U.S. Department of the Interior
U.S. Geological Survey

Harmful Algal Blooms

What are harmful algal blooms (HABs)?

Freshwater and marine HABs can occur anytime water use is impaired due to excessive accumulations of algae or algal by-products. Potential impairments include reduction in water quality, accumulation of malodorous scums in beach areas, production of toxins potent enough to cause illness or kill aquatic and terrestrial organisms, including humans, and the production of taste-and-odor compounds that cause unpalatable drinking water and fish. HABs are a global problem and the poisoning of humans and mammals after exposure to toxic freshwater and/or marine algae has been reported from over 50 countries worldwide and at least 32 U.S. states. HAB occurrence is influenced by physical, chemical, biological, hydrological, and meteorological factors and it is difficult to identify the specific factors that cause a particular bloom event.

Harmful algal bloom in a Kansas reservoir used for drinking-water supply and recreation, June 2003. Photo courtesy of the Kansas Department of Health and Environment.

HABs cause ecologic, economic, and public health concerns in both freshwater and marine ecosystems.

Ecologic Concerns

- HABs may cause mortality of aquatic organisms because of low dissolved oxygen or algal toxins and mortality of terrestrial organisms relying on the water resource.
- Long-term impacts of persistent HABs on ecosystem structure and function are not well understood.

Harmful algal bloom in a Missouri reservoir used for drinking-water supply and recreation, October 2001.

Economic Concerns

- Economic concerns associated with HABs include increased drinking water treatment costs, loss of recreational revenue, loss of aquacultural and fisheries revenue, and loss of livestock.
- Taste-and-odor compounds are of particular concern to drinking water suppliers because of increased treatment costs and customer dissatisfaction with malodorous drinking water.
- Economic losses in the United States because of HABs during the last decade are estimated to be in excess of a billion dollars.

Public Health Concerns

- Human illness may occur after consumption of drinking water