

**Power to the People: Collaborative Watershed Management in the Cuyahoga River Area of Concern**

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## **Abstract**

This project examines collaborative watershed management in the Cuyahoga River Area of Concern (AOC), focusing on the biophysical nature of the river system, the reciprocal relationship between local culture and strategic planning, and institutional rules that guide decision-making. Twenty-three semi-structured interviews were conducted with members of the Cuyahoga River AOC Advisory Committee and supported by a thorough document analysis and direct participant observation to analyze the decision-making processes and collaborative relationships that shape management actions in the watershed. Results suggest that financial and technical resources, along with political support, are essential for large-scale and complex restoration projects like those found in the Cuyahoga AOC. Organizations with governmental ties and that have the capacity to donate resources for restoration have the biggest impact on environmental outcomes. Social outcomes are contingent upon successful collaboration and support community development and improved connection to the resource.

**Key words:** Collaboration, Watershed Management, Institutional Analysis, Great Lakes, Areas of Concern

## 1.0 Introduction

Natural resource management has evolved from largely top-down, government control towards more collaborative approaches that seek to address all environmental stressors on an ecosystem scale (Cortner and Moote, 1999; Grumbine, 1994; Koontz et al., 2004; Wondolleck and Yaffee, 2000). One area where collaborative approaches have gained momentum is with watershed management (Imperial, 2005; Leach and Pelky, 2001; Sabatier et al., 2005). Watershed management institutions, alternately called watershed partnerships, watershed advisory committees, or integrated water resource management, among other things, are informal coalitions of diverse stakeholders that develop and implement strategic management plans for habitat restoration, sustainable land use, and restoration actions geared towards improving water quality (Sabatier et al., 2005). Federal and state governments are increasingly supporting watershed-based efforts with financial, technical, and human resources, which are beginning to translate into ecological improvements in some cases (Born and Genskow, 2000; Brisboil and de Loe, 2016; Hardy, 2010; Koontz et al., 2004; Steelman and Carmin, 2002).

A growing body of research has sought to better understand similarities and differences among watershed partnerships that can serve as corollaries for successful outcomes (Hardy and Koontz, 2010; Hardy and Koontz, 2009; Koontz et al., 2004; Moore and Koontz, 2003). For example, land use patterns in different watersheds have been shown to impact the organizational resources, perceptions, and experiences of watershed stakeholders (O'Neill, 2005). Urban partnerships more often focus on strengthening model codes and ordinances for stormwater management and remediation of contaminated sediments, whereas rural partnerships work more with landowners on easements and best management practices (BMPs) to address incompatible development (Hardy and Koontz, 2010). Moreover, the same governance arrangements will not be resilient in all locations – institutions need to adapt to local biophysical conditions to achieve success (Moore and Koontz, 2003). For example, government-centered collaboration is more appropriate for restoration of large-scale and highly contaminated watersheds, such as Superfund sites, due to the enormous price tags and necessity for technical resources. Citizen-centered arrangements can be more effective for conservation of relatively intact ecosystems

and less costly projects, like eradicating invasive species and environmental education campaigns (Hardy and Koontz, 2009).

Scholars also point to social variables, such as norms of reciprocity, local knowledge, and communities' connection to the resource as important predictors of management outcomes (Ostrom, 2009). It is thus valuable to explore the stakeholders involved in watershed partnerships and how they collaborate with each other. "This approach entails directing attention to who the actors are, what their interests and motives are, who they collaborate with, and how the structures of such "collaborative networks" relate to the actors' joint abilities to address different environmental problems" (Bodin, 2017, page 2). Within these networks, local knowledge can be as important as "expert" knowledge and enhance individual and group learning (Weible, Pattison, and Sabatier, 2010). Collaborative approaches are based on repeated interactions of stakeholders, which builds the trust and shared understanding vital for self-organization (Lebel et al., 2006). Conversely, varying degrees of participation in collaborative partnerships can complicate decision-making and confuse the roles for individual actors, supporting the need for research on the institutional processes and internal decision making arrangements within these groups (Grumbine, 1994; Imperial, 1999; Slocombe, 1993).

Institutional analyses of watershed partnerships indicate that watersheds are "managed" by a diverse portfolio of governmental and nongovernmental actors whose decisions ultimately impact environmental and social outcomes (Imperial and Hennessey, 2000). Efforts to inform collaborative approaches for watershed management have thus shifted inward towards better understanding partnerships' inter-organizational networks, or "institutional ecosystems" (Imperial, 1999). Results suggest that characteristics and organizational structures of collaborative watershed efforts often correlate to water quality improvements (Bidwell and Ryan, 2006; Imperial and Hennessey, 2000; Korfmacher, 2000; Leach et al., 2002; Moore and Koontz, 2003; Thomas, 1999). In other words, variables such as social capital, diversity of constituents, inclusive decision-making processes, and governmental resources are increasingly recognized as being important to watershed outcomes.

Just and inclusive governance arrangements represent one characteristic that appears to be vital for the sustainable management of environmental systems such as watersheds (Ostrom, 2009; Partelow, 2018).

Empowering local leaders establishes trust and credibility and helps them serve as honest brokers of information about environmental problems and corresponding management strategies within their communities (Grumbine, 1994; Landre and Knuth, 1993). This approach seeks to build relationships among traditionally disparate parties and share responsibility for environmental management by collaborating with government (rather than commanded and control) to secure “resources, incentives, and opportunities important for collective action” (Wondolleck and Yaffee, 2000, pg. 5). Watersheds thus can be thought of as “political and ideological constructs,” that necessitate robust and deliberate governance systems to ensure future resilience (Molle, 2009).

