watersheds, can limit opportunities for attention to outside perspectives (Araral & Wang, 2013; Molle, 2006; van Meerkerk et al., 2013). With a hydrologically-based Area of Concern boundary that includes only the waterway itself, the Detroit River Area of Concern’s boundary is especially limiting. While the river’s watershed was discussed extensively as a “Source Area of Concern” in the early 1990s, that term is no longer used and very few projects are completed on the Detroit River watershed.

Finally, the creation of beneficial use impairments, management actions, and delisting criteria provides a clear set of problems, solutions, and rules for the Area of Concern to address.

Actors in the Detroit River AOC are focused on restoring impaired beneficial uses through the completion of management actions, including construction projects, research projects, and monitoring. These management actions are assessed using rules known as delisting criteria. The Canadian side of the Detroit River AOC develops all of its rules locally; in the United States, a combination of state and locally-derived rules is used. Because the AOC program does not have the force of law behind it, federal regulations and related programs are also used to support progress.

Whether or not this water-centric perspective is appropriate for the Detroit River AOC is not answerable in a simple conclusion. As de Loë and Patterson (2017, p. 93) describe, “a water-centric perspective is likely to be appropriate when the practical scope of causes, effects, and interests associated with a water issue are relatively clear, uncontentious, and bound by sector.” The Detroit River AOC was carefully and purposefully designed to match this description, in order to more easily manage the complexity of the legacy pollution cleanup challenge. As a result, people working on the Detroit River AOC have completed numerous high-profile projects, and thus the river should qualify for delisting as an Area of Concern without having to address external connections. Findings in the literature affirm that water-centric practices can help to manage complexity: tight boundary judgments work well to reduce complexity and focus on systems that can be controlled (Boons et al., 2009; van Meerkerk et al., 2013) while dense networks of actors can facilitate trust and coordination (Kramer & Pahl-Wostl, 2014).

That being said, a water-centric perspective has caused challenges in the AOC. On both sides of the border, central actors report struggling to engage with the general public and with actors outside of the water sector. Where the Canadian side offers an opportunity for a wider audience to get involved—on a Public Advisory Council that participates indirectly in the process—disagreements about the scope of remedial actions are frequent. On the American side, indirect participation in the AOC is extremely limited, concealing such disagreement. Neither situation is surprising, as previous literature suggests that water-centric boundaries (Blomquist & Schlager, 2005) and engagement strategies (Biswas, 2004; United Nations World Water Assessment Programme, 2009) often exclude those outside of water. Also, a heavy reliance on larger-scale regulations and funding programs entails risk that changes in those programs will severely impact the AOC, both positively or negatively. These issues and disagreements illustrate that accounting for external connections is likely to be necessary (de Loë & Patterson, 2017). While these external connections may not be addressed as part of the AOC program proper, efforts could be made to engage external drivers, institutions, and actors in parallel to or after AOC delisting.

The external connections identified in this analysis correlate with external connections described in the broader water governance literature. These parallels include discussions of climate change (Fane et al., 2011; Hoekstra, 2011; Kundzewicz et al., 2007), invasive species (Strayer, 2009), population and demographic shifts, and land use change as a result of urbanization or agricultural production (Rockström et al., 2014; United Nations World Water Assessment Programme, 2012). The impact of adjacent waterways, and of external motivations such as funding, provide additional connections less frequently discussed in the literature. Of course, the details of each of these connections—as well as their relative importance—are heavily dependent on context (de Loë & Patterson, 2017; McGinnis & Ostrom, 2014). For the Detroit River, a combination of unique hydrology, proximity to Lake Erie, a changing physical landscape, and variable political priorities are especially pertinent.

