

Introduction

The Great Lakes are a national treasure that supports significant economic, recreational, environmental, and cultural uses. Lakes Huron, Ontario, Michigan, Erie, and Superior cover an area of over 94,000 square miles (Senate Great Lakes Regional 2006), with 10,000 miles of coastline and 30,000 islands (Great Lakes Interagency Task Force 2010). The Lakes are bordered by the Canadian province of Ontario, and the American states of New York, Pennsylvania, Ohio, Indiana, Illinois, Michigan, and Minnesota. Around forty million people live in the Great Lakes Basin, which consists of the Great Lakes watershed and the St. Lawrence River watershed (House Reauthorization 2008). Included in this population are thirty-five Tribal Nations, which total 175,000 people (Senate Great Lakes Regional 2006).

The Great Lakes contains 20% of the world's freshwater supplies (Great Lakes Interagency Task Force 2010) and 90-95% of the United States' surface freshwater (House Reauthorization 2008). These waters provide drinking water for thirty million Americans (House Progress 2008). The Great Lakes water resources have not become a commodity as defined by the North American Free Trade Agreement, despite longstanding concerns of those in the United States and Canada (Flesher 2011).

The Great Lakes support significant habitat and recreational opportunities. They are home to at least one hundred endemic or globally rare species, which are under threat due to an influx of invasive species. Still, the fisheries yield \$18 billion per year (Flesher 2011). 637 state parks receive over 250 million visitors per year (Senate Great Lakes Regional 2006), yielding \$35 billion from recreational activities each year (House Progress 2008).

This area supports high economic activity in the sectors of manufacturing, industry, and agriculture. The Great Lakes states yield one-third of the gross state product in the country, although the states contain only one-fourth of the nation's population (Senate Great Lakes Regional 2006). The states support 60% of the nation's manufacturing activities (Senate Great Lakes Regional 2006), and 30% of the nation's agricultural sales (House Progress 2008). Mining, steel production, machine tool creation, and

auto manufacturing are all popular industries in the region (House Reauthorization 2008). 50 million tons of imports and exports are transported through the Great Lakes basin waters each year (House Progress 2008).

According to many experts, scientists, and policy-makers, the Great Lakes are at an ecological tipping point (Senate Great Lakes Regional 2006). Because of increased ecological and anthropogenic stressors, the Lakes are not adequately supporting recreational, habitat, or drinking water uses. Many people contract gastrointestinal illnesses because of pathogens in beach waters, and beach advisory days are common in some areas. Restoration efforts have abounded in the 20th and 21st centuries, and now the myriad of programs may not be able to effectively coordinate in regards to leadership and limited funding. Former President Bush's Executive Order 13340 of 2004 attempted to provide leadership through the creation of an Interagency Task Force (ITF), a collaboration of federal agencies and U.S. Cabinet heads led by the Environmental Protection Agency (EPA Great Lakes Interagency 2009). President Obama's 2009 Great Lakes Restoration Initiative (GLRI) pledged an influx of federal funding to support restoration efforts from 2010 to 2014 (Flesher 2011). These efforts to provide federal leadership and funding have achieved limited success and should be evaluated using scientific, legal, and ethical parameters.

Exploring Problems in the Great Lakes

Many issues threaten the integrity of the Great Lakes, and each lake or shoreline segment experiences different stressors. The large area covered by the Great Lakes can certainly absorb some of the human and ecological stressors, but a decline in water quality and habitat quality has demonstrated the need for restoration measures. The ITF identified five areas of action in their Fiscal Year 2010 through 2014 GLRI Action Plan. These include toxic substances and Areas of Concern (severely degraded areas designated for priority clean-up); invasive species; habitat and wildlife protection and restoration; accountability, education, monitoring, evaluation, communication, and partnerships; and nearshore health

and nonpoint source pollution (Great Lakes Interagency Task Force 2010). Additional problems identified by Congressman, organizational leaders, and federal agencies include the lack of leadership and coordination, as well as the lack of funding for restoration activities.

Large-Scale Challenges of Restoration Efforts

The Great Lakes comprise a unique system that is particularly ill-suited to process an influx of pollutants and stressors. According to Dr. Donald Scavia, Director of the Michigan Sea Grant Program, “The Great Lakes are probably more vulnerable than the oceans because they are relatively closed and evolutionarily younger, ill-prepared systems, ill-prepared to deal with these large fluctuations and stress” (House Great Lakes Restoration 2006, 49). The Great Lakes have very slow outflow rates, which measure the amount of time a water volume is retained within the Lake system. These retention times range from 191 years for Lake Superior to 2.6 years for Lake Erie (House Reauthorization 2008). Overall, less than 1% of the Great Lakes’ waters are recycled each year, which means pollutants and sediment have a particularly long residence time as compared to coastal beach zones (U.S. GAO Great Lakes 2008).