In the Great Lakes region, there is no bigger influence on watershed management than the Great Lakes Water Quality Agreement (GLWQA) and complimentary funding sources like the Great Lakes Restoration Initiative (GLRI) and Great Lakes Legacy Act (GLLA). The GLWQA promotes “locally-designed ecosystem approaches that account for the interrelationships among air, water, land, and all living things, including humans, and involve all user groups” (GLWQA, 2012). This entails stakeholder engagement in efforts to improve individuals’ local communities (Williams and Stewart, 1998). It also focuses on restoration of entire ecosystems, often at the watershed scale, instead of jurisdictional boundaries (Hartig and Vallentyne, 1989).

Research on watershed management in the Great Lakes has often focused on ecological outcomes and return on investment for restoration, as well as “lessons learned” regarding stakeholder participation (Hartig et al., 2020; Hartig et al., 2018). However, there has been little work done on the institutional variables that shape decision making within watershed partnerships, and how interactions among participants can impact restoration actions and outcomes. This project seeks to fill this gap by investigating the collaborative relationships that inform management actions in the Cuyahoga River Area of Concern (AOC) in northeast Ohio. The study employs a promising tool for investigating the interorganizational networks associated with collaborative environmental management. The Institutional Analysis and Development (IAD) framework (Kiser and Ostrom, 1982; Ostrom, 1990, 1999; Ostrom, Gardner, and Walker, 1994) has been used to explore watershed partnerships and to model decision making among collaborative watershed efforts in different locations (Hardy and Koontz, 2010; Hardy and Koontz, 2009; Kauneckis and Imperial, 2007; Mudliar and Koontz, 2020). This study uses the IAD

framework to address three linked questions in the Cuyahoga River AOC: (i) How do local biophysical characteristics impact actions and outputs of watershed management; (ii) How does culture and social capital influence the stakeholders involved and their roles in the collaborative process; and (iii) How do institutional rules affect decision making processes, resultant strategic management actions, and watershed-scale outcomes.

## **1.1 Background**

### ***1.1.1 Great Lakes Water Quality Agreement***

The Great Lakes Water Quality Agreement (GLWQA) is a bi-national commitment between the governments of the United States and Canada and coordinated by the International Joint Commission (IJC) to ‘restore and protect the waters of the Great Lakes’ (U.S. EPA, 2019). The GLWQA represents a general set of formal institutional rules that direct federal and state/provincial agencies, under the supervision of local collaborative advisory committees, to clean up the most polluted rivers draining into the Great Lakes. First signed in 1972, then amended in 1978, 1987, and 2012, the GLWQA has provisions to address harmful algal blooms, aquatic invasive species, impacts from climate change, discharges from vessels, and the focus of this project, cleanup efforts on the most polluted waterbodies associated with the Great Lakes. More specifically, Annex I of the GLWQA seeks to ‘restore highly contaminated sites within the Great Lakes basin through the development and implementation of Remedial Action Plans (RAPs)’ (U.S. EPA, 2019). These sites, designated Areas of Concern (AOCs), indicate human activities have caused serious damage to the environment, to the point that fish and other aquatic species are harmed and traditional uses of the water are impaired. AOCs are defined as:

*“Geographic areas designated by Canada or the United States where significant impairment of beneficial uses has occurred as a result of human activities at the local level. Impairment of a beneficial use is a reduction in the chemical, physical, or biological integrity of the waters of the Great Lakes sufficient to cause any of 14 specific problems (beneficial use impairments, or BUIs)” (GLWQA, Annex I, 2012).*

A total of 43 AOCs have been identified by the United States (26) and Canada (12), with 5 binational AOCs shared by the two countries. Efforts to clean up the AOCs represents a truly collaborative process, including a suite of stakeholders ranging from the United States Environmental Protection Agency (U.S. EPA) and Environment and Climate Change Canada (ECCC), to other federal and state environmental agencies, and many local governments, nongovernmental organizations (NGOs), businesses, and independent residents.

### ***1.1.2 Cuyahoga River***

Among the 43 AOCs in the Great Lakes, this study takes a close look at the Cuyahoga River AOC. Restoration efforts along the Cuyahoga River began to take off in earnest in the 1980's when the State of Ohio mandated the completion of a RAP designed to restore all impaired beneficial uses for the river and its watershed. The OEPA designated the Cuyahoga AOC as the lower 46.5 miles of the river, its sub-watersheds, and 10 miles of adjacent Lake Erie coastline. A local advisory committee, originally called the Cuyahoga River RAP Coordinating Committee (CCC), represented a wide variety of stakeholders involved in the use and management of the watershed. By the end of the decade a nonprofit facilitating organization called Cuyahoga River Restoration (originally called the Cuyahoga River Community Planning Organization) was created to support the RAP's activities (Goodman and Gigante, 2018). In 2020 the Cuyahoga County Soil and Water Conservation District took over responsibilities as the AOC's facilitating organization.