6.2 Case-specific recommendations

This research provided the opportunity for multiple actors involved with the Detroit River Area of Concern to share their experiences and to offer suggestions for engaging with external drivers, institutions, and actors. These suggestions, along with findings from this research, illuminate potential avenues to better incorporate external connections into the Area of Concern process while still maintaining focus and specificity where it is needed. In accordance with the fourth and final step of the diagnostic approach presented in Chapter Two, and with the second purpose of this research, this section provides recommendations for actors in the Detroit River AOC water community to engage with important external drivers, institutions, and actors, either immediately or at strategic points in the future (Heikkila, 2016). Because these recommendations are derived from this study's findings—the previous steps of the diagnostic approach—this completes the diagnostic process. Though these outcomes are tailored to the Detroit River AOC's situation, it is very likely that they can be applied to similar water governance situations, and the potential transferability of these recommendations are discussed at the conclusion of this chapter.

Throughout this section, the recommendations offered are cognizant of the transaction costs associated with addressing external connections, hopefully increasing their feasibility and likelihood of adoption. Additionally, in some places the recommendations may also help to remedy more “internal” challenges, such as accountability and limited public involvement.

6.2.1 A proactive discussion of “life beyond delisting”

With the Detroit River AOC program itself designed in a purposefully specific manner, addressing external connections in parallel to or after the delisting process is probably the most feasible option for actors on the Detroit River Area of Concern. However, because the Detroit River AOC is far from delisting at this point in time, discussions about “life beyond delisting” have been limited. One recommendation that emerges from this study's findings is for actors on the Detroit River AOC to begin thinking about and acting upon “life beyond delisting” as soon as possible, and to incorporate external connections while doing so.

One way to plan for “life beyond delisting” while addressing external connections would be to conduct a visioning or goal-setting exercise on the Detroit River. Ideally, the visioning exercise would involve a diverse group of stakeholders, and would enable them to create a joint broad-based vision for the river that is much grander than the Area of Concern program itself. While a visioning exercise has not yet occurred in the Detroit River AOC, it has been successfully completed on several other Areas of Concern. For instance, Hamilton Harbour, Collingwood Harbour, and Wheatley Harbour AOCs in Canada worked with community groups to develop visions from the very beginning of their delisting efforts (Respondents C1, C11). While the Detroit River is well past the beginning of their delisting efforts, engaging external actors in this way years ago would likely have been useful for the AOC. Muskegon Lake AOC in the United States recently created a “Muskegon Lake Vision 2020” document when they were nearing delisting (West Michigan Shoreline Regional Development Commission, 2016; Respondent A3)—an option that is possible and relevant for the Detroit River Area of Concern to begin now.

A visioning exercise would work well to engage representatives of external drivers and institutions and other actors along with local ones because it would create space for them to get involved on their own terms. A broad-based vision would create an opportunity to connect external drivers to the AOC process; external institutions and actors would also get to see their

interests reflected in the vision for the river, prompting them to act in ways that benefit the health of the river and create a sense of ownership and responsibility. Additionally, the visioning exercise would provide current actors the chance to discuss their work with important external actors and to link their progress with external progress. Because the majority of the vision items cannot be completed through the Remedial Action Plan process, the visioning process would give current actors a key opportunity to explain the role of the Detroit River AOC, their role in the process during and after delisting, and how duties can be shared between current and new actors.

Because most of the implementation of a visioning exercise would be undertaken after the Detroit River is delisted, and to ensure a smooth transition as the Detroit River delists and loses resources, it is also recommended that funding and expertise support be provided to the Detroit River for a short time after AOC delisting. This recommendation has been brought up on several other occasions (Mandelia, 2016; Respondent I2; personal observations), and would also help alleviate some internal concerns associated with uncertainty after delisting.

6.2.2 Leveraging existing work

For each of the four external connections identified in Chapter Five, this study revealed examples of important work occurring outside of the Detroit River Area of Concern. Thus, for each of the four external connections, actors in the Detroit River AOC have the potential to connect with existing initiatives and networks—with the goal of complementing one another’s efforts and facilitating joint progress while reducing transaction costs associated with establishing novel initiatives or networks. Regardless of whether or not a formal visioning exercise for the river is completed, current AOC actors and external actors would benefit generally from understanding one another’s priorities, looking for areas of mutual interest, and collaborating when appropriate.

