

**Environmental Governance in the Great Lakes:
Evaluating Institutional Performance and Collaborative Outcomes**

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ABSTRACT

The Great Lakes are an invaluable natural resource, containing more than one fifth of the world's surface fresh water by volume and providing drinking water, commerce, and recreation opportunities to millions. They also offer the ultimate laboratory for analyzing collaborative governance of water resources. A combination of land use changes, industrialization, and climate change have led to the emergence of a myriad of environmental issues facing Great Lakes communities. Harmful algal blooms, plastic marine debris, and aquatic invasive species are but a few examples of emerging dilemmas. This study employs the Institutional Analysis and Development (IAD) framework to examine the external factors, internal structures, and policy decisions of the Great Lakes Water Quality Agreement (GLWQA) and the impacts these variables have on environmental outcomes. The IAD framework is applied specifically to Annex I the GLWQA and used to examine three variables that impact program outcomes: the biophysical environment, culture, and institutional rules. Data was acquired via participant observation and government documents produced by the International Joint Commission, U.S. Environmental Protection Agency (EPA), Environment and Climate Change Canada, state and local government agencies, nonprofit organization, and scholarly articles published on the subject. Results indicate that the biophysical characteristics of the resource, communities of people that rely on the Great Lakes, and institutional rules established by the GLWQA all contribute to the policy's implementation and resulting outcomes.

KEY WORDS: Institutions, IAD Framework, Great Lakes, Watershed Management

INTRODUCTION

The Great Lakes are an invaluable natural resource, containing more than one fifth of the world's surface fresh water by volume and providing drinking water, commerce, and recreation opportunities to millions. They also offer the ultimate laboratory for analyzing collaborative governance of water resources. A combination of land use changes, industrialization, and climate change have led to a myriad of environmental issues facing Great Lakes communities. Harmful algal blooms, plastic marine debris, and aquatic invasive species are but a few examples of emerging dilemmas. This project attempts to better understand how evolving policy processes and collective action institutions provide rules and resources to help guide local actions and ultimately affect environmental conditions in the Great Lakes.

With the establishment of the International Joint Commission (IJC) as mandated by the binational 1909 Boundary Waters Treaty and their role in implementing Annex I of the Great Lakes Water Quality Agreement (GLWQA), both the United States and Canada have adopted a general set of formal institutional rules that direct federal and state agencies, under the supervision of local advisory committees, to clean up 43 of the most polluted rivers draining into the Great Lakes. These tributaries, 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. The GLWQA provides an incredible opportunity to investigate collaborative policymaking and explore what variables and conditions influence institutional performance in the region.

In an effort to explore the complexities of binational governance and all of the actors and actions involved in regional water management, this portion of the study will be guided in part by the Institutional Analysis and Development (IAD) framework (Kiser and Ostrom 1982). The

IAD framework is employed to investigate how biophysical, cultural, and institutional factors affect the decisions made within collaborative watershed management throughout AOCs in the Great Lakes. The framework can help reveal strengths and weaknesses of the GLWQA, as well as identify and inform decision makers and decision-making processes affecting the resource.

BACKGROUND ON THE GLWQA

The Great Lakes Water Quality Agreement (GLWQA) is a bi-national commitment between the governments of the United States and Canada to ‘restore and protect the waters of the Great Lakes’ (U.S. EPA, 2019). First signed in 1972, then amended in 1978, 1987, and 2012, the Agreement 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 tributaries entering 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).

The purpose of Annex 1 of the GLWQA is to restore beneficial uses that have been impaired at designated Areas of Concern (AOCs) throughout the Great Lakes (see figure 1 below). 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 Environment and Climate

Change Canada and the U.S. EPA, to other federal and state agencies, and many local governments, nongovernmental organizations (NGOs), businesses, and independent residents.



Figure 1: Areas of Concern (AOCs) in the Great Lakes Basin (U.S. EPA, 2019)

CUYAHOGA RIVER AOC

Among the 43 AOCs in the Great Lakes, this study takes a closer look at the Cuyahoga River. Restoration efforts along the Cuyahoga 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 Ohio EPA (OPEA) 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 organization now called Cuyahoga River Restoration (originally called the Cuyahoga River Community Planning Organization) was created to support the RAP’s activities (Goodman and Gigante, 2018).