The ultimate goal of the Cuyahoga RAP was to “restore the river and all impaired beneficial uses through the remediation of existing problems, and to protect the resource for future generations” (Goodman and Gigante, 2018, pg. 4). Beneficial Use Impairments (BUIs) either restrict people's ability to use the resource, negatively impact fish and other aquatic communities, or degrade water quality. Examples might include not being able to swim at certain beaches or healthy fish populations not surviving because the water is not clean enough. For the Cuyahoga River AOC, there were originally 10 BUIs that the RAP had targeted for restoration (see Table 1).

Restrictions on Fish Consumption	Beach Closings (recreational contact)
Degradation of Fish Populations	Public Access and Recreation Impairments
Fish Tumors or Other Deformities	Degradation of Aesthetics
Degradation of Benthos	Eutrophication or Undesirable Algae
Restrictions on Navigational Dredging	Loss of Fish Habitat

Table 1: Cuyahoga River AOC Beneficial Use Impairments (BUIs)

Development and implementation of the Cuyahoga RAP has unfolded in two distinct stages. Stage 1 finished in 1992 (updated in 1996) and focused on identification of use impairments and causes (Cuyahoga River Community Planning Organization, 2008). Stage 2 lasted until 2013 (updated in 2015) and identified operational actions and the organizations responsible for them (Cuyahoga River Restoration, 2015). Financial resources provided by the GLRI in 2010, along with technical and human resources from the OEPA, Cuyahoga River Restoration and the Cuyahoga County Soil and Water Conservation District, and the formation of the Cuyahoga River AOC Advisory Committee aided the process greatly. According to the Executive Director of Cuyahoga River Restoration, “This partnership has used a community based planning model in enhancing legitimacy through direct stakeholder participation in decision making, achieving community ownership of the work, and achieving progress through partnerships” (Goodman and Gigante, 2018, pg. 5).

## 2.0 Methods

The IAD framework is employed to investigate how biophysical, cultural, and institutional factors affect the structure and decision making processes of the Cuyahoga AOC Advisory Committee and contribute to subsequent environmental and social outputs. The framework can help reveal strengths and weaknesses of the collaborative management, as well as identify and inform policy makers and practitioners influencing the resource.



## ***2.1 IAD Framework***

The IAD framework provides a means through which the complex decisions made by any particular institution can be broken down into components for analysis. The framework can then help researchers determine which specific factors influence decision-making behavior within the institution and the resulting outcomes (Kiser and Ostrom, 1982). This is especially useful when examining Annex I of the GLWQA, since the bi-national policy represents a governance strategy buoyed by a variety of agencies at differing levels of government and local stakeholder participation is on a voluntary basis.

### ***2.1.1 Concepts and Variables***

The IAD framework outlines three external factors that influence the decision-making process and outcomes of an institution (see Figure 1). The first is the biological and physical environment (Ostrom et al., 1994). This variable is particularly important when analyzing the AOC program since restoration decisions recommended by local advisory committees and approved by the U.S. EPA and ECCC target specific environmental criteria. The second factor is the community, which includes all the individuals who are involved in and impacted by the decisions made in the institution (Kiser and Ostrom, 1982). One significant aspect of the community variable of the GLWQA are local resource users, including recreationists, the shipping industry, manufacturers, and residents and retail businesses near the river. The cultural influence of these stakeholders on management actions can be measured using the IAD framework. The final factor is the institutional rules and behavioral norms that influence decision-making (Kiser and Ostrom, 1982). These rules include formal policy rules, such as legislation implementing the GLWQA, and informal rules, such as typical interactions among agency employees and resource users associated with AOC advisory committees.

