Consideration of the Impact of Climate Change on Lake Levels in the Management Plans of Tribal Fisheries and Culturally Important Sites

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For Indigenous peoples in the Great Lakes region (including federally-recognized Tribes), water is a fundamental element of spiritual, cultural, economic and political significance. Tribal governments, Indigenous organizations and individual Indigenous families are active in the protection of water quality. Freshwater ecosystems play an important role in the physical sustenance of Indigenous populations, both as a food source and as an important source of economic stability. Water is also a key component of the governance of federally-recognized Tribes, which denotes the idea of a Tribe's organizational capacity to exercise self-determination over, and protection of, the spiritual, cultural, economic and political dimensions of Indigenous ways of life.

Our changing climate has the potential to impose a wide spectrum of impacts on freshwater ecosystems within the Great Lakes. In an assessment of climate changes within the Midwestern United States from the 1951-1980 to the 1981-2010 climatological periods, the Great Lakes Integrated Sciences + Assessments (GLISA) found that temperatures across this region have been warming, with the greatest warming observed during the winter months across the upper Great Lakes, + 2.0 to +4.0°F (GLISA 2014a; GLISA 2014b). Over this same period, decreases in total precipitation have been observed across the Upper Great Lakes during the Winter through Summer seasons, with an increase in precipitation observed across the entire Midwest in the Fall.

Warming air temperatures play an important role in controlling the water levels of the Great Lakes, as air-water temperature differences, and the extent of seasonal ice coverage, drive evaporation from these lakes. The variability and long-term trends in water levels play important roles in determining the ecological diversity of coastal wetlands, which serve as spawning grounds, nurseries and feeding zones for a variety of fish species of importance to both the Indigenous Tribes and the general public. For these reasons, changes in the climate of the Great Lakes region pose challenges for the: (a) management of Tribal fisheries which support important fish populations and (b) protection of culturally important coastal sites (ex: Tribal burial grounds).

During the "Planning Grant" phase of the Graham Sustainability Institute's *Great Lakes Water Levels Integrated Assessment*, we established a collaborative relationship with two Indigenous Tribes: the Little Traverse Bay Bands of Odawa Indians and the Grand Traverse Band of Ottawa and Chippewa Indians. This new proposal seeks to work with these Tribes to **identify two plausible, climate-driven lake level futures for the Lake Michigan-Huron system**. Following work plans developed with each of these Tribes during the "Planning Grant" phase, we will **assess the potential impact of these plausible futures on the vulnerabilities of Tribal communities, their fisheries and their Tribal governance** This project will support each Indigenous Tribe in the development of: (a) climate change adaptation strategies associated with each of these plausible futures and (b) community education and engagement activities that will be required to gain community commitment or "buy-in" for these adaptation strategies.

Typical climate change adaptation strategies employ both engineering and best practices solutions. For Indigenous peoples, the sovereignty and jurisdiction of Tribal governments, Tribal economic capacity, and cultural and spiritual considerations must be applied in any strategy that seeks to protect the Indigenous ways of life of Tribal citizens in the face of a changing climate. The development of such a strategy as part of this project will not only build the capacity of the Tribes to address climate adaptation within the context of Tribal values, but also the ability of the Graham Sustainability Institute to reach out to other federally-recognized Tribes within the Great Lakes.