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 river or lake, 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 are currently 10 BUIs that the RAP has 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 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

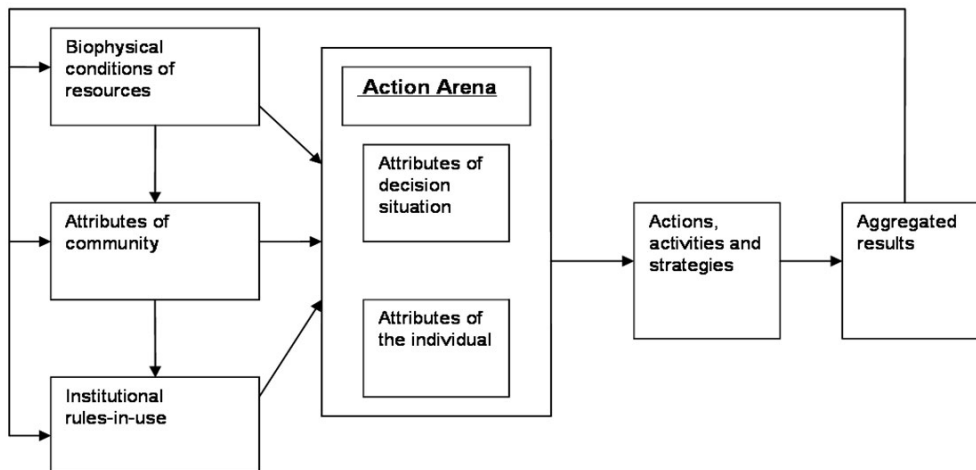
River Restoration, 2015). Financial resources provided by the Great Lakes Restoration Initiative (GLRI) in 2010, along with technical and human resources from the OEPA, Cuyahoga River Restoration, and the formation of an AOC Advisory Committee aided the process greatly. According to the Executive Director of CRR, “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).

THE IAD FRAMEWORK

The Institutional Analysis and Development (IAD) framework developed by Kiser and Ostrom (1982) 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 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. Imperial (1999) argues that the IAD framework is particularly effective for ecosystem based management systems because it not only addresses institutional rules, but biophysical and cultural influences as well. Therefore, it is an appropriate framework with which to analyze river restoration, since the AOC-delisting process involves the restoration of particular environments and requires the input of collaborative advisory committees. The IAD framework also examines the impact of human behavior on the institution and vice versa, which is particularly important when dealing with programs that are designed to influence resource use (Imperial 1999), such as changing the actions of local resource users (boaters, anglers, etc.).

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 GLWQA since restoration decisions recommended by local advisory committees and approved by the OEPA 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 anglers, boaters, the shipping industry, paddlers and kayakers, and residents and 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 between agency employees and resource users within AOC advisory committees (Kiser and Ostrom, 1982).



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 all local stakeholders who participate in the program, state and local officials who implement and enforce the program, private non-governmental organizations 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). The IAD framework can be used both to predict potential outcomes and evaluate measurable outcomes (Ostrom, 1999). 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 in the program, solutions for recurring problems, and methods to increase efficiency (Ostrom, 1999).

METHODS

As stated, this study employs the Institutional Analysis and Development (IAD) framework to examine implementation of Annex I of the GLWQA. In order to employ the framework, information was collected from research articles, government documents on the structure and implementation of the GLWQA, and participant observation at meetings of the Cuyahoga River AOC Advisory Committee, Bi-national AOC conferences, and other events geared towards restoring the Cuyahoga River. Information was also gleaned from informal conversations with key stakeholders associated with the program in order to verify data collected through secondary sources and supplement findings on the biophysical, cultural, and institutional factors influencing implementation of the GLWQA. These conversations involved officials with the OEPA, Ohio Lake Erie Commission, and regional government and nongovernmental entities.

Interactions took place with officials at four levels of government: local, state, national, and international. Once all relevant information was compiled, this information was then sorted using the IAD framework according to the biophysical, cultural, and institutional variables.

