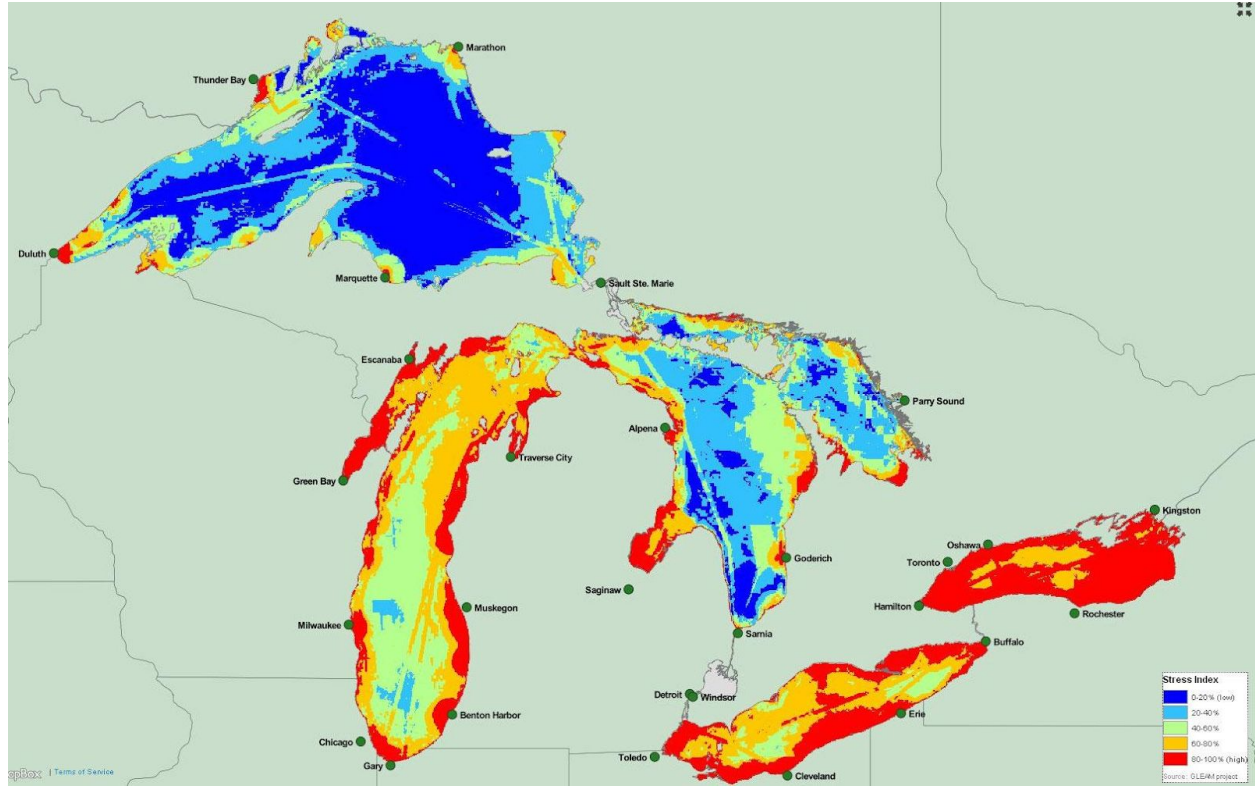


# Stressors in the Great Lakes

Source: <http://greatlakemapping.org/lake-stressors>



# Phragmites

Invasive phragmites near Lake Erie (Photo: Michigan Sea Grant)

Invasive common reed (*Phragmites australis*), is a perennial grass causing significant ecological and economic impacts in the Great Lakes region. The plant grows rapidly, creating dense stands that choke out all other plant species and provides very poor quality habitat for other wetland organisms. It has been found in coastal and interior wetlands, streamside corridors, roadside ditches, and other areas with wet soil.