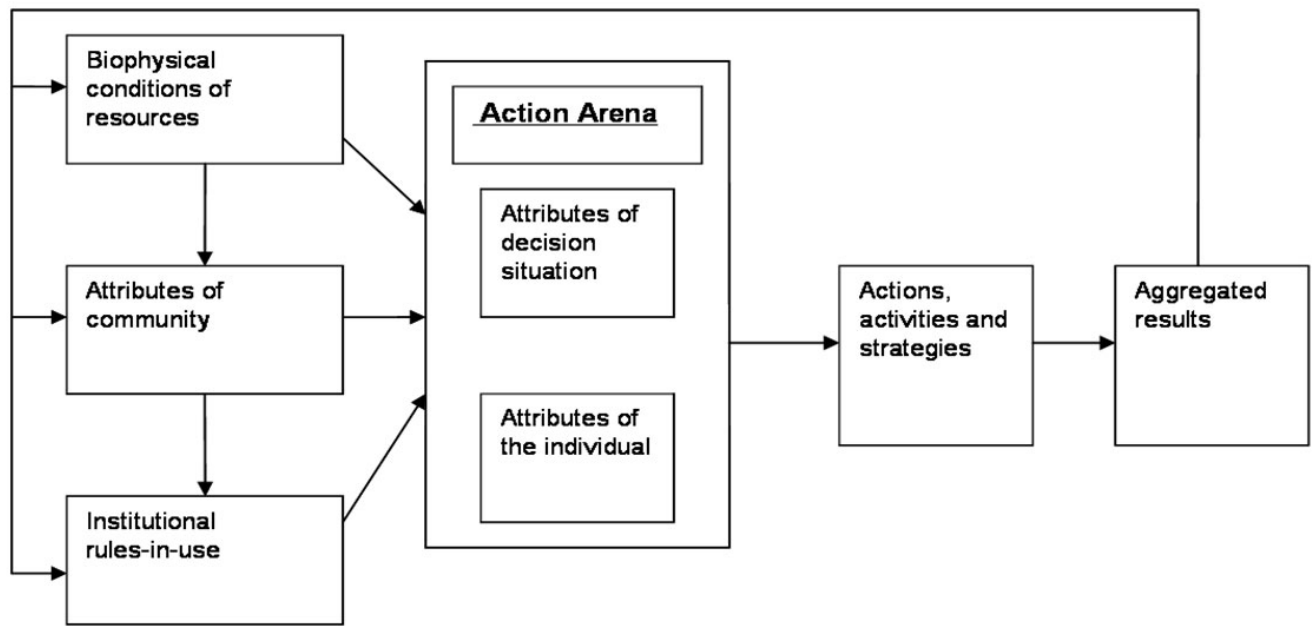


Figure 1: IAD Framework. Adapted from Rules, Games, and Common-Pool Resources, by E. Ostrom, R. Gardner, & J. Walker, 1994, p. 37.

These factors are then examined in the context of the action arena: all of the individuals who interact to make decisions that affect the outcomes of the institution (Ostrom, 2011). For Great Lakes AOCs, the action arena includes advisory committees, local residents, state and local officials who implement and enforce the program, consultants and NGOs that assist in implementation, and policy makers who dictate the overarching rules. Decisions are made in the action arena, affected by the external variables, then generate outcomes (Kiser and Ostrom, 1982). Since the framework isolates the external variables and the connections between those variables and the outcomes, both the outcomes themselves and the processes that lead to those outcomes can be evaluated (Ostrom, 1999). Thus, the framework can be used to identify strengths and weaknesses of the AOC program and advisory committees, solutions for recurring problems, and methods to increase efficiency.

## ***2.2 Data collection***

Data collection for this study included semi-structured interviews with key informants, a review of research articles and government documents on the structure and implementation of the GLWQA and Cuyahoga RAP, and direct participant observation at quarterly meetings of the Advisory Committee from 2017-2020, Bi-national AOC conferences in 2017 and 2019, and other professional events geared towards restoring the Cuyahoga River. Key informants are people with firsthand knowledge of the events being studied who provide factual information about the organization from an insider perspective. In this study, key informants are those most closely involved with collaborative watershed management in the Cuyahoga River AOC: members of the Advisory Committee. Twenty three members out of 25 individuals on the Committee (including one alternate) were interviewed.

The Committee members that agreed to be interviewed make up a diverse membership profile, representing government agencies and regional government-backed collaborative entities (10), environmental consulting firms (5), nongovernmental organizations (5), members of the public (3), and academia (2). The amount of time individuals have served on the Committee also varies greatly, ranging from about 2 months to “from the beginning,” approximately sometime around 1987. The distribution is somewhat bimodal, with six people having served for 10 years or more, while six people have only served for 2 years or less.

Interviews were conducted between January 28, 2020 and April 20, 2020, and lasted between 30 minutes and 90 minutes each, with follow-up phone calls as needed to corroborate information. Interview questions prompted respondents about the institutional network of rules and community attributes in place in the Cuyahoga River watershed, as well as environmental systems in question, patterns of interaction among key decision makers, and decision situations within the Advisory Committee that impact AOC restoration outcomes.

Primary and secondary sources from documents pertaining to the Cuyahoga River AOC included the U.S. EPA and OEPA reports on the GLWQA and beneficial use impairments, Cuyahoga River RAPs, completed

watershed action plans, data concerning organization and watershed characteristics, including information about group history, goals, objectives, activities, financial resources, and partner organizations.

## 3.0 Results

### 3.1 Biophysical

The GLWQA was drafted in direct response to severe disturbances to the integrity of a valuable and unique biophysical system. In its own words, the goal of the GLWQA is to: “restore and maintain the chemical, physical, and biological integrity of the Waters of the Great Lakes” (GLWQA, 2012). In order to achieve this goal, the governments of the United States and Canada have established nine general objectives based on environmental quality. According to the GLWQA (2012), the waters of the Great Lakes should:

1. *Be a source of safe, high-quality drinking water;*
2. *Allow for swimming and other recreational use, unrestricted by environmental quality concerns;*
3. *Allow for human consumption of fish and wildlife unrestricted by concerns due to harmful pollutants;*
4. *Be free from pollutants in quantities or concentrations that could be harmful to human health, wildlife or organisms, through direct exposure or indirect exposure through the food chain;*
5. *Support healthy wetlands and other habitats to sustain resilient populations of native species;*
6. *Be free from nutrients that directly or indirectly enter the water as a result of human activity, in amounts that promote growth of algae and cyanobacteria that interfere with aquatic ecosystem health, or human use of the ecosystem;*
7. *Be free from the introduction and spread of aquatic invasive species and terrestrial invasive species that adversely impact the quality of the Waters of the Great Lakes;*
8. *Be free from the harmful impacts of contaminated groundwater; and,*
9. *Be free from other substances, materials or conditions that may negatively impact the chemical, physical or biological integrity of the Waters of the Great Lakes.*

While the GLWQA establishes goals for the waters of the Great Lakes, individual members of the 43 local Advisory Committees that recommend management action plans to state and provincial environmental agencies come to the collaborative planning table with their own biases and expertise. In an effort to explore the differences in expertise among stakeholders in the Cuyahoga River AOC, members of the Advisory Committee were asked to share their professional goals related to watershed management along the Cuyahoga River. In many cases, Committee members’ goals mirror those established by the GLWQA, albeit from a broader perspective. The number one goal stated by Committee members is simply “river restoration,” followed closely by

improvements in water quality. In contrast to the GLWQA, Committee members also value social goals, such as public environmental education and community development. Given the connection between the professional expertise of Committee members and prioritization of projects that receive funding for implementation, it is also helpful to better understand Committee members' opinions on the biggest environmental threats in the Cuyahoga River AOC. Results indicate that stormwater runoff is perceived to be the biggest threat, especially as it relates to degraded water quality. Climate change is also seen as negatively impacting the environment, as are loss of wildlife habitat and emerging contaminants, such as marine debris.