RESULTS

Biophysical Environment

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 Act 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.*

In order for a watershed to be considered an Area of Concern (AOC), significant impairment of beneficial uses must have occurred as a result of human activities (USEPA, 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 (Binational, 2019). 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 biophysical environment plays a major role in on-the-ground implementation as well. Local advisory committees work with key stakeholders to identify and prioritize restoration opportunities, helping the EPA to initiate restoration. While the EPA ultimately decides what conservation practices will be used, the environment dictates which practices are most attractive. For example, particular soil types along riverbanks are more suitable for vegetative buffers, and certain areas may be better for building wetlands rather 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 in the soil, and presence and diversity of species.

Annex 1 of the GLWQA is designed to work in conjunction with federal, state, and local stakeholders in both the United States and Canada. Local advisory committees who create the restoration plans for each AOC also take into account state laws and conservation requirements. In fact, the GLWQA holds the promise of assisting municipalities in improving economic conditions and fulfilling state 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. Riverbank landowners will be able to gather higher rental payments on their properties due to the environmental improvements and diversify use of the resource. The combination of IJC guidance with federal, state, and local government initiatives is exemplified

by the GLWQA. Through the AOCs, states can collaborate with local stakeholders to create restoration plans that focuses 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, but the decisions of local stakeholders as well. New technologies allow environmental consultants to test innovative ways to create fish habitat along impaired rivers and plant toxin-resistant native vegetation. These examples show how the structure of the program is well suited to its purpose of restoring ecosystem integrity to the biophysical landscape, and in turn, is heavily influenced by local environmental conditions.

Community Attributes

The most significant cultural groups associated with the GLWQA are resource users, landowners and businesses with riverfront property, and local municipalities. How the community uses the river and riparian land can also have a major impact on restoration actions, and whether there is public resistance to the program. If, for example, a municipal landowner chooses to participate in restoration actions, it may reduce the amount of land available for development or place policies that are more restrictive on local resource users. 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.

Community preferences also influence the way in which AOCs are managed and restored. The overall state community can have a similar impact. If there are certain environmental projects that are favored by the community, those projects can be targeted through the RAPs and the assistance of NGOs and state agencies. In Cleveland, OH, Lake Erie is a major component of the local culture and so restoration practices have been targeted towards improving

water quality in the Cuyahoga River and Lake, improving the health and habitat of native aquatic species, and enhancing the nearshore segment of the Cuyahoga River and adjacent coastline.

National public opinion and politics also influence the program. Changes to the program in 2012 reflected the desires of the public and of policy makers to expedite cleanup of BUIs along identified river systems. The public views the GLWQA as a beneficial program which provides better water quality and habitat enhancement, which are both popular, relatively non-controversial environmental issues. NGOs voice support for the program as well, although sometimes criticize the GLWQA for its complexity and long time horizon for restoration.

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 well being of their state and county.

Institutional Rules

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/Environment and Climate Change Canada 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 draw up lists of management actions to be approved by the state 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.

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 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.

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 Environment and Climate Change Canada. Therefore, there are nearly constant minor policy changes to the regulations of AOCs. In general, the GLWQA tends to correlate well with state priorities. United States 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.

Cuyahoga River AOC Outcomes

According to the Cuyahoga River AOC Advisory Committee (of which I am a member), "delisting" is how we refer to restoring BUIs in the Cuyahoga River RAP AOC to target levels, so that they can be removed from the list of impairments and so that eventually the AOC can be removed from the U.S. EPA's list of degraded waterways. The GLWQA has established the BUIs and the targets are set by OEPA using state regulations, policies, or guidance. The Cuyahoga AOC had an additional locally identified impairment, Public Access, which reached its goals and has since been removed.