Toxic substances, chemicals, and heavy metals are all pollutants influencing beneficial uses in the Great Lakes. According to the 2002 EPA National Water Quality Inventory, which assessed 10% of the Great Lakes shores, 91% of the assessed shores were considered to be impaired. The main causes of impairment were pathogens, metals, and toxic compounds. The same program, which assessed 84% of the Great Lakes open waters, found that 99% of assessed open waters were impaired. The main causes of open water impairment were priority organics, metals, and pesticides (House Reauthorization 2008). To address areas of heavy toxic contamination, the 1987 Great Lakes Water Quality Agreement Amendments between the United States and Canada established “Areas of Concern.” These forty-three Areas of Concern are ecologically degraded areas, in which at least one of the fifteen ecological beneficial uses is impaired (House Reauthorization 2008). Areas of Concern are generally impaired because of toxics and sediment (EPA OIG 2009). Only four Areas of Concern have been delisted since 1987; three are located

in Canada, and one is the Oswego River site in New York (AP 2011). Additionally, Bioaccumulative Chemicals of Concern (BCCs) have water quality standards set by the Great Lakes Initiative, the final water quality guidance set by EPA and the Great Lakes States. However, EPA cannot regulate most BCCs because it cannot accurately measure the small quantities required by the water quality standards. Of the nine BCCs, only Mercury and Lindane can be measured in the allowable amounts (House Progress 2008).

Invasive species are an increasing cause of concern for the Great Lakes states. Over 160 non-native aquatic species have invaded the Great Lakes since 1880 (Senate Great Lakes Ecosystem 2010). An invasive aquatic species is added on average every eight months to the already numerous alien species in the lakes (House Great Lakes Restoration 2006). For example, the invasive Asian carp is seriously threatening the Great Lakes' multi-billion dollar fishing industry (Quinlan 2011). The carp has destroyed ecosystem stability in the Great Lakes, and some have even advocated putting electrical fence barriers at the carp's main entry points of the Great Lakes system (House Great Lakes Restoration 2006).

Habitat and wildlife protection are threatened by water quality concerns, as well as the invasive species already mentioned. One main anthropocentrically-exacerbated factor of wildlife diminishment is algal blooms. 2011 produced a record-sized algal bloom in Lake Erie, which washed up onshore. These blooms can spread diseases, and also use oxygen needed by other species. Climate change may also increase habitat destruction, by increasing water temperatures and therefore the biological activity of algal blooms. In addition, warm weather effects on precipitation could have devastating effects. For instance, if warm weather brings more intense storms, an increase of sediment runoff, nutrient runoff, and streamside erosion will occur. If warm weather provides an overall decrease in precipitation, there will be more concentrated anoxia and anaerobic life zones in the Great Lakes due to lower water levels (Pyper 2011).

The administrative, less tangible aspects of restoration are also experiencing challenges, including accountability, education, monitoring, evaluation, communication, and partnerships. Before the ITF was created, a 2003 Government Accountability Office report identified the two big barriers to restoration as

lack of strategy and lack of coordination (Senate Great Lakes Regional 2006). Restoration actions are being taken by universities, NGO's, local government, industry, citizens groups, state government, and many federal agencies. Communication and partnerships are necessary components of a comprehensive restoration plan because of the many groups involved. Monitoring, evaluation, and accountability are also necessary to measure program results and efficiently target future funding. According to Irene Brooks, the former Chair of the International Joint Commission (a collaborative commission between United States and Canada), accountability and responsibility are key components to the Great Lakes restoration efforts (House Progress 2008).