Committee members suggest a suite of restoration actions to combat such challenges. The most impactful restoration actions as perceived by the Committee are dam removal, stormwater management, habitat restoration, wastewater treatment, and education and outreach. Respondents hope that, if implemented successfully, these actions will lead to specific environmental and social outcomes. Environmentally, the most important potential outcomes include improved water quality, ecosystem integrity, better public access, increased environmental awareness, and reduced contaminants in the river. Socially, the most important outcomes are seen as public access and recreation, use of the Cuyahoga River Water Trail and Towpath, better education and awareness, increased environmental ethics among watershed residents, and improved community development. In order to achieve these goals, funding, support from the state government and local communities, improved stormwater management projects, and help from the federal government are thought to be the biggest influences.

With all of the time and resources that go into large scale restoration efforts, it is important to understand how Committee members measure success and determine if their goals for restoration are being met. The majority of respondents in this study indicate that they measure success according to BUI removal, EPA approval of the Committee's management action plans, and water quality and wildlife habitat improvements. These responses represent a relatively straight forward, biologically grounded, and empirically based approach. Other, more difficult to quantify measures are also suggested by Committee members, such as community engagement, number of people who use the river for recreation, and community and economic development purposes.

While the broad objective of the GLWQA is to improve environmental quality, local advisory committees have the latitude to decide which environmental objectives are most important in each watershed. These objectives are thus subject to local land use and community development interests. When asked what the most pressing environmental issues are in the Cuyahoga watershed, the top response by Committee members overwhelmingly was stormwater management, including contributors to, and results of, stormwater such as impervious surfaces and combined sewer overflows. Officials at the North East Ohio Regional Sewer District (NEORS) in Cleveland must agree, as the agency recently committed to a 3 billion dollar effort dubbed *Project Clean Lake* that seeks to store combined sewer overflows in a series of underground tunnels and keep sewage from polluting Lake Erie. Committee members also feel that water quality issues such as nutrient loading and high bacteria levels are important, and to a lesser extent, sediment issues associated with erosion, dredging, and legacy sediment in the river bottom. Other issues cited by the Committee include climate change, alterations to wildlife habitat and impacts on wildlife populations, plastic marine debris, public access, and outdated dams.

In order for a watershed to be considered an AOC, significant impairment of beneficial uses must have occurred as a result of human activities (U.S. EPA, 2019). RAPs for each AOC are based on environmental factors, as are restoration actions. RAPs for each impaired water body: ‘identify beneficial use impairments and causes; include criteria for restoring beneficial uses (established in consultation with the local community); identify remedial measures to be taken and entities responsible for implementing these measures; summarize the remedial measures taken and the status of beneficial uses; and describe surveillance and monitoring processes’ (GLWQA, 2012). Progress on RAPs are reported biannually to the Great Lakes Executive Committee and chronicled in a Progress Report of the Parties every three years.

The Advisory Committee worked with key stakeholders to identify and prioritize restoration opportunities for the Cuyahoga RAP, which has been pivotal in helping the EPA to initiate restoration actions. While the EPA ultimately decides what conservation practices will be used, the environment dictates which practices are most effective, and the Advisory Committee recommends actions to implement. For example, particular soil types along riverbanks are more suitable for vegetative buffers, and certain areas may be better for wetland mitigation

than others. Factors that influence types of restoration also include soil erosion potential, landscape properties, size of the river channel, type of substrate, presence of toxins, existence of dams, and species diversity.

Do to the role of the Advisory Committee in prioritizing management actions in the RAP, Committee members' opinions about the effectiveness of different management strategies is of critical importance. For this project, Committee members were asked what types of watershed restoration and conservation programs are, or would be, most impactful in the Cuyahoga AOC. The removal of several dams along the river is absolutely seen as the most impactful. This process has already started with demolition beginning on the Brecksville Diversion Dam and Pinery Feeder Dam in the Cuyahoga Valley National Park. A larger dam along the Cuyahoga Falls Gorge is targeted for removal next. Committee members also highlight the importance of stormwater management efforts spearheaded by the NEORSD, ecological habitat restoration, reduction of impervious surfaces, as well as wastewater treatment, and education and outreach.

Annex 1 of the GLWQA is designed to work in conjunction with federal, state, provincial, and local stakeholders in both the United States and Canada. Local advisory committees who recommend the management action plans for each AOC also take into account local laws and conservation requirements. In fact, the GLWQA holds the promise of assisting municipalities in improving economic conditions and fulfilling regulatory requirements for land and stormwater management. For example, in Cleveland, OH, recently enacted management actions have resulted in greater public access to the Cuyahoga River, improved aesthetics, and less restrictive guidance on fish consumption. In theory, riverbank landowners will be able to gather higher rental payments on their properties due to the environmental improvements and diversified use of the resource. The combination of IJC guidance with existing government initiatives is exemplified by the GLWQA. Through the AOCs, states and provinces can collaborate with local stakeholders to implement restoration plans that focus on issues of national and regional environmental importance.