For the broader external connections of large-scale environmental change and adjacent waterways, focusing on the Detroit River AOC’s existing connection with the St. Clair – Detroit River System (SCDRS) Initiative could be a worthwhile place to start. While most of SCDRS’s membership consists of water-related organizations (St. Clair - Detroit River System Initiative, 2017b), the group is focused on addressing issues of invasive species, emerging contaminants, and societal satisfaction in addition to water quality and habitat (St. Clair - Detroit River System Initiative, 2014), and presentations on SCDRS at recent meetings indicate the organization is interested in expanding its membership (personal observations). AOC actors might also consider engaging with local climate change action plans, especially since the adaptation projects proposed in these plans also contribute to improved water quality (Detroit Climate Action Collaborative, 2015b; The City of Windsor, 2012).

For the more locally-driven external connections of land use and motivation, the Detroit River AOC has the opportunity to interact with numerous development-related organizations and projects in the area, including but not limited to municipal government agencies, recreation and tourism organizations, economic development organizations, and developers. Calls to better integrate remediation and redevelopment are common in documents related to Areas of Concern (Hartig & Law, 1994; Hoffman & Williams, 2017; Mandelia, 2016; Michigan Department of Environmental Quality, 1996) and in the broader water governance literature (Muller, 2015). Although the simultaneous occurrence of AOC restoration and economic redevelopment can complicate matters if groups are working in different directions (Hartig & Zarull, 1992b, p. 263), coordination between simultaneous remediation and redevelopment also can create a positive

feedback loop: restoration or anticipated restoration work can spur development, and an increased awareness of water issues as a result of development can spur restoration work (Kubursi, 2012, p. 133).

Finally, Detroit River AOC actors could look to the more positive recognitions the Detroit River has received, reconnecting to conservation-related initiatives such as the Heritage Rivers program and the International Wildlife Refuge. This opportunity is a unique one: many other waterways cannot claim significant natural and cultural heritage values, and the diversity of heritage values on the Detroit River can appeal to a wide variety of actors. While the American Heritage Rivers program is currently defunct, the river still carries the distinction and actors could consider connecting to local historical or cultural groups that may have an interest in the river's health. In Canada, some Canadian Heritage River activities continue, including a recent paddling event (Essex Region Conservation Authority, 2017). However, current activities do not engage the breadth of individuals and groups that were involved during the nomination process in the late 1990s (Detroit River Canadian Heritage Rivers Application Team, 1998, 1999), and there may be opportunity to reconnect with some of these individuals and groups.

This study's findings made it clear that several actors on the Detroit River AOC were already aware of these external initiatives, and some even work with external actors and projects when not working on AOC projects. Therefore, it is likely that these actors would also qualify as "boundary spanners" (Edelenbos & van Meerkerk, 2015; Levina & Vaast, 2005; van Meerkerk & Edelenbos, 2014; Williams, 2002) and could begin the process of more deeply connecting AOC progress with external efforts. Boundary spanners are defined as "vital individuals who facilitate the sharing of expertise by linking two or more groups of people separated by location, hierarchy, or function" (Levina & Vaast, 2005, p. 338). Effective boundary spanners may be appointed or may emerge organically (Levina & Vaast, 2005), and their work can reduce transaction costs if they serve as networkers, active listeners, translators of knowledge, and relationship builders (Edelenbos & van Meerkerk, 2015; van Meerkerk & Edelenbos, 2014). To ensure that synergies with external actors do not become "water-centric," it is important that AOC actors communicate with new actors on the new actors' own terms (Edelenbos & van Meerkerk, 2015; Rogers & Hall, 2003). It is also important that they seek out opportunities to participate in non-water decision-making, rather than simply inviting or expecting external actors to participate in water-related meetings (Ingram, 2008; Mollinga et al., 2007).

6.2.3 Rethinking boundary judgments

Literature on more holistic approaches to water governance often highlights the need to adjust boundaries, for instance, shifting from pre-defined watersheds to more open-ended "problemsheds" (Allan, 2005; Mollinga et al., 2007; Muller, 2015). In the Detroit River AOC, where boundaries and scope are often a point of contention, rethinking boundaries will force AOC actors to address external connections.