Focus Area: Nearshore Health and Pathogens

The ITF Action Plan identified nearshore environmental stressors as excessive nutrient loadings, bacteria and other pathogens, development and shoreline hardening, agriculture practices, failing septic systems, grey water pipes, boating pump-outs, and invasive species. The “aquatic nearshore” is the beginning of the shoreline to the offshore at a depth where warm surface waters reach the bottom in early fall (twenty to thirty meters). “Terrestrial nearshore” can be narrow beaches or inland features, and are more of a concern in regards to human contact with pathogens (Great Lakes Interagency Task Force 2010). States are required to find and report high concentrations of pathogenic activity that might imply risks for recreational water uses (U.S. GAO Beach 2007). Pathogens are normally detected through the use of Fecal Indicator Bacteria, and *E. coli* is the indicator commonly used for the Great Lakes freshwater shores. Pathogens may be transported and deposited through a variety of sources, including nonpoint source surface runoff and wildlife fecal matter or point source sewage outflow pipes (U.S. GAO Beach 2007).

The IJC's 15th Biennial Report identified rainfall, sewer overflows, and other catastrophic events as potential indicators of high bacteria levels (International Joint Commission 2011). From 2009 to 2010, the five cities of Detroit, Cleveland, Buffalo, Gary, and Milwaukee discharged 41 billion gallons of

sewage into the Great Lakes system. The main problem comes from Combined Sewage Overflows (CSOs) which are part of over 200 communities in the Great Lakes system (Alexander and Wallace 2010). Combined Sewage Overflow pipes may exceed capacity during storms, and a mixture of stormwater and untreated sewage discharge is released into the Great Lakes or connecting tributaries. Chicago is currently building their “Deep Tunnel Project” to hold more water during storms (Hawthorne 2011), but Mayor Daley of Chicago believes the city will not be ready for a dumping ban until 2027 (House Progress 2008). A huge funding shortfall exists for upgrading water systems in the Great Lakes region, as water infrastructure needs total \$23.3 billion dollars according to some estimates (Alexander and Wallace 2010).

Nonpoint source pollution in the form of agricultural and urban runoff generally provides a greater threat to overall water quality than does point source pollution. With pathogens, however, this does not necessarily hold true. Even if *E. coli* tests show high results, this could be a false positive due to nonpoint biological sources of bacteria from birds, algae, and other animals which have bacteria that is less harmful to humans. These nonpoint sources do not contain as much human fecal matter and dangerous bacteria as sewage outflow does. Groundwater could also be a threat to water quality, and hydrological connections are not always thoroughly explored. As much as 29% of Lake Erie’s water and 79% of Lake Michigan’s water may be from groundwater. Pathogens are a big threat to groundwater supplies because of agricultural practices and human sewage and septic system leaks (International Joint Commission 2011).

With so many issues contributing to the poor water quality and ecological disturbances of the Great Lakes, along with the concerns of climate change, strong leadership is needed to coordinate restoration efforts. The IJC has been existence since the 1909 Boundary Waters Treaty between the United States and Canada, and much of its work involves assisting governments achieve their goal of cleaning up the Great Lakes and preventing further pollution in the system. However, they have not successfully coordinated the United States restoration efforts at all levels, nor do they claim that as their

mission (International Joint Commission 2011). Many funding shortfalls exist, and most currently-funded efforts are not holistic, but rather focus on one specific project or pollutant problem. With regard to pathogens, funding needs are represented by aging sewage infrastructure and lack of pathogen source tracking.

Proposed Solutions

In May 2004, former President Bush established Executive Order 13340, which created the Great Lakes ITF (Senate Great Lakes Ecosystem 2010). The ITF is a combination of eleven federal Agency and Cabinet heads, led by the EPA, whose goal is to coordinate restoration of the Great Lakes. The Executive Order guidelines require the ITF to collaborate with Canada, coordinate the development of consistent federal policies, develop outcome-based goals for the Great Lakes, exchange information, coordinate government action, coordinate scientific research, and report to the President concerning progress (EPA Great Lakes Interagency 2009). This leadership body was intended to unite the parties involved in Great Lakes restoration, guide further efforts, and develop outcomes to demonstrate progress.

Executive Order 13340 also requires the ITF to collaborate with cities and states to create a regional collaborative effort, which took shape in the form of the Great Lakes Regional Collaboration (GLRC) in December 2004. The GLRC is composed of over 1500 members of local, state, and federal government in addition to other stakeholders and members of tribes. The GLRC is a regional partnership that was formed in order to create a guidance strategy for Great Lakes restoration. The GLRC was organized into eight strategy teams, and each of these teams focused on one specific area of restoration. The recommendations are all compiled into the GLRC strategy, which was created in 2005 with the goal of providing the ITF with on-the-ground information and guidance from different restoration stakeholders (Great Lakes Regional Collaboration 2005).

