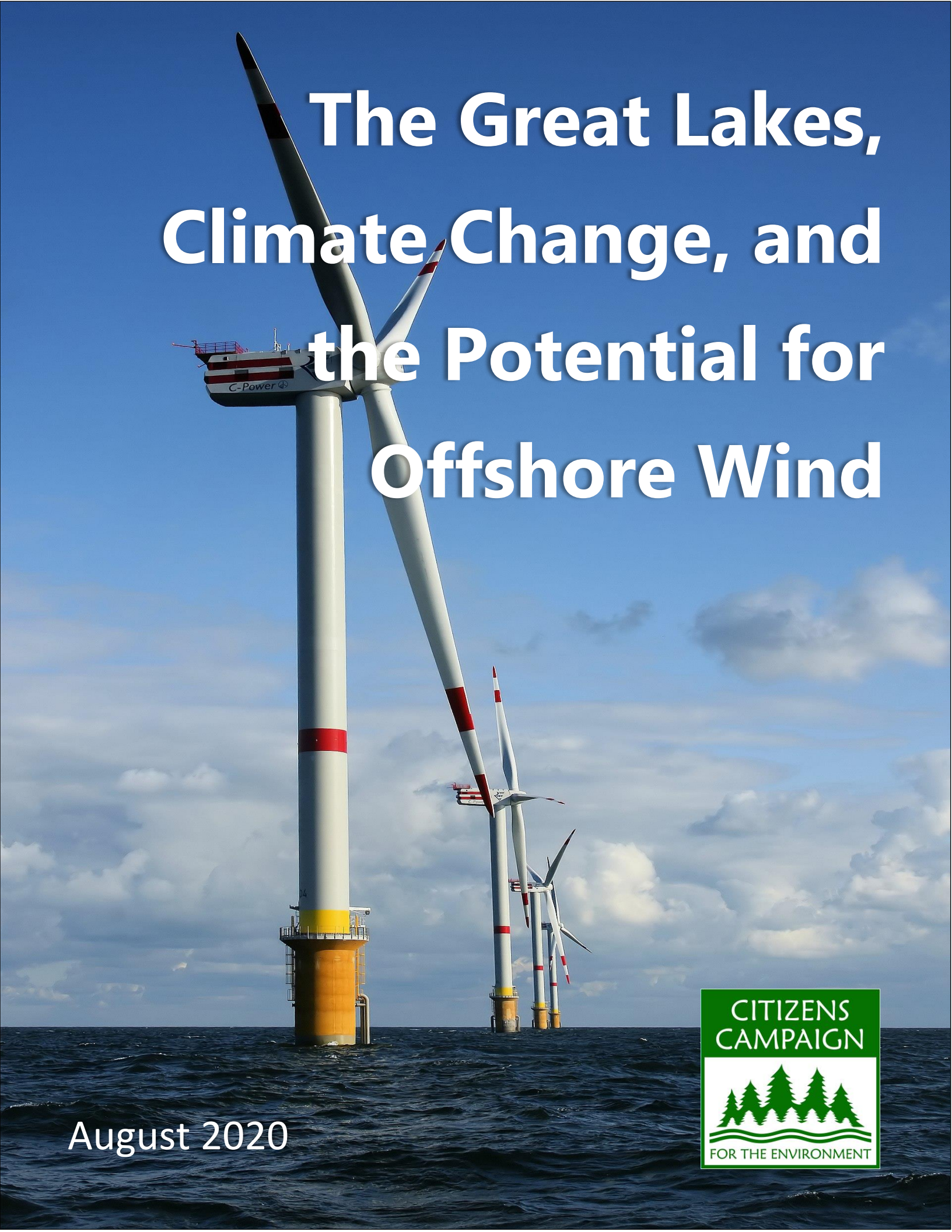
The Great Lakes, Climate Change, and the Potential for Offshore Wind



August 2020

CITIZENS CAMPAIGN FOR THE ENVIRONMENT

Overview

The Great Lakes are a natural wonder of the world that hold one-fifth of the world's fresh water supply. Comprising over 700 miles of New York's shoreline, Lake Erie, Lake Ontario, the Niagara River, and the St. Lawrence River supply millions of New Yorkers with their drinking water, provide habitat for fish and wildlife, and support billion-dollar industries such as tourism and fishing.

Despite the immense value and importance of the Great Lakes, the health of the ecosystem remains under threat. Climate change, fueled predominantly by our continued reliance on fossil fuels, exacerbates existing environmental threats and presents new challenges to the lake ecosystem. ***Our nation has invested billions of dollars in recent years in successful efforts to protect and restore the Great Lakes; however, climate change threatens to thwart progress and move us backward.***

Scientists in the Great Lakes region have indicated that warmer weather, changes in seasonal precipitation, and increased extreme weather events—all associated with climate change—will continue to cause significant adverse impacts on the Great Lakes region.