In the Detroit River AOC, actors' varying interpretations of the Great Lakes Water Quality Agreement contribute to disagreements on scope and, ultimately, to the "water-centric" problem framing present on the Detroit River AOC; clarifying interpretations of this document could help to resolve this disagreement and prompt a focus on external connections. Governmental actors leading the AOC process stress a narrow boundary or scope, noting the specific lists of beneficial use impairments and Remedial Action Plan components that dominate the GLWQA's section on

Areas of Concern. Meanwhile, Canadian non-governmental respondents and the IJC note that the GLWQA calls for Remedial Action Plans to embody “a systematic and comprehensive ecosystem approach,” (Government of Canada & Government of the United States of America, 2012, p. 22) and argue for a broader boundary. Though a narrow boundary has proven to be more convenient for pursuing measurable achievements in practice and over time, it has come at the expense of addressing more fundamental issues and bigger opportunities in the form of external connections. While the recommendations listed earlier in this chapter are meant to reconcile these lines of thinking—they expand the boundaries of the “action situation” without expanding the boundaries of the AOC—a future Great Lakes Water Quality Agreement might consider formally clarifying what is meant by a “systematic and comprehensive ecosystem approach.” Such formalization could make the recommendations listed above more likely to be pursued in the Detroit River, and could prompt similar efforts in other AOCs.

Additionally, looking beyond the international boundary between the United States and Canada could help actors address external connections more effectively. While addressing external connections will occasionally occur on a domestic basis, a holistic approach to water governance on the Detroit River would be more complete with a binational component. For instance, the visioning exercise described earlier could be a binational exercise; additionally, the Detroit River’s positive designations are binational, and SCDRS is a binational organization. While the primary benefit of this binationalization would be accounting for as many relevant external connections as possible, secondary benefits could include strengthening the relatively weak ties between AOC actors on the American and Canadian sides (Respondents A6, C4, C13), strengthening the relatively weak ties between organizations in the Detroit River region more generally (Nelles, 2011), and learning from the different experiences of other countries and other organizations.

6.3 Lessons learned

Though the findings and recommendations presented in this document are context-specific and tailored to the Detroit River AOC’s situation, a number of lessons can be gained from this analysis. This section briefly and broadly explores the implications and potential transferability of these findings to other water governance settings. While only general statements can be made based on this study alone, practitioners interested in applying the information to their own specific situation may consider comparing the original Detroit River context and findings to their case, and carefully modifying relevant recommendations to fit their needs.

A first lesson is that while complexity cannot be underestimated without risk. On the Detroit River, this resulted in a water-centric perspective being both appropriate and inappropriate for the problem setting. On one hand, in an effort to diminish the influence of complexity, the Detroit River AOC was designed and implemented as a suite of large-scale public restoration projects. This characterization is amenable to water centrality because it features a clearly defined project area and specific set of actors and procedures. Similar conditions are likely to exist in many other restoration and public works projects and in other Areas of Concern. On the other hand, the Detroit River outside of the AOC is still a complex system, especially when considering the interactions among the area’s large population, unique hydrology, and tumultuous history. As a result, some actors call for a more comprehensive and ecosystem-based program for the Detroit River—a characterization that is less amenable to water centrality. The long-term

sustainability of the Detroit River is an objective that involves an unclear boundary, actors from multiple sectors, and inputs from numerous temporal and spatial scales. Though some components and interactions that define the Detroit River region may not be present in other areas, the presence of disagreements surrounding seemingly clear programs like the Detroit River AOC could illuminate unique complexities and predict the presence of external connections.

A second lesson is that though dynamic geographies like the Detroit River have significant external connections to account for, they also have significant resources available to assist in this endeavor, reducing transaction costs. While the external connections identified through this analysis are not especially unique to the Detroit River, the details and magnitude of these connections are unique: the ongoing renewal of the Detroit-Windsor population and the region's proximity to the struggling Lake Erie, for instance, offer distinctive challenges. At the same time, these distinctive challenges have prompted action from numerous local entities, and each of the external connections identified on the Detroit River was associated with existing programs. Instead of creating new programs or incorporating external issues into the AOC, which would come with significant transaction costs, actors can work with these existing local entities to address external connections. This type of arrangement may be less feasible for areas with smaller populations or areas not experiencing sudden change.