In February of 2009, President Obama proposed the Great Lakes Restoration Initiative (GLRI), to be enacted from Fiscal Years 2010 through 2014. He pledged to appropriate \$2 billion toward Great

Lakes restoration during that time period, in order to catalyze the recommendations of the GLRC Strategy and provide an influx of federal funding for restoration. The Initiative provided \$475 million in 2010 and \$300 million in 2011 to fund and implement a grant program for activities supporting Great Lakes restoration. A lot of the money is given to project-specific research and implementation grants (Flesher 2011). Monitoring and evaluation is also part of the process, however, because these are necessary to determine long-term trends and prove results.

Because federal agencies and many other entities apply for limited GLRI funding grants each year, certain applicant criteria have been adopted by the GLRI 2010-2014 Action Plan. The Action Plan was created by the ITF based on information from the GLRC Strategy, in order to guide implementation of the GLRI. Preferred grant applicants are those whose projects can provide concrete environmental outcomes, connect to high priority restoration needs, correlate to the strategies and goals of existing programs, and show feasibility of success. In addition, projects should be economically conservative, promote sustainability, provide results at a local level, experience public support, and promote collaborations (Great Lakes Interagency Task Force 2010). Thus far, much of the grant money has been allocated to federal agencies, each of which are involved in regional and local level programs (Interagency Task Force 2011).

Combined with the leadership of the ITF, the GLRI provides a funding source to catalyze newly-developed and ongoing projects. The ITF now has more influence and authority because of the GLRI, and the GLRI benefits from having a leadership body that was already in place five years prior to GLRI's inception. The ITF had already gained considerable knowledge and experience in coordination. These federal programs cannot be evaluated solely on their own merit, but by how they guide and contribute overall to restoration efforts. Science, law, and ethics provide a useful, inter-related framework with which to evaluate leadership and funding effectiveness.

Solutions Analysis

Ethical Implications of the ITF and GLRI

The ITF was tasked with the important job of coordinating restoration efforts, which are happening at a local, state, and federal level. Ensuring that each program, concern, and voice is heard entails ethical considerations that may be overshadowed by the practicality of broad goals and compromise. Executive Order 13340 laid out instructions that the ITF should develop a collaboration of local and regional stakeholders, which was accomplished successfully in the form of the GLRC. Tribal considerations, however, seem to have been minimized in the process of compromise and goal-setting. Equity must be considered during both the goal-setting and action plan procedure, as well as in the outcome of specific programs.

Large scale programs like the IJC and federal agencies have been consistently involved in on-the-ground research and action implementation efforts. One of the ITF goals is to complement existing programs, without overlap or redundancy. Since the ITF consists of eleven Federal agency and Cabinet heads, communication and shared perspectives of these leaders is critical. The Great Lakes National Program Office (GLNPO) has been working in tandem with the ITF to distribute the grants of the GLRI (House Progress 2008). The EPA appropriates much of the grant money to other federal agencies, who initiate regional environmental efforts (Quinlan 2011). For instance, in 2010, \$255 million of the GLRI \$475 million was dispersed to sixteen federal agencies (Interagency Task Force 2011). The IJC was the body that designated the 43 Areas of Concern in 1987, of which 39 are still in critical condition. EPA Administrator Lisa Jackson has pledged to direct funding toward nine target sites in 2012 and 2013, in hopes that targeting a few will concentrate attention and achieve results (AP 2011).

The Great Lakes Compact of 2008 is a contract that creates an agreement of collaboration on Great Lakes water resources. This compact is a form of collaboration between the States, rather than an agreement mandated by the Federal governments. The eight Great Lakes states can therefore act as a unit

outside of Federal government control, regarding negotiations of Great Lakes restoration. In this way, state sovereignty can be preserved over some restoration aspects despite the fact that strong federal leadership has been established (House Consent 2008).

The GLRC Strategy demonstrates an example of innovative provisions to bring together all possible stakeholders. Since the GLRC consists of over 1500 members including local, state, and federal governments along with tribes and other stakeholders, the Strategy creation process drew from a wealth of knowledge, experience, and information. The Strategy was integrated into the Fiscal Years 2010 through 2014 Great Lakes Restoration Initiative Action Plan, created by the Interagency Task Force to prioritize GLRI funding and provide metrics of success (Great Lakes Interagency Task Force 2010).