The U.S. EPA has thus far approved the removal of three of ten BUIs established for the Cuyahoga River AOC. The first was "Degradation of Aesthetics," acknowledging that aesthetics have improved dramatically in the decades since the Cuyahoga and nearby Lake Erie tributaries were named one of the 27 federally-designated U.S. waterways that have experienced environmental degradation. The second impairment approved for removal is "Lack of Public Access," which recognized that, while 30 years ago the ship channel was inaccessible for most recreational uses, now the area is used regularly for fishing, paddling, and is enjoyed via new trails and amenities. The most recent impairment removed is "Fish Consumption," which indicates that fish caught in the Cuyahoga River are no longer subject to stricter consumption advisories than fish caught in Lake Erie. "This is a significant step forward on the path to delisting the Cuyahoga [River AOC]. It's great to know that the progress we're making to restore the AOC can now be recognized. With lasting support from state and federal agencies, and local

partners, we can see a future when we reach all our restoration goals,” said Jennifer Grieser, Chair of the Cuyahoga River AOC Advisory Committee.

DISCUSSION

Exploring the function and implementation of the GLWQA offers a window into binational policymaking and the collaborative process underlying restoration and management of large lake ecosystems. There is mounting evidence to suggest that in terms of watershed management, collaborative processes taking place at multiple levels of analysis play a role in environmental outcomes (Hardy and Koontz, 2009). For instance, according to the IJC (Binational, 2019), implementation of operational restoration actions mandated by the GLWQA has led to the complete delisting of seven AOCs, meaning, “all remedial actions are complete and all beneficial uses are restored.” An additional two AOCs have been designated as an “AOC in recovery,” indicating that all remedial actions are complete and monitoring is underway to track the natural restoration of beneficial uses (Binational, 2019). These outputs represent impressive environmental gains within individual watersheds connected to the same ecosystem. Across these cases, pollution has been abated, fish and other wildlife abundance and diversity has increased, and water quality has improved. Moreover, community and economic development projects have sprung up where industrial wastelands once existed. By most measures, the GLWWA, and especially the AOC program defined by Annex I of the Act, has been a success.

Given the triumphs and tribulations of binational governance of the Great Lakes in North America, it would be fascinating to investigate similarities and differences among related governance institutions across the globe. Large lake ecosystems that share borders among two or more countries, and that endure similar biophysical issues as the Great Lakes would appear

ripe for investigation. Comparative case studies could reveal strengths and weaknesses of institutional arrangements across the cases and help to inform current and future management strategies. Furthermore, lessons learned from the United States and Canada in terms of collaborative policymaking may be useful for other government actors with similar concerns about cross-border resource management, and in turn, policymakers and practitioners in North America stand to learn from the approaches underway elsewhere.

Scholars have already begun to explore governance arrangement in large lake ecosystems in different countries around the world. In Peru and Bolivia, researchers have looked at the problem with pollution and unsustainable water use in Lake Titicaca and assessed the institutional performance of international water management efforts (Rieckermann et al., 2006). In Uganda, scholars have looked at land use and the threat of nonpoint source pollution in Lake Victoria (Banadda and Kigobe, 2009). In the Baltic Sea, commons scholars have investigated the promise of adaptive governance, using lessons learned from external cases as a guide (Valman, Osterblom, and Olsson, 2015). While located in different parts of the world, each of these large lake ecosystems face some of the same threats that plague the Great Lakes – water quantity and quality problems, harmful algal blooms, plastic marine debris, aquatic invasive species, and concerns about over fishing. Applied research exploring trends across cases can help inform future sustainability efforts.

CONCLUSION

The structure of the GLWQA is well suited to its purpose and functions as implemented by the IJC. Biophysical characteristics of the land and water are the major determinants for involvement in the program and the types of restoration practices that are enacted. The regulations on these characteristics are flexible enough to account for changes across time and

space. Stakeholder attitudes are growing increasingly more accepting of river restoration programs, and involvement in cleaning up polluted rivers can be a source of pride for local communities. The IJC has structured the program in a way that appeals to resource users and at times can help them to accomplish state and local conservation goals at a reduced cost or at no cost with additional financial assistance from sources like the Great Lakes Legacy Act (GLLA) and Great Lakes Restoration Initiative (GLRI). Moreover, the implementation of the program is structured in a way that allows many groups to participate and work together to accomplish similar goals. Even though some of the environmental benefits of the GLWQA are difficult to quantify, the observable outcomes fulfill the policy goals outlined by federal law and the IJC.