6.4 Summary

The findings of this research—that a water-centric perspective is present in the Detroit River AOC, that this perspective is somehow both appropriate and inappropriate, and that several external considerations are or have the potential to impact the river—illuminate several opportunities for improving water governance on the Detroit River Area of Concern and beyond. This chapter makes suggestions for capitalizing on those opportunities while keeping in mind the costs and risks associated with doing so. While the Detroit River AOC's contextual characteristics and resulting recommendations are specific to the area, it is likely that other geographies and programs will relate to the Detroit River AOC's experience and may find the recommendations and lessons learned useful.

Additionally, recommendations and opportunities for continued learning are plentiful with respect to the research approach used for this study—an approach that scholars and practitioners alike might find value in using. These recommendations and opportunities are discussed in the next and final chapter of this thesis.

Chapter 7

Conclusion

This thesis concludes with a reflection on the research process as a whole, discussing the practical and scholarly significance of this study and outlining limitations and opportunities for future research.

7.1 Scholarly and practical contributions

The purpose of this research was to administer a diagnostic framework for identifying and evaluating the importance of external factors, using the Detroit River AOC as an exploratory case. This was accomplished using a case study approach. This research will contribute to literatures that consider the role of external influences on water governance; furthermore, practical contributions for water managers and decision-makers are also apparent.

As the first study to test this diagnostic approach, this research lends strength to the diagnostic approach itself by demonstrating that it can be successfully used. This study found the approach to be very flexible and accommodating, highlighting the approach's ability to be applied to the extent required (partial or complete, shallow or in-depth, depending on analyst timing and needs). This study also found the approach to be cognizant of transaction costs. Moving towards a more holistic approach to water governance comes with significant costs, which can overwhelm practitioners and cause them to revert to more limited "water-centric" approaches. However, this approach and this analysis show that these costs can be mitigated: first by determining whether or not external connections matter in a given situation, and then by strategically addressing the connections that matter most (de Loë & Patterson, in press).

The findings of this study also add to the vast body of data and literature related to Elinor Ostrom's social-ecological systems framework and to diagnostic approaches. Most research using diagnosis and/or the SES framework focuses internally on the situation at hand and regards exogenous influences as contextual or peripheral. While the first steps of this analysis are more similar to traditional applications of diagnosis and the SES framework, the process of "spiraling out" breaks from these traditional applications by incorporating external drivers, institutions, and actors into the core problem setting or action situation. By analyzing features such as environmental change and population shifts in-depth, and by incorporating these features directly into the Detroit River action situation, synergies and opportunities for collaboration became apparent.

As a final theoretical contribution, many water governance scholars and practitioners have recognized the need to link water with external drivers, institutions and actors. Though the findings of this research do not identify any especially novel external drivers, institutions, or actors, the influential role of external connections on the Detroit River AOC once again demonstrates the prevalence and importance of external connections in water governance.

This research is also relevant for water management practitioners, especially because of its focus on the Great Lakes and the Area of Concern program. As a result of the Great Lakes Water Quality Agreement, the Great Lakes basin generally is known for lessons and best practices on

water resources collaboration, and the Area of Concern program is often heralded in Great Lakes gatherings as the most successful component of the GLWQA (personal observations). Although this research examined only one Area of Concern, it demonstrates that phenomena occurring outside of the AOC program have the potential to significantly impact the progress and success of restoration work occurring in the AOCs.

In addition to revealing critical external connections surrounding the Detroit River Area of Concern, this research provides a comprehensive description and exploration of the Detroit River AOC process itself. This description, on its own, may be useful to water management practitioners and public citizens interested in the Detroit River AOC or AOCs more generally. The description provided in this thesis is unique because it is binational and reflects upon a variety of stakeholder perspectives; newcomers to the Detroit River AOC may find it a valuable primer, while more experienced Detroit River AOC officials might use it to understand alternative perspectives and more clearly explain the strengths and limitations of their work.