Not only does the biophysical environment affect the decisions and actions of the government agencies implementing the program and means by which successful restoration is measured, but the strategies for restoration employed by local stakeholders as well. For example, new technologies allow environmental

consultants to test innovative ways to create fish habitat along bulkheads found in channelized sections of the river and plant toxin-resistant native vegetation to restore wildlife habitat. These examples show how the structure of the program is well suited to its purpose of restoring ecosystem integrity to the watersheds, and in turn, is heavily influenced by local environmental conditions.

Given the connection between the goals and expertise of Committee members and the influence of local environmental stressors and baseline conditions, this study aimed to find out what environmental outcomes are most important to Committee members. The most important environmental outcomes cited by the group include (in order of importance): improved water quality, improved ecosystem integrity, better public access and environmental awareness, and reduced contaminants in the river. This in part is determined by the biophysical scale of restoration activities. When asked who has the biggest influence on restoration activities, Committee members cited the EPA (fed and state) first, followed by the NEORSD, AOC Advisory Committee, Army Corps of Engineers (ACOE), Ohio Lake Erie Commission (OLEC), Cleveland Metroparks, and existing environmental policy framework established by the GLWQA and Clean Water Act (CWA). Thus members of the Advisory Committee are focused on improving the aquatic and terrestrial habitat of the watershed, and feel large government agencies who often fund, as well as provide technical and human resources, are the most vital contributors to river restoration.

### ***3.2 Social***

Ecological restoration within the AOCs can have a significant impact on resource users, residents and landowners, and local municipalities. How a community uses (or not) the river and riparian land can also have a major impact on restoration plans, and whether there is public support or resistance to management actions. If, for example, a municipal landowner chooses to participate in a restoration project, it may reduce the amount of land available for development. Stringent stormwater management policies and model building codes in riparian areas can also be restrictive on real estate developers and businesses. On the other hand, restoration actions can improve public accessibility and recreation opportunities on the river, increase property values, and improve economic and community development efforts in the watershed.



Members of the Advisory Committee are aware of the connection between the Cuyahoga River and the people who live in its watershed, and are especially enthusiastic about the social benefits associated with restoring the AOC. When asked about the importance of social outcomes associated with the AOC program, Committee members indicate that improvements in public access and recreation along the river are the most important, including increased visibility and usage of the Cuyahoga River Water Trail and Ohio and Erie Canal Towpath Trail. Committee members are also excited about increases in public education and awareness and how they can help build an environmental ethic among watershed residents, as well as community and economic development, public health, and improved aesthetics.

National public opinion and politics also influence implementation of Annex 1 of the GLWQA. Changes to the AOC program in 2012 reflected the desires of the public and of policy makers to expedite cleanup of BUIs along identified river systems. The public agenda viewed the GLWQA as a beneficial program that provides better water quality and habitat enhancement, which are both popular, relatively non-controversial environmental issues. Government agencies, nongovernmental organizations, and municipalities have also voiced support for the program, although sometimes criticize the GLWQA for its complexity and long time horizon for restoration.

Restoration of the Cuyahoga AOC is seen by Committee members as being impacted both positively and negatively by local public opinion and politics. Almost half of the Committee members interviewed for this study feel that local residents either don't care about the river, are not connected to the resource, or have a perception that the river is not clean. This ties in with a long-standing mantra mentioned by one Committee member that Cleveland is known colloquially as the "Mistake on the Lake." Alternatively, several members feel that northeast Ohioans do have pride in the river, generally support restoration efforts, and take ownership of the resource. A concern, however, is that communities located within the Cuyahoga watershed do not all enjoy the same level of economic development, leading some locals to prioritize public services over river restoration. Others fear that the historical lack of public access negatively impacts current perceptions of recreation on the river. One member suggested that Clevelanders are a "bunch of fighters," and will always fight to protect the river.

Municipal preferences about land use and community development also influence the way in which AOCs are managed and restored. County and state governments can have a similar impact. If there are certain environmental projects that are favored by a community, those projects can be targeted through the RAPs and seek the assistance of NGOs and state agencies. The officials who implement the program are also a part of the community, as they decide which restoration measures to implement. Officials are highly motivated to provide resource managers with the maximum possible benefits and put in place effective restoration measures. They seek to improve environmental attributes of the state, while also improving local ecosystem integrity. The program thus provides landowners with the economic and technical opportunity to participate in restoration and contribute to the wellbeing of their state and county. In Cleveland, OH, Lake Erie is a major component of the local culture and thus AOC restoration practices have been targeted towards improving water quality in the Cuyahoga River and Lake, health and habitat of native aquatic species, and nearshore segment of the Cuyahoga River and adjacent coastline.