Fighting climate change is essential to protecting the health of our Great Lakes for current and future generations. In response to the climate crisis, New York State enacted the Climate Leadership and

Impacts of Climate Change in the Great Lakes Region[1]

- Increased flooding of our coastal communities
- Decreased crop yields
- Higher temperatures and poorer air quality in urban communities, which harms public health, especially for the most vulnerable people – the elderly and children with asthma
- More sewage overflows that close beaches, kill fish, and threaten public health
- Increased runoff that contributes to harmful algal blooms and a "dead zone" in Lake Erie that cannot sustain life
- New species of pathogenic bacteria, viruses, and non-native species flourishing in the lakes
- Adverse impacts to native fish species, including changes to their physiological state and performance
- Driving many species of mammals, birds, amphibians, reptiles, and macroinvertebrates out of the region
- Spreading more disease, such as botulism—killing more birds that consume fish
- Fluctuating lake levels that adversely impact recreational boating, shipping, and power generation

Community Protection Act (CLCPA) into law in 2019. The CLCPA sets statewide mandates of 70% renewable energy by 2030 and carbon-free electricity by 2040. Offshore wind, in both the Atlantic and in the Great Lakes, will need to play a critical role in generating clean, carbon-free electricity and meeting the state's ambitious renewable energy mandates.

Downstate, there are 1,826 megawatts (MW) of offshore wind are under development off NY's coast and a recent solicitation for an additional 2,500 MW has been announced. Great Lakes offshore wind is completely untapped, and no projects are currently under development in New York's Great Lakes waters. New York State is considering the feasibility of Great Lakes offshore wind to help meet clean energy mandates. As we consider the potential for offshore wind in the Great Lakes, it is essential that we look to fact-based information about offshore wind and its potential benefits and impacts on the lakes, all within the context of climate change.

Responsibly-Sited Offshore Wind

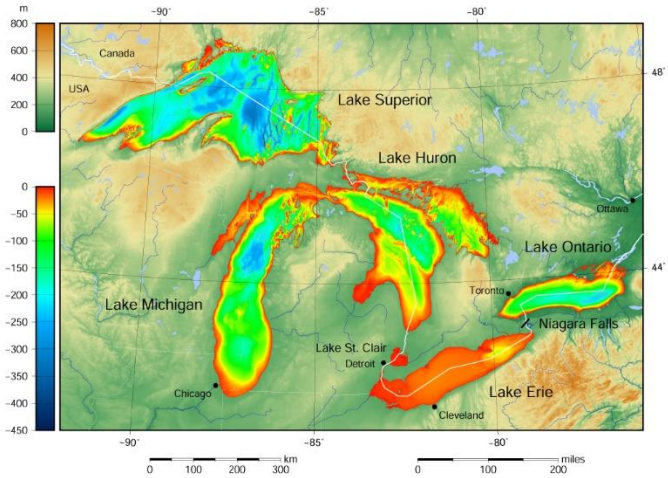
It is critical that any offshore wind project is responsibly-sited and evaluated to protect the Great Lakes ecosystem and the lakes' many uses. Rigorous, site-specific environmental review will need to take place before a project is built, to ensure that potential impacts to the Great Lakes are avoided, minimized, or mitigated. There are a multitude of federal and state agencies and authorities that can assert jurisdiction over the project, depending upon the exact location and size of any proposed wind farm. In New York State, five different agencies will need to provide—or deny—at least 13 different permits or approvals, including water quality (Department of Environmental Conservation), coastal zone management (Department of State), cultural and historical sites (Office of Parks, Recreation, and Historic Preservation), stormwater management (Department of Environmental Conservation), bottomlands easements (Office of General Services), transmission line placement (Public Service Commission), and more. The recently created New York State Office of Renewable Energy Siting will develop streamlined siting standards to ensure development initiatives move in a timely manner. There is also federal jurisdiction over issues such as navigable waters (Army Corps of Engineers),

navigation (Coast Guard), mitigation for structures over 200 feet (Federal Aviation Administration), and the Endangered Species Act (U.S. Fish and Wildlife consultation).[2]

Offshore Wind and Fighting Climate Change

A study of wind energy impacts in the eastern USA, conducted by the National Renewable Energy Laboratory, concluded that "Wind generation displaces carbon-based fuels, directly reducing carbon dioxide (CO2) emissions. Emissions continue to decline as more wind is added to the supply picture."[3]

Offshore wind will slash greenhouse gas emissions in New York State. The first 2,400 MW of offshore wind energy developed to meet New York's target would reduce greenhouse gas emissions in the state by more than five million short tons each year, the equivalent of removing nearly one million cars from the road by 2030.[4]



According to the National Oceanic and Atmospheric Administration, 2016 was the warmest year on record, and surface temperatures of the Great Lakes were above average.

