INVASIVE ALGAE

Golden Alga

Prymnesium parvum

Sea Grant PENNSYLVANIA

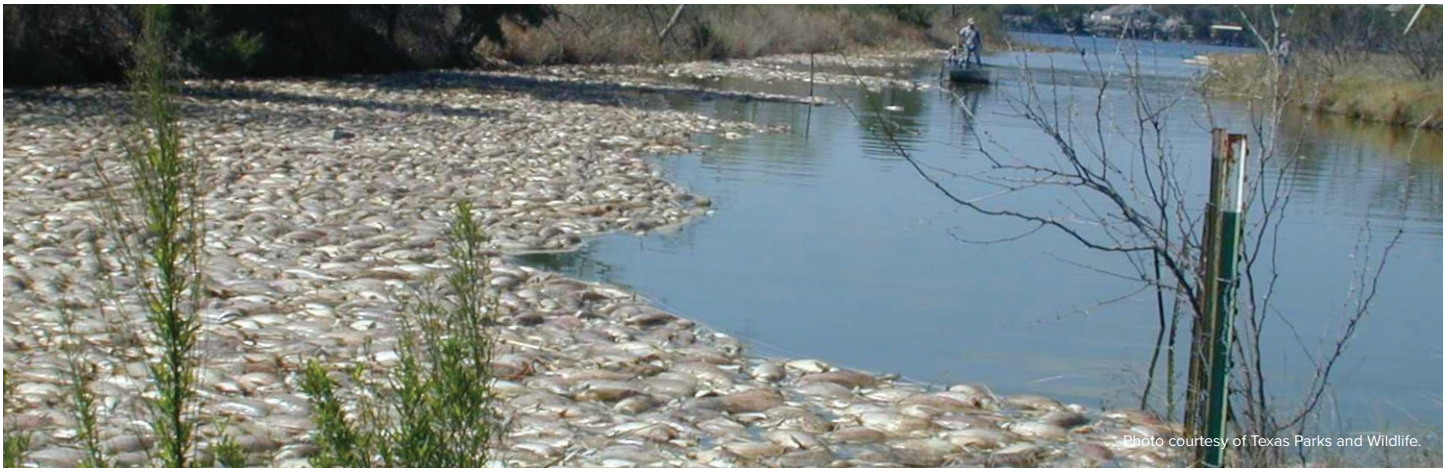


Photo courtesy of Texas Parks and Wildlife.

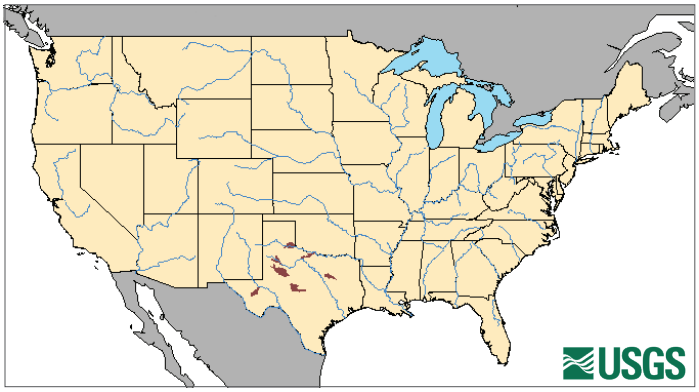
Golden Alga is a naturally occurring, one-celled, microscopic organism that can produce toxins under certain environmental conditions. These toxins have caused die-offs of gill-breathing organisms such as fish and clams— resulting in ecological and economic harm to the affected water system.

Species Description

Golden Alga is a tiny, single-celled organism that is about the size of a human blood cell. Algae are primitive aquatic plants that usually lack true stems, roots, or leaves. Golden Alga is very mobile and uses its two “tails” called flagella to move about in the waters of lakes and ponds. A short, stiff, hair-like structure called a haptonema is used to attach the cell to other cells or objects. A yellow-green, C-shaped chloroplast wraps around the middle of the cell and can be seen under a microscope. During a typical bloom, the water turns yellowish, yellow copper, or a brownish tea color. Foaming at the surface of the water in areas where there is a lot of wave action is another sign. Exposed fish may swim slowly or erratically just below the surface, lie inactively along the bottom in shallow areas, or show no avoidance to human presence. Other visible signs include redness or hemorrhaging at the base of the fins, around the mouth area, under the chin, and along the belly.