7.2 Limitations and research opportunities

Understanding the limitations of this study is crucial for appropriately interpreting the results and contributions of this study. Reflecting upon these weaknesses has also highlighted opportunities for future research on this topic.

First, it is likely that that important information was missed due to the absence of perspectives from individuals not involved with the Area of Concern. Due to time and resource constraints, the interviewees recruited for this case were individuals familiar with the Detroit River AOC program. As a result, voices of individuals less familiar with the AOC—including the perspectives of external organizations discussed in this study’s results and recommendations—were missed. Because this research lacks the complete perspective of the region, the resulting evidence of this study is limited accordingly. For instance, interviewing additional individuals may have exposed new external connections or may have provided differing evidence about the external connections that were identified.

Another possible limitation to this research is its exploratory focus. While this broad focus allowed for a comprehensive identification and analysis of external connections on the Detroit River Area of Concern, each of the external concerns identified in Chapter Five could be described in more depth than what this research allowed. Additionally, a study that compared two distinct Area of Concern geographies (rather than one AOC geography split into two countries) would have improved the transferability of findings. While the choice of an exploratory focus was made consciously, the shortcomings associated with that should still be recognized.

The limitations and exploratory nature of this research illuminate several opportunities for future study. Given the growing awareness of, and increasing need to consider, external connections in water governance, studies that continue applying and advancing this diagnostic approach to this topic in diverse empirical settings are warranted. Further testing of the approach will continue to refine the process itself, will illuminate commonalities between findings, and will help to increase the likelihood of successful transferability. Comparing two distinct geographic contexts using the diagnostic approach would be an especially logical next step.

Lastly, just as addressing “internal” shortcomings is not enough when problems are external to water, addressing “external” shortcomings will fall short if internal challenges are not resolved.

Therefore, future research could also examine how internal and external shortcomings in water governance are related. For instance, in this study on the Detroit River AOC, several interviewees discussed challenges of public participation and communication; however, as more “internal” topics, these were not a focus of the diagnostic framework and were not included in the analysis. Future studies might use these or similar data to consider how “internal” challenges such as public participation, communication, leadership, accountability, and power imbalances affect actors’ ability to successfully address external connections.

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Appendix A

Interview guide

About you	What is your role in the RAP process? How long have you been in this line of work?
About decision-making	How have people used the river in the past and present, and how is the Detroit River affected by those uses? Are all of these uses addressed in the RAP?
	Who are the individuals / groups responsible for planning and implementing these actions in the Detroit River (participating in making decisions in the AOC)? <ul style="list-style-type: none"> • Who is most involved? Why? How?
	What goals / outcomes are most important for you and your organization? (priority)
	Besides the RAP, what other rules (formal, informal) are being used to protect the Detroit River?
About outcomes / results of decision-making	What do you think are notable accomplishments from the Detroit River RAP process? <ul style="list-style-type: none"> • What do you think are the reasons for this success? What has facilitated the success?
	What have been some challenges or frustrations related to the RAP? <ul style="list-style-type: none"> • Why do you think these are so challenging? • What do you think it will take to overcome those challenges?
	Are there any issues or opportunities related to the Detroit River that you think have been neglected through this RAP process?
Final q's	How does the DR RAP compare to other RAPs you have worked on (e.g. St Clair River)?
	Have you or your organization given thought to “life after RAP” or “life beyond RAP”? <ul style="list-style-type: none"> • How? / In what way?
	Any questions for me, additional comments?