According to Diane Katz, Director at the Mackinac Center for Public Policy, the GLRC Strategy calls for more regulatory involvement, but citizens and private incentives provide a more effective opportunity for restoration. She says, “The problem is the excess of well-intended but ill-conceived programs that fall under disjointed regulatory agencies at the international, federal, state, provincial, and local levels” (Senate Great Lakes Regional 2006, 29). According to Ms. Katz, the private sector should have more involvement in the creation of policy, and we should rely more on property rights and market-based incentives to revive Areas of Concern (Senate Great Lakes Regional 2006). However, according to some estimates, local governments are already spending \$15 billion per year on Great Lakes restoration activities (House Reauthorization 2008). For instance, Grand Rapids invested \$1,000 per person to upgrade sewer systems, and \$350 million total to prevent sewage outflows (House Great Lakes Restoration 2006). Federal influence may be needed to properly manage redundant programs, establish partnerships, provide funding, and advise local governments.

The Healing Our Waters-Great Lakes Coalition provided a list of recommendations for the GLRI funding allocation process, which combines the benefits of federal oversight with the strengths of local sovereignty. According to the Coalition, EPA should target the GLRI funds toward on-the-ground

restoration and ensure that all stakeholders, particularly NGOs, help create restoration priorities. The GLRI should allow EPA to target funding toward multiple projects in specific, high priority areas. Non-federal organizations should have a streamlined application process to apply for multiple agency grants in one step. In additions, investments could be better targeted if EPA reduces the number of federal programs receiving GLRI funding. Money does not have to go through convoluted federal programs and screening processes before reaching the local level projects (Healing Our Waters- Great Lakes Coalition 2011).

During a hearing on the GLRC Strategy before the Senate Subcommittee on Environment and Public Works in March of 2006, Tribal Chairman Frank Ettawageshik urged the listeners and Congressmen to consider the Native American principle of looking at current decisions and assessing impacts for seven generations. Each of our actions must consider the future of seven generations, and we are somebody else's seventh generation. The earth is a whole composed of interconnected parts, and we should never have allowed the Great Lakes to become so degraded (Senate Great Lakes Regional 2006). This spiritual and mental way of looking at the Great Lakes is different from the economic, utilitarian principles that are often held today. According to Tribal Chairman Ettawageshik, our methods of assessing the costs of restoration are undervaluing the natural biological and ecological systems.

According to the GLRC *Tribal Nations Issues and Perspectives* document, "Tribal populations tend to face increased risk of public health threats from environmental contamination and to be subject to impacts from environmental degradation to a greater extent than other population segments" (Great Lakes Regional Collaboration Tribal 2005, 4). Tribal communities have a great reliance on fish, wild game, and other natural foods, which makes them particularly susceptible to bioaccumulative toxics. These communities are also impacted more severely by habitat destruction and overfishing in the Great Lakes. Tribes have some of the most pristine land in the Great Lakes Basin, and tribal benefits will correspond to overarching benefits for others in the Great Lakes region. However, tribal environmental and natural resources programs often experience significant federal cuts and funding reallocations, as compared to

states. In addition, tribal historic and cultural value have the potential to be impacted by habitat destruction and pollution (Great Lakes Regional Collaboration Tribal 2005).

Federal funding and leadership certainly has the potential to overshadow local and regional concerns through overarching programs and prescribed solutions. However, because the ITF relied on the Strategy of the GLRC to create its action plan and prioritize GLRI funding, many stakeholders were allowed to be part of the process. The mission of the ITF to support local programs rather than developing new, comprehensive solutions allows partnerships to form through grant allocations. Despite these facts, local preferences may still be overshadowed, and federal regulation may appear ineffective as compared to citizens groups and private restoration efforts. The Healing Our Waters- Great Lakes Coalition recommendations should be implemented to direct grant funds in an equitable fashion. The unique considerations and priorities of tribes can often be set aside in order to reach a broader compromise. Tribes are a population subset who live in close communion with the land and are affected disproportionately by pollutants and habitat destruction. While tribal members were present in the GLRC Strategy creation, federal resources could be better allocated to support tribal needs and their successful environmental programs.

Scientific Aspects of the ITF and GLRI

According to the Interagency Task Force Action Plan, science will be at the forefront of any restoration decisions and questions. Congressman Ehlers of Michigan, as Chair of the U.S. House Subcommittee of Science in 2006, said that all actions must be validated by science. Science is the key to measuring progress and guaranteeing that dollars are spent efficiently (House Great Lakes Restoration 2006). The GLRI grants will fund projects that advance monitoring, evaluation, or on-the-ground remediation actions. However, since the ITF's goal is to coordinate federal agencies rather than set up targeted programs, identified research needs and Action Plan goals may not have the proper

implementation measures. Particularly in the case of beach health and pathogens, the funded programs may not always address the scientific needs.