## Impacts of invasive *Phragmites*

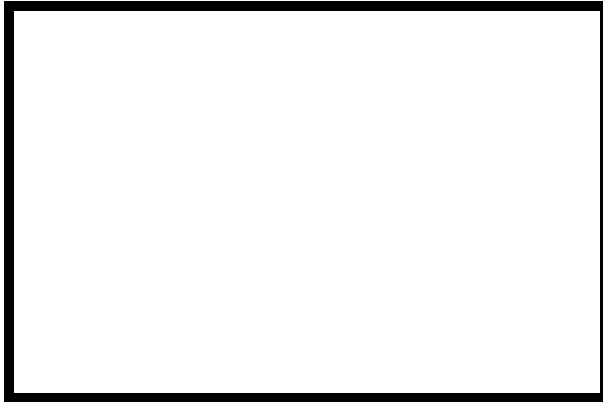
*Phragmites* is a major threat to the biodiversity and function of coastal wetlands. The plant forms dense monocultures which:

- Crowd out native plants
- Inhibit animal movement
- Serve as a poor quality food for animals
- Slow decomposition
- Alter water levels
- Block sunlight to underlying plant communities
- Reduce habitat diversity

A native form of *Phragmites* does exist in the Great Lakes region, but it is quite rare. The invasive form of the plant is quickly displacing the native variety, along with many other native plant species. Once established, invasive *Phragmites* is difficult to eradicate, often requiring a combination of repeated herbicide applications, burning and other control techniques.

**Spatial distribution of *Phragmites* as a stressor in the Laurentian Great Lakes (Inset: Western Lake Erie).**

# Round goby



Round goby (Photo: Michigan Sea Grant)

The round goby (*Neogobius melanostomus*) is a bottom-dwelling fish whose native range is in Eurasia. It was first observed in the St. Clair River, presumably a ballast water introduction, and is now widespread in all of the Great Lakes except Lake Superior where it is

reported from only a few locations. It is especially abundant in Lakes Erie and Ontario. The round goby population of western Lake Erie was estimated at 9.9 billion individuals in 2002.<sup>1</sup>

## Impacts of round goby invasion

- The round goby is extremely aggressive and is a prolific breeder, often spawning several times each season. Once established, it can quickly become the dominant fish species in an area.
- The round goby prefers rocky, shallow areas but flourishes in a wide variety of habitats. It out-competes native species, particularly other bottom-dwelling species like mottled sculpin, logperch, and darters, for food and space, and preys on eggs and fry of other fish.
- The round goby also preys heavily on zebra mussels, which are often high in contaminants, leading to concerns about increased risk of contaminant exposure for sport fish and other round goby predators.

**Spatial distribution of round goby as a stressor in the Laurentian Great Lakes (Inset: Western Lake Erie)\***

# Decreased winter ice cover



Winter ice in Lake Michigan (R. Greaves)

Changes in the extent and duration of winter ice cover may influence lake levels via water loss through evaporation. Loss of ice cover earlier in the spring can lead to higher water temperatures by affecting the onset of summer warming. Overall, the spatial

extent of Great Lakes ice cover has decreased by 71% in the past 40 years.<sup>1</sup>

- Where detailed records are available, the duration of winter ice cover has decreased (e.g., Grand Traverse Bay, MI; Bayfield, WI).
- The annual maximum percentage of lake surface covered by ice is highest in Lake Erie.
- Lake Superior has the second-highest maximum percentage of ice cover, due to colder air temperatures.
- Evidence to date and future projections suggest climate change will bring reductions in the extent and duration of winter ice cover, and Lakes Erie and Superior may show the greatest changes.

**Spatial distribution of reduced ice cover as a stressor in the Laurentian Great Lakes. (Inset: Western Lake Superior).**

# Warming water temperatures

Warming air temperatures in the Great Lakes region will bring about warmer water temperatures. Summer surface water temperatures appear to be increasing across the Great Lakes basin.

- Larger temperature increases have been observed in the upper Great Lakes relative to the lower Great Lakes.
- Summer water temperatures appear to be warming at a faster rate than mean annual air temperatures in the upper Great Lakes. This is likely due to an earlier onset of summer, which may last longer, and to the decreasing duration and extent of winter ice cover.<sup>1,2</sup>

Model projections predict that water surface temperatures between 2000 and 2100 will warm at rates ranging from 0.37-0.93°C per decade in Lake Superior to between 0.20 and 0.60°C per decade in Lake Erie.<sup>3</sup> These temperature changes are expected to:

- Affect the metabolism and possibly the growth rates of fish
- Alter the ranges and abundances of many species due to changes in thermal habitat.
- Affect the timing of seasonal events such as spring blooms of algae and the onset of fish spawning.
- Promote the spread of nuisance algae and invasive species.

Note that some environmental alterations caused by climate change have the potential to be beneficial for some species. For example warmer water temperatures likely will increase ecosystem productivity unless nutrients or other factors become limiting, and may expand the thermal habitat available to some native fishes.