Appendix B

Coding guide

First stage	Second stage	Third stage
<ul style="list-style-type: none"> • 01 Defining the Detroit River AOC action situation. 	<ul style="list-style-type: none"> • 01 Defining the Detroit River AOC action situation. <ul style="list-style-type: none"> ○ Actors. ○ Governance system. ○ Resource goods and services. ○ Resource system. 	<ul style="list-style-type: none"> • 01 Defining the Detroit River AOC action situation. <ul style="list-style-type: none"> ○ Actors. <ul style="list-style-type: none"> ▪ In Canada ▪ In the United States ▪ Binational collaboration ▪ General ○ Governance system. <ul style="list-style-type: none"> ▪ In Canada ▪ In the United States ▪ General ○ Resource goods and services. ○ Resource system.
<ul style="list-style-type: none"> • 02 Assessing the Detroit River AOC action situation. 	<ul style="list-style-type: none"> • 02 Assessing the Detroit River AOC action situation. <ul style="list-style-type: none"> ○ Accomplishments ○ Challenges, shortcomings, limitations 	
<ul style="list-style-type: none"> • 03 Identifying new / adjacent action situations. 	<ul style="list-style-type: none"> • 03 Identifying new / adjacent action situations. <ul style="list-style-type: none"> ▪ Environmental factors ▪ Health ▪ Adjacent waterways ▪ Lakewide management ▪ Agriculture ▪ Nonpoint source and CSOs ▪ Population, economy, LULC ▪ Recreation, access ▪ Funding, expertise, resources ▪ Local engagement ▪ Other laws, programs 	<ul style="list-style-type: none"> • 03 Identifying new / adjacent action situations. <ul style="list-style-type: none"> ○ Large-scale environmental change <ul style="list-style-type: none"> ▪ Environmental factors ▪ Health ○ Upstream and downstream waterways <ul style="list-style-type: none"> ▪ Adjacent waterways ▪ Lakewide management ○ Development and land use change <ul style="list-style-type: none"> ▪ Agriculture ▪ Nonpoint source and CSOs ▪ Population, economy, LULC ▪ Recreation, access

		<ul style="list-style-type: none">○ Recognition and funding / motivational structures<ul style="list-style-type: none">▪ Funding, expertise, resources▪ Local engagement▪ Other laws, programs
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Appendix C

Current and past beneficial use impairments in the Detroit River Area of Concern

Beneficial use impairment (Government of Canada & Government of the United States of America, 2012, pp. 21-22)	1991 RAP Status (Green et al., 2010; Michigan Department of Natural Resources & Ontario Ministry of the Environment, 1991)	2017 Status – USA (Michigan Office of the Great Lakes, 2016a)	2017 Status – Canada. (Detroit River Canadian Cleanup, 2017b)
Restrictions on fish and wildlife consumption	Impaired for fish.	Impaired for fish.	Impaired for fish.
Tainting of fish and wildlife flavor	Not impaired (not applicable to this Area of Concern).	Not impaired (restored 2013).	Not impaired (restored 2014).
Degradation of fish and wildlife populations	Not impaired (not applicable to this Area of Concern).	Impaired.	Impaired.
Fish tumors and other deformities	Impaired.	Impaired.	Impaired.
Bird or animal deformities or reproduction problems	Not impaired (not applicable to this Area of Concern).	Impaired.	Impaired.
Degradation of benthos	Impaired.	Impaired.	Impaired.
Restrictions on dredging activities	Impaired.	Impaired.	Impaired.
Eutrophication or undesirable algae	Not impaired (not applicable to this Area of Concern).	Not impaired (not applicable to this Area of Concern).	Not impaired (not applicable to this Area of Concern).
Restrictions on drinking water consumption, or taste and odor problems	Impaired.	Not impaired (restored 2011).	Not impaired (not applicable to this Area of Concern).
Beach closings	Impaired.	Impaired.	Not impaired (restored 2014).
Degradation of aesthetics	Impaired.	Impaired.	Not impaired (restored 2014).
Added costs to agriculture or industry	Not impaired (not applicable to this Area of Concern).	Not impaired (not applicable to this Area of Concern).	Not impaired (not applicable to this Area of Concern).

Degradation of phytoplankton and zooplankton populations	Not impaired (not applicable to this Area of Concern).	Not impaired (not applicable to this Area of Concern).	Requires further assessment.
Loss of fish and wildlife habitat	Impaired.	Impaired.	Impaired.