In 2005, NOAA, EPA, and USGS held a collaborative workshop with beach managers to determine research and federal aid needs. The beach managers called for rapid test methods, predictive models, and real-time data to take a precautionary approach for beach closures. Fecal Indicator Bacteria testing normally takes 18 to 24 hours, which cannot adequately protect public health since beach bathers are not aware of current water conditions. Managers would like to be able to accurately track pathogen sources and nonpoint source pollution origins. They also voiced concern that epidemiological studies and relationships between Fecal Indicator Bacteria and pathogens have not been fully explored. They requested training for standardized survey design and test methods, to improve the efficiency of pathogen detection (NOAA 2006). These needs are partially addressed by GLRI grants, ITF Action Plan goals, and the GLRC Strategy.

Executive Order 13340 charged the following items to the ITF: “Develop outcome-based goals for the Great Lakes system relying upon, among other things, existing data and science-based indicators of water quality and related environmental factors. These goals shall focus on outcomes such as cleaner water, sustainable fisheries, and biodiversity of the Great Lakes systems and ensure that federal policies, strategies, projects, and priorities support measurable results. Ensure coordinated Federal scientific and other research associated with the Great Lakes system” (Bush 2004). The ITF applied these scientific goals as they formed the 2010-2014 GLRI Action Plan. They have prioritized tracking progress and using the best available science. Grant recipients must communicate their progress to the EPA, who will write annual reports in conjunction with an independent science review board. In addition, project selection is based on scientific parameters like achievable outcomes, observable local impacts, promotion of sustainability, and a standard of using the “best science” to complete the work (Great Lakes Interagency Task Force 2010).

For nearshore health, the ITF created a list of objectives to be achieved by 2014, in which monitoring, source tracking, and managing pollution all play a role. In addition, predictive modeling and rapid testing should be employed at 33% of high priority beaches, which is a key goal. The target is to increase the percentage of beaches meeting bacteria standards 95% or more of beach days, from 86% of beaches in 2006 to 89% of beaches in 2014. To achieve progress, the ITF has recommended pollutant source identification and improved public health protection at beaches (Great Lakes Interagency Task Force 2010). However, concrete actions to achieve progress largely depend on the grants that are funded through the GLRI and the government and university commitment to generating necessary data and research activities.

The GLRC Strategy provides a number of recommendations to improve coastal water quality. The strategy calls for better enforcement of regulations dealing with industrial waste discharges and human waste discharges, and it also calls for creating wet weather programs and improving wastewater treatment systems. The GLRC recommends identifying and controlling nonpoint sources through regulatory enforcement and public education. A risk-based system for assessing recreational waters should be standardized, tested, and implemented, and drinking water source quality should be protected (Great Lakes Regional Collaboration 2005).

Most beach managers do not know the sources of high pathogen levels. Source tracking can include physical observation, chemical testing, genetic comparisons, and modeling. In 2007, EPA partnered with state and local entities to create a Standardized Sanitary Survey. For the first time, an informational tool to track long-term beach conditions and potentially identify sources of pathogens was made available to all beach managers (Great Lakes Regional Collaboration 2005). The “Routine Survey” includes daily conditions like temperature, wind speed and direction, wave height, bacteria samples, turbidity, bather load, and other components. The “Annual Survey” includes foundational factors like land use, erosion and accretion, beach material, beach cleaning, advisories and closings, and other components. Monitoring and reporting using the sanitary surveys can help prioritize beaches which need

grant assistance from the BEACH Act funding. The BEACH Act of 2000 provides grants for states to create coastal pathogen monitoring and public notification programs, and two of the nine grant criteria suggest that states use sanitary surveys to develop a tiered monitoring approach (EPA Great Lakes Beach 2008). The GLRC Clean Beaches Initiative would like to increase the use of these sanitary surveys, and has been encouraging local entities, states, and tribes to use the EPA form (Great Lakes Regional Collaboration 2005).