Native & Introduced Ranges

Golden Alga occurs on every continent except for Antarctica. It is found primarily in coastal waters and estuaries where there is mixing between freshwater and seawater; however, it can also occur in freshwater that has a relatively high salt content. Scientists first identified the alga in Texas in 1985 and it has since spread to more than 15 states. It is unknown whether the alga is an invasive species to North America, or whether it is native, but it was not identified before the 1980s. The first known occurrence of Golden Alga in Pennsylvania was in 2009 in Dunkard Creek, along the Pennsylvania-West Virginia Border.



Biology & Spread

A single drop of water may contain over 2,000 Golden Alga cells. While it is uncertain how Golden Alga moves from one body of water to another, or how it ended up in Pennsylvania, unintentional spread may have occurred in many ways. It may naturally disperse by water currents moving downstream or through canal pathways. It could also spread by sticking to the feathers or fur of waterfowl and other animals. Under stressful conditions, Golden Alga can form into dormant cysts that can hitchhike to new areas in live wells, bait buckets, recreational boating and fishing equipment, or equipment used during water withdrawals. During its resting cyst stage, it can survive in dried lake sediments and be distributed by strong winds.

Habitat

Golden Alga is generally found in brackish waters and can thrive in a variety of environmental conditions; however, it prefers alkaline waters with high salt and mineral content. The probability for Golden Alga blooms increases as water temperatures rise above 50°F (10°C), with optimum temperatures between 65°F (18°C) and 85°F (29°C); however, there is a possibility that blooms can occur in cooler water. Other factors that affect its growth include phosphorus (P) and nitrogen (N) levels, cationic substance levels, and pH. Toxic blooms typically occur at salinity levels of 1-12 PSU, temperatures of 10-25°C (50-77°F), and at fairly high P and N levels.

Impacts

Threat to Biodiversity

Golden Alga is fast-growing, resilient, and uses nutrients more effectively than other algae. A harmful algal bloom is an explosion in the population of one or more algae species. In a bloom situation, enough toxins are released to kill fish and clams. The toxin causes bleeding internally from the gills; impeding the organism's ability to exchange water and absorb oxygen. Impacts can range from minor reductions in forage fish to major fish and clam kills. Blooms may also threaten endangered species, or species of concern, which may lack sufficient numbers to recover from kills. Fish kills caused by Golden Alga blooms may last for days, weeks, or months and can change locations daily.

Human Health

There is no evidence that the toxins produced by Golden Alga harm other wildlife, livestock, or humans. Cattle, birds, and other animals have been observed drinking water during a bloom with no apparent effects. One reason for this is that Golden Alga toxins will break down in acidic conditions such as the stomach. Also, terrestrial animals have skin layers which protect them from the toxins.

Photo courtesy of Texas Parks and Wildlife.

Economic Impact

Golden Alga could have devastating economic impacts on local businesses and communities that rely on the affected water source. Repeated fish kills in many western states' reservoirs have decimated their recreational fisheries. Fish kills can also reduce local revenues, as tourists are less likely to fish and boat in an area with a fish kill. The cost of winter fish kills in Texas in 2001 was estimated to exceed 18 million dollars lost to the local economy. Projected management, control, and monitoring costs in Texas are another estimated 7.9 million dollars per year.

Prevention & Control

There are many algal control treatments available but not all may be successful at controlling Golden Alga. Copper sulfate can kill Golden Alga cells; however, it will not reduce toxicity and may harm other non-target plants. Non-chemical treatments may include rakes and filters, pH treatments, or reducing the salinity in the affected waterway. More research is needed to explore potential management actions for Golden Alga. To help prevent the spread of Golden Alga in Pennsylvania's waterways:

- Know how to identify and report Golden Alga.
- Always check for and remove plants, mud, and debris from boats, trailers, clothing, and equipment before entering a water body and before leaving a water body.
- Drain all water from bait buckets, bilges, and live wells before transporting to new areas.
- Clean all gear and equipment with hot water (140°F or 40°C) or salt water, OR let boats and equipment dry thoroughly for at least five days before entering a new water body.

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References:

Arizona Game and Fish Department. Golden Alga typically asked questions.Sager, D., Fries, L., Singhurst, L., and Southard, G. 2007. Guidelines for Golden Alga Prymnesium parvum Management Options for Ponds and Small Reservoirs (Public Waters) in Texas. Texas Parks and Wildlife. Report #: PWD RP T3200-1404.Texas Parks and Wildlife. Harmful Algal Blooms Index: Golden Alga.Wisconsin Department of Natural Resources. Golden alga Factsheet.

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