Considering the interplay among local and state actors, and the relative importance of prioritizing certain management actions over others, local social networks and connections within a community can have tremendous value and enhance collaborative governance arrangements. In order for these governance relationships to perform efficiently and effectively, a certain level of trust among stakeholders is necessary for program implementation. Members of the Advisory Committee revealed that trust appears to be important throughout the entire program. The Federal government trusts that implementers will use funds appropriately. The OEPA and OLEC trusts that the Advisory Committee's management plans are viable. Committee members trust the leadership to put the Advisory Committee in a position to succeed. Finally, the public trusts the Committee's expertise to restore the river. One Committee member summed up the role of trust by saying, "...trust is especially important when [the] Feds give millions of dollars and trust local implementers to follow through on restoration projects. They trusted us that this is a reasonable management list. Within our group, we trust each other to represent the AOC professionally, and use our jobs to extend the messaging."

### ***3.3 Institutional***

The GLWQA was passed in 1972 and placed under the discretion of the IJC as an outgrowth of the Boundary Waters Act of 1909. The basic structure and purposes of the AOC program (Annex 1 of the GLWQA) are set through this bill. The statute mandates that AOCs are to be administered by the U.S. EPA/ECCC and implemented by state/provincial environmental agencies in the United States and Canada. Operational activities of the program are carried out through a number of Federal, state, and local stakeholders, led by local AOC advisory committees. In the United States, state EPA offices approve the RAPs and determine how to proceed with management actions. Local advisory committees work with state agencies to draw up lists of management actions to be approved by the U.S. EPA. The GLWQA also allows for the consultation of other agencies as necessary, such as state natural resource agencies and the U.S. Fish and Wildlife Service. Additionally, it sets many of the definitions that govern the AOCs, including specific biophysical characteristics, enforcement and implementation mechanisms, and economic terms.

While the GLWQA identifies the international and Federal partners required to oversee the AOC program, and stipulates certain collective choice processes such as the formation of local advisory groups, much of the management decisions are coordinated by local and state actors that are unique to each AOC. For this study, Committee members were asked to identify the major decision makers in the Cuyahoga AOC. The clear front runner according to members of the Advisory Committee is the NEORSD, given their role in regional stormwater management and implementation of *Project Clean Lake*. Next is the EPA (Federal and state offices received equal votes), followed by Cleveland Metroparks, and collaborative efforts among communities and the Committee, including the Executive Committee (includes Chairperson and Vice Chairperson of the AOC, plus the Chairs of the three subcommittees: Governance, Strategic Implementation and Planning, and Public Outreach and Education). Several other options were noted, such as the Cuyahoga County Planning Commission, the City of Akron, Cuyahoga River Restoration (former AOC facilitating organization), and Cuyahoga Valley National Park. Furthermore, like all AOCs, the Cuyahoga River has its own set of influential decision makers. When asked who or what has the biggest impact on the structure and decision making processes of the Advisory Committee, the

Great Lakes National Program Office of the EPA and the OEPA are most often cited, followed by the GLWQA itself, the AOC Committee Chair and Executive Committee, OLEC, and the NEORSD.

While the GLWQA is a bi-national agreement between the United States and Canada, the statute is broad enough to allow many of the specifics of the AOC program to be regulated internally by the U.S. EPA and ECCC. Therefore, there are nearly constant minor policy changes to the regulations of AOCs. In general, the GLWQA tends to correlate well with state priorities. Federal and state EPA officials consistently work with state agricultural, fish and wildlife, forestry, stormwater management, planning, and parks and recreation agencies to ensure that the restoration methods recommended by local advisory committees are beneficial to the state's environmental priorities. Often, officials with state agencies are the most knowledgeable about how local ecosystems function. This knowledge can be invaluable to implementing the program in a cost-effective and environmentally beneficial manner that champions restoration actions that are environmentally sustainable.

While state priorities help keep internal decision making in AOCs focused, sometimes external factors can impact an Advisory Committee's ability to achieve their goals. According to Committee members, the number one factor outside of state policy intervention that affects restoration success in the Cuyahoga AOC is availability of funding, followed by the effectiveness of the OEPA Coordinator, local community actions, large scale projects such as the NEORSD tunnels, the President of the U.S., media, climate change, and finally, input from the business community. These external factors can affect policy guidance for collaborative institutions such as AOCs through the support of informal advocacy coalitions that coalesce around issues related to, but not directly analogous with, improving water quality. Interest groups, governmental agencies, NGOs, and individuals will loosely unite as an advocacy coalition in order to promote a common cause or agenda in a way that influences government policy. For the Cuyahoga AOC, the most important issues other than watershed management reported by Committee members that garner support from varying advocacy coalitions and thus influence policy include (in order of impact), economic development, transportation, stormwater management, recreation, public health, industry, green/grey infrastructure, climate change, spirituality, and agriculture.

The GLWQA relies heavily on interagency cooperation. Officials at the state and local level, usually state employees or members of local municipalities, state extension programs, or other government agencies and nongovernmental organizations, explain restoration measures to businesses and landowners, helping them to understand and fulfill AOC restoration requirements. One of the major goals of the local advisory committees is to give landowners and municipal governments the maximum economic and community development benefit in accordance with the physical qualities of the impacted rivers, state regulations, and preferences of the state and U.S. EPA. AOCs provide a means through which the landowner can restore land in fulfillment of bi-national, national, state, and local regulations, while still receiving financial and technical resources to help defray the cost of implementing the necessary restoration measures.