Future research on this project could complete employment of the full IAD framework, which also includes how external factors influence decisions at three levels of choice (Kiser and Ostrom, 1982). Additionally, first-hand observation of AOCs other than the Cuyahoga River, such as shadowing an EPA technician or local advisory committee in a different state or Canada, would provide insights into the institutional processes that occur across the program. Lastly, cross case comparisons of institutional arrangements and collaborative management strategies for large lake ecosystems in different locations can help inform current restoration and management efforts and promote sustainable development in the Americas and abroad. Examples of similar systems ripe for future inquiry include Lake Titicaca (Bolivia, Peru), Lake Victoria (Kenya, Tanzania, Uganda), and the Baltic Sea (Denmark, Estonia, Finland, Germany, Latvia, Lithuania, Norway, Poland, Russia, Sweden).

WORKS CITED

- Banadda, N., Kansime, F., Kigobe, M., Kizza, M., and Nhapi, I. (2009). Land use based nonpoint source pollution: A threat to water quality in Murchison Bay, Uganda. *Water Policy*, 11 (1), 93-104.
- Binational (2019). *Canada-United States Collaboration for Great Lakes Water Quality*. Online resource accessed 5.23.2019. <binational.net>.
- Cuyahoga River Community Planning Organization (2008). *Cuyahoga River Remedial Action Plan*. Cleveland, Ohio, USA.
- Cuyahoga River Restoration (2015). *Stage 2 Delisting Implementation Plan Update and Progress Report*. Cleveland, Ohio, USA.
- Great Lakes Water Quality Agreement (2012). *Protocol Amending the Agreement Between Canada and the United States of America on Great Lakes Water Quality, 1978, as Amended on October 16, 1983, and on November 18, 1987, Signed September 7, 2012*.
- Goodman, J., and M. Gigante (2018). Cleveland Flats revitalization linked to recovery of the Cuyahoga River. *International Association of Great Lakes Research, Cuyahoga River Case Study #7*, 1-11.
- Hardy, Scott D. and Tomas M. Koontz (2009). "Rules for Collaboration: Institutional Analysis of Group Membership and Levels of Action in Watershed Partnerships." *Policy Studies Journal*, 37 (3) 393-414.
- Imperial, M.T. (1999). Institutional analysis and ecosystem based management: the Institutional Analysis and Development Framework. *Environmental Management*, 24, 449-465.

- Kiser, L.L. and E. Ostrom (1982). The three worlds of action: a metatheoretical synthesis of institutional approaches. In E. Ostrom (Ed.), *Strategies of Political Inquiry*. Beverly Hills: Sage Publications.
- Nelson, E., M. Uwasu, and S. Polasky (2007). Voting on open space: what explains the appearance and support of municipal-level open space conservation referenda in the United States. *Ecological Economics*, 62, 580-593.
- Ostrom, E. (1990). *Governing the Commons: The Evolution for Institutions of Collective Action*. New York, NY. Cambridge University Press.
- Ostrom, E. (1999). Institutional rational choice: an assessment of the Institutional Analysis and Development framework. In P.A. Sabatier (Ed.), *Theories of the Policy Process*. Boulder: Westview Press.
- Ostrom, E. (2011). Background on the Institutional Analysis and Development Framework. *Policy Studies Journal*, 39, 7-27.
- Ostrom, E., R. Gardner, and J. Walker (1994). *Rules, Games, and Common Pool Resources*. Ann Arbor: The University of Michigan Press.
- Ribaudo, M.C., D.L. Hoag, M.E. Smith, and R. Heimlich (2001). Environmental indices and the politics of the Conservation Reserve Program. *Ecological Indicators*, 1, 11-20.
- Rieckermann, J., Daebel, H., Ronteltap, M., and t. Bernauer (2006). Assessing the performance of international water management at Lake Titicaca. *Aquatic Sciences*, 68, 503-516.
- U.S. EPA (2019). What is the Great Lakes Water Quality Agreement? Online resource accessed on 3.23.2019. <<https://www.epa.gov/glwqa/what-glwqa>>.
- Valman, M., Osterblom, H., and P. Olsson (2015). Adaptive governance of the Baltic Sea – lessons from elsewhere. *International Journal of the Commons*, 9 (1), 440-465.