Offshore Wind and Wildlife

Offshore wind helps to fight climate change, which is having devastating impacts on wildlife in the Great Lakes region. All large-scale electricity production has an impact on wildlife, and it is important to consider wind's wildlife impacts within the context of all forms of electricity generation. Compared to other forms of electricity generation, wind power poses the lowest collective risk for potential harm to wildlife.[5] Burning fossil fuels, such as coal, oil and natural gas, is considered the conventional means for generating electricity. The Great Lakes have long been home to significant energy generation, primarily from fossil fuels and nuclear plants. Emissions from fossil fuels combustion threaten wildlife with mercury poisoning, acid rain, changing habitats due to climate change, and diverse impacts from mining, drilling, and other fuel extraction activities.[6] Nuclear power is prone to releases of radioactive steam,[7] and can also harm fish and other aquatic life through water intake and thermal discharge.[8] The storage of radioactive waste also poses a threat to wildlife due to the potential for toxic contamination and destruction of habitat.[9]

Offshore Wind and Birds

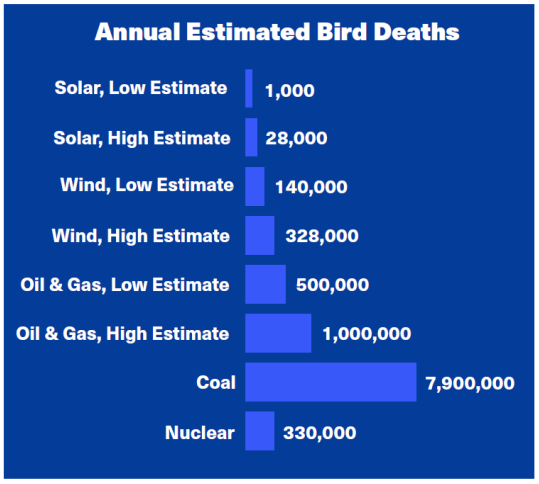
Climate change, caused by the use of fossil fuels, remains a foremost threat to birds. In 2014, the National Audubon Society conducted a study assessing climate

change's impacts to North America's birds. The study found that 314 of 588 species would lose more than half their 2010 geographic range by 2080 due to climate change.[10]

Current studies demonstrate that modern wind turbines have little impact on birds relative to other human introduced threats. The leading causes of bird deaths in America are habitat loss, tall buildings, and cats.[11] Studies show that wind energy is one of the safest ways to produce energy with respect to bird impacts (see figure 1). In reviewing 170 North American wind facility collision-fatality-monitoring studies, the American Wind Wildlife Institute reports that most studies report fatality rates of three to five birds per megawatt per year, inclusive of all affected species.[12]

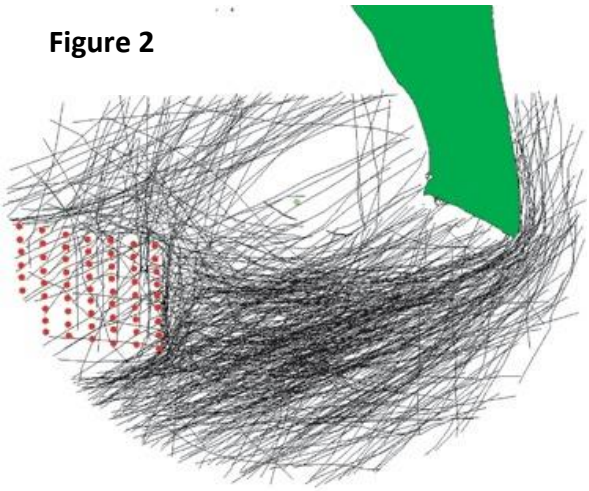
Early wind development—decades ago—used poor siting and turbine design; however, modern day wind farms utilize best practices, improved technology, operational mitigation techniques, and include a rigorous regulatory framework that significantly reduced impacts to birds. Pre-construction bird migration studies are used to determine appropriate areas to site offshore wind turbines to avoid bird mortality, while post-construction studies are used to inform operational mitigation strategies. Technology has also improved—turbines now utilize a monopole design so birds are unable to nest on turbines. More powerful, modern wind turbines allow a wind farm to produce the same amount of electricity with far fewer individual turbines, resulting in fewer collisions with birds. Turbine blades are larger and rotate more slowly; allowing birds to perceive and avoid them. Research from Europe has demonstrated how birds tend to fly around offshore wind farms, avoiding the turbines (see figure 2).

Figure 1



Estimated bird deaths by different energy types (U.S. News and Worlds Report 2014)

Figure 2



Radar Registrations from Nysted offshore wind farm applied on a GIS-platform. Red dots indicate individual wind turbine, green area the land, green dot the siting of radar, and black lines migrating water bird flocks determined visually at the Nysted offshore wind farm. Adopted farm. Adopted from Kahlert et al. 2004.