The importance of financial, technical, and human resources cannot be overstated in relation to restoration efforts in the Cuyahoga AOC. In terms of funding, several sources were identified by Committee members as critical to restoration success. GLRI funds lead the way, followed by money from the OEPA, NEORSD, GLLA, City of Akron, and several others with mentions such as the ACOE, Cleveland Foundation, and local communities. Technical resources are thought of as being provided first by the NEORSD, as well as the OEPA, environmental consultants, and Cleveland Metroparks, among others. Human resources are seen as predominantly offered by AOC Advisory Committee members, Cuyahoga River Restoration and Cuyahoga County Soil and Water Conservation District, local residents, and regional watershed groups.

## **4.0 Discussion**

Collaborative approaches to watershed management have been touted as a more sustainable way to protect and restore river systems than traditional command-and-control methods (Imperial, 2005; Leach and Pelky, 2001). However, evidence suggests that if not implemented well, such approaches can amount to what Sabatier and others (2005) describe as “swimming upstream.” This study posits that a better understanding of the structure and decision-making processes of watershed partnerships can help support more sustainable watershed-level outcomes.

Members of the Cuyahoga River AOC Advisory Committee interviewed for this study prioritized biophysical variables in the Cuyahoga River AOC in concert with Annex I of the GLWQA (U.S. EPA, 2019). This suggests that the policy is being implemented according to Congressional intent and that the local Advisory Committee is in fact accomplishing its stated goals. Stormwater management was identified as the top environmental threat by Committee members. A colossal amount of financial resources have been dedicated to addressing stormwater in the Cuyahoga River watershed, led by the NEORSD \$3 billion dollar *Project Clean Lake*. It is not a coincidence that Committee members identified the NEORSD as the most important decision maker in the Cuyahoga watershed with the second biggest influence on restoration activities, only after the EPA. Accordingly, following the GLRI and OEPA, the NEORSD is perceived to be the third most important provider of financial resources for watershed management in the region. These findings echo past research indicating that organizations with governmental ties are best suited to address large scale management actions due to the high costs and complex technical problems facing practitioners (Hardy, 2010, Hardy and Koontz, 2009; Moore and Koontz, 2003).

When focusing on social variables associated with watershed management, improvements in public access and recreation and increased usage of the Cuyahoga River Water Trail and Ohio and Erie Canal Towpath are cited as the top two most important outcomes to Committee members. Interestingly, these responses speak to the first two BUIs to be officially removed from the Cuyahoga AOC – Recreation and Public Access and Aesthetics. Again, this indicates strategic alignment between perceptions of Committee members and environmental and social outcomes. Committee members further suggest that national public opinion and politics can influence management actions and outcomes in the watershed. This reaffirms what Brisbois and de Loe (2016) report in their power theory-based analysis of watershed governance, that political influence among stakeholders involved in collaborative partnerships holds the power to influence environmental and social outcomes in watersheds, especially those related to community and economic development.

Results from the Cuyahoga River AOC also substantiate findings from other Great Lakes watersheds about how social outcomes are in part a result of effective collaboration. This starts with ensuring meaningful

participation in watershed management planning and building partnerships among networks of key stakeholders (Hartig et al., 2018). Child and others (2018) suggest that these partnerships are often born of formal collaborative efforts and can help build effective working relationships, trust among stakeholders, and sustainable facilitation of watershed activities. This describes the experience in the Cuyahoga and other Great Lakes watersheds, where the collaborative process of forming an advisory committee and sharing local information and knowledge provides perspective on the social impact of collaborative decisions (Harris et al., 2003). These relationships can further serve to empower community leaders, who then help overcome institutional variables related to water resource management in their communities, such as securing funding for restoration projects, building capacity among local stakeholders, and increasing public education and awareness for watershed residents (Mostert, 2015).

The prioritization of institutional variables by Committee members in this research also reflect findings from related studies on watershed management. For example, the two biggest institutional factors related to Committee success in the Cuyahoga AOC as ranked by Committee members are funding and effectiveness of state government – in this case the OEPA. As stated above, this speaks to similar government-centered watershed partnerships in terms of membership profile (Hardy, 2010; Hardy and Koontz, 2009; Moore and Koontz, 2003) and the need for financial and technical resources to address complex environmental restoration projects such as dam removal and remediation of contaminated sediments (Koontz et al., 2004). For example, the GLRI, OEPA, and NEORSO are recognized as the most important sources of financial resources to restoration of the Cuyahoga AOC. As a result, approximately three quarters of a billion dollars of investment along the shipping channel of the Cuyahoga River has translated to a thriving entertainment district (Hartig et al., 2020). This helps to connect the dots between improvements in biophysical conditions of the watershed, local culture and community development, and the institutional variables such as funding and inclusive decision-making that support the type of large scale restoration actions that make all of this possible.

## **5.0 Conclusions**

This research project was conducted in conjunction with the Cuyahoga River AOC Advisory Committee. The project seeks to better understand the collaborative decision-making processes of the group in relation to the development of management action plans in the Cuyahoga AOC, as defined by the GLWQA. While this project focuses on the Cuyahoga River AOC, it is the author's hope that the lessons learned will be transferrable to other AOCs throughout the Great Lakes and help inform more sustainable environmental and social outcomes connected to collaborative approaches to watershed management.

Moving forward, studies involving watersheds in areas with different land use would provide information about how biophysical variables affect collaborative processes and resultant restoration strategies. Research involving watersheds with different groups of stakeholders and levels of community involvement could help to further explain the role of social capital and trust within watershed partnerships. Finally, projects in watersheds with different institutional arrangements would offer clues on the importance of government in structuring funding sources and decision-making processes to support sustainable environmental and social outcomes.

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