Perspectives differ concerning whether science and research are the biggest restoration priorities, or if most GLRI funds should go toward on-the-ground actions. In a 2010 interview, EPA Administrator Lisa Jackson's senior Great Lakes adviser, Cameron Davis, commented on how the GLRI money should be targeted. He spoke of the importance of initial monitoring and evaluation, because in order to demonstrate progress there must be a consistent, complete baseline data set. In his views, the scientific studies and monitoring must come first to provide data and methods for future actions. Accountability is certainly a federal, state, and local priority, but people still tend to favor on-the-ground actions without first gathering data about the water segment's conditions. The GLRI has allocated money toward action-oriented projects, but the initial funding was "front-loaded" in favor of monitoring. The GLRI has a science advisory board, which will help direct funding toward projects that can achieve measurable results (Gillies 2010). But in a 2006 hearing before the House Subcommittee on Science, Mayor George Hartwell of Grand Rapids, Michigan, claimed that research was not the most pressing priority. He called for action and funding, though his statement was before the GLRI was established. Dr. Donald Scavia of the Michigan Sea Grant Program said in the same hearing that an adequate science plan should include integrative assessment, monitoring, and innovative restoration. However, the "rule of thumb" is that 10% of funds should go toward science to provide a basis and support restoration (House Great Lakes Restoration 2006).

The research needs identified by beach managers are largely addressed by the ITF Action Plan and GLRC Strategy. However, funding for these research needs is dependent on the types of GLRI grants

that are distributed. If the grants are largely focused on monitoring and evaluation, more progressive research measures might be ignored. Innovation in terms of rapid-testing and source-tracking could be largely ignored if people are looking for immediate results, because the technology is just starting to catch up with the demand. Funding priorities will really dictate which of these scientific goals and research needs will be addressed, but ITF and GLRC priorities have reflected that nearshore health should be addressed a holistic manner.

Political and Legal Aspects of the ITF and GLRI

Clean Water Act Section 118 includes many legislative pieces that address Great Lakes water quality. Section 118 established the GLNPO, run by the EPA with the goal of coordinating regional restoration activities. It also establishes the implementation requirements for creating Remedial Action Plans for Areas of Concern under the Great Lakes Water Quality Agreement Amendments of 1987. The Great Lakes Legacy Act was added in 2002 to fund remediation of toxics and sediment, mainly in Areas of Concern (Congress Clean Water Act). Since the ITF and GLRI were the result of executive actions and decisions, they are not part of the Clean Water Act and do not have Congressionally-supported funding appropriations established for each year. For instance, although President Obama asked for \$350 million in Great Lakes funding for Fiscal Year 2011, the Congressional committee only decided to appropriate \$250 million. However, Steve LaTourette of Ohio added a \$50 million amendment that increased the total to \$300 million (Flesher 2011). The Great Lakes states do represent a strong political force, but may not be able to persuade a majority of Congress to prioritize Great Lakes restoration, which receives only half of the funding that the Everglades restoration plan receives (Senate Great Lakes Regional 2006).

The Great Lakes Ecosystem Protection Act of 2010 was a failed bill that sought to establish funding authorization of the GLRI and leadership through a Great Lakes Leadership Council. The bill would have authorized \$475 million per year between 2011 and 2015 to support the GLRI, meant to primarily target invasive species and nonpoint source pollution. The bill also would have authorized \$150

million per year for the Great Lakes Legacy Act, which is generally seen as under-funded. Another goal of the bill was to reauthorize the GLNPO. However, this bill never left committee and was never voted upon (Senate Great Lakes Ecosystem 2010).

As discussed previously, the GLRC Strategy is a unique plan that resulted from a collaborative effort on the part of stakeholders. Executive Order 13340 did call for the creation of such a strategy, and delegated implementation to the ITF. However, once the strategy was developed, Bush did not fund the strategy's recommendations in Fiscal Year 2006. The strategy recommended \$20.1 billion in funding over five years, including \$10.5 billion of new Federal funding. In Fiscal Year 2007, Bush allocated only \$70 million to clean and protect the Great Lakes, of which \$50 million was for the Great Lakes Legacy Act. However, before the 2008 presidential election, the Republic frontrunner John McCain and Democratic frontrunners Hilary Clinton and Barack Obama all signed pledges to support comprehensive Great Lakes restoration legislation and increased funding appropriations (House Progress 2008). When Obama took office, he fulfilled his pledge by creating the GLRI that has been discussed in depth. These events illustrate the fact that not only Congress, but also the Executive Branch, can display variable support for the Great Lakes Restoration plans.