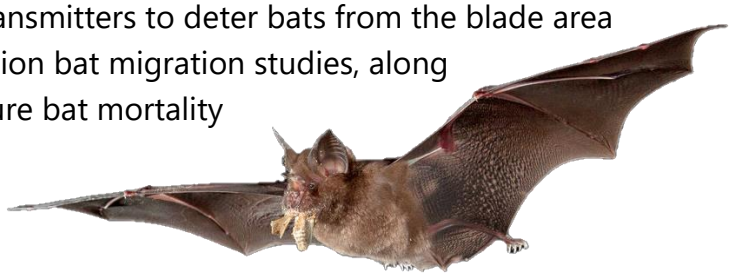
Offshore Wind and Bats

Existing research on the impact of climate change on bats strongly suggests that bats will be affected at least as significantly as other wildlife species. According to Bat Conservation International, increased variation in climatic extremes raises the possibility of bats emerging from hibernation early or at a greater frequency. That would not only put hibernating bats at risk from depleted energy

stores but could also affect the birth and survival of pups. Resources, especially insect prey, may be limited or variable during periods of early arousal from hibernation.[13]

A site-specific analysis will need to be undertaken to study bat migration patterns in an area before a project moves forward. Bat fatalities associated with wind turbines are typically caused by collisions. Like birds, bats are known to collide with other man-made structures, such as lighthouses, communication towers, tall buildings, and power lines.

The reasons bats are attracted to turbines are not fully understood, but by controlling for a variety of factors, it is possible to decrease the number of fatalities from bat-turbine collisions. Studies are underway to determine the effectiveness of taking mitigation actions, including curtailing blade rotation at low wind speeds and use of ultrasonic transmitters to deter bats from the blade area as a means of mitigating bat fatalities. Pre-construction bat migration studies, along with operational mitigation strategies, can help ensure bat mortality is minimized.



Offshore Wind and Fish

The global experience with offshore wind's impacts on fish has been largely positive. Offshore wind turbine foundations act as artificial reefs, creating habitats for many species of fish. Evidence of this positive impact can be seen at the first U.S. offshore wind farm off the coast of Rhode Island[14] and in Europe.

While there are currently no offshore wind turbines in the Great Lakes, there are other structures in the lake that act as artificial reefs. A study of existing artificial reefs in Lake Erie near Lorain and Lakewood, Ohio found as many as 60 times more fish than non-reef sites, including smallmouth bass, walleye, and yellow perch.[15]

Fishery resources and habitat vary throughout the Great Lakes, and site-specific analysis is necessary to avoid impacts to fish migration and spawning areas, endangered or threatened fish, and sensitive

or unique habitat. Identifying these unique areas will allow development to avoid, minimize, or mitigate impacts to fisheries and habitat.

A potential concern for fish and other wildlife is noise from construction activities, although this is a short-term impact, with documentation of fish and wildlife returning to the site after the construction is over. For example, porpoises at offshore wind farms in Europe moved away from construction areas during pile driving activity. Once the construction ended, the porpoises returned to the site.[16] Equinor Wind—a developer proposing a project off the coast of Long Island—is considering using alternative foundations called gravity foundations that completely eliminate the need for pile driving, significantly reducing construction noise. This technology has been used successfully in Europe since 1991.[17] Operational wind turbines do produce some underwater noise, but it is at or below background noise.[18]

Offshore Wind and Great Lakes Water Quality

Construction of a wind farm in the Great Lakes is not expected to have any significant or long-term adverse impacts on water quality. Studies conducted on a proposed offshore wind project off Cleveland in Lake Erie was expected to have no impact on drinking water quality.[19]

Pre-construction studies will need to determine if contaminated sediment exists in the project area. Locating facilities and transmission lines, or anchoring vessels in areas that may disturb or stir up contaminated sediment, should be avoided. For example, in 1987, the International Joint Commission identified 43 Areas of Concern (AOC), or "toxic hotspots," within the Great Lakes. There are currently five AOCs in New York Great Lakes waters—the Buffalo River, Niagara River, Eighteen Mile Creek, Rochester Embayment, and the St Lawrence River at Massena.[20] These AOCs are unlikely to be considered for wind development, but regardless, wind projects should take precaution to avoid disturbing this contaminated sediment. Similarly, disruption of Confined Disposal Facilities (CDFs), which are located along the shore and contain contaminated sediment from dredging, should be avoided.

Furthermore, improved technology, such as a "suction bucket foundations" or "gravity foundations" can mitigate the impact of construction on the lakebed by avoiding the use of pile driving of the foundation. Construction related sediment resuspension and enhanced turbidity near the turbines can be mitigated by the use of these technologies, which has minimal and only temporary impact on surrounding sediments during installation.

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