The GLRC Strategy called for \$7 billion in funding over five years to address necessary wastewater treatment upgrades. However, Bush's Fiscal Year 2007 budget cut the Clean Water State Revolving Fund (SRF) by almost 50% to \$689 million (Senate Great Lakes Regional 2006). Obama's Fiscal Year 2010 budget, however, appropriated \$2 billion for the SRF (Alexander and Wallace 2010). SRF is the primary federal funding source for wastewater treatment infrastructure, and through this Clean Water Act provision, the federal government provides low-interest loans to states. This legislation is counted upon to help accomplish Great Lakes restoration goals, but lack of funding could be a major hindrance. The GLRI grants do not generally go toward wastewater treatment upgrades, because these are rather expensive and may not provide the immediate, cost-effective results many parties are looking for in the Great Lakes.

EPA is heavily involved in restoration aspects of the Great Lakes. Administrator Lisa Jackson is the head of the ITF, the GLNPO is headed by the EPA, and EPA is in charge of distributing the GLRI grants. Problems could arise because the current Congress does not support many EPA actions. If the Great Lakes Initiative becomes ideologically coupled with EPA actions, there may be resistance for funding. EPA made a strategic move in the summer of 2011, however, by providing \$6.6 million to put unemployed people to work through restoration actions. This showed how saving the Great Lakes could also provide jobs and immediate economic benefits for the region, rather than stifling the economy (Flesher 2011).

Diane Katz of the Mackinac Center for Public Policy claimed at a 2006 Senate Science Subcommittee hearing that there is no accountability for the billions of dollars spent on the Great Lakes, or on the many programs involved in restoration (Senate Great Lakes Regional 2006). However, a strength of the GLRI funding system is that grants are tracked online. The grant amounts and recipients are publicly accessible, and the recipients are responsible to report on their progress (Interagency Task Force 2011). The GLNPO has effectively set up an accountability system, but only for the GLRI grants.

The ITF has many goals regarding beach health, which were previously discussed in the science section. However, a large hindrance to meeting those goals may be the flawed funding scheme utilized by the BEACH Act of 2000. EPA's current grant formula does not accurately reflect monitoring program needs because it overemphasizes the "Length of Beach Season" variable over the "Beach Miles" and "Beach Use" variables. A GAO report found that from 2001 to 2006, EPA was expecting to receive \$30 million per year in funding but received only \$10 million per year. As a result, the grant formula overemphasized "Length of Beach Season," the baseline parameter, and that factor was weighted at 82% of the formula priority. According to the GAO, "As a result, Indiana, which has 45 miles of shoreline and a coastal population of 741,468, received about \$205,800 in 2006, while Michigan, which has 3,224 miles of shoreline and a coastal population of 4,842,023, received about \$278,450 in 2006" (U.S. GAO Beach 2007, 9). In addition to this grant dispersion issue, the grants cannot be used to look for sources of

contaminants, which is a large funding need for the Great Lakes beaches (U.S. GAO Beach 2007). By operating in conjunction with inflexible legislation like the BEACH Act, the ITF is at a severe disadvantage for reaching its 2014 Action Plan beach goals.

While the GLRI and ITF do exhibit strengths of flexibility and federal guidance, there are certainly implementation areas needing improvement. Both executive actions should be congressionally authorized, with legislative appropriations for funding. In addition, the ITF must work to reach its nearshore goals by examining existing legislation like the Clean Water SRF and BEACH Act. If these are not adequate resources to achieve ITF's nearshore Action Plan goals, some of the GLRI money should be directed toward wastewater upgrades and source tracking, as well as the research needs identified by beach managers. The funding variability of the GLRI itself is significant and can impact the local and state recipients who depend on these grants for projects.

Conclusion

The Great Lakes comprise a system of struggling ecosystems plagued by invasive species, beach bacteria, toxics, and habitat degradation. There are many stakeholders who each prioritize different projects and funding directions for Great Lakes restoration. Local governments, local communities, non-governmental organizations, state governments, and the federal government all have a part to play in the long process of restoration. Before, a lack of leadership was crippling efforts because of replicated programs and lack of a clear-cut, unified strategy. However, the ITF has provided an Action Plan created from the GLRC Strategy, with short and long term goals. The ITF should be congressionally authorized to create a leadership body with enforceable authority. Funding has long been identified as a restoration need, especially regarding beach health. This has been provided by the GLRI, but the funding is variable from year-to-year and may not always be targeted toward areas of the greatest needs. Because the BEACH Act of 2000 and the Clean Water SRF are supposed to protect recreational waters, beaches may

not receive adequate funding for source tracking and wastewater infrastructure upgrades. The ITF should consider allocating GLRI funds to address these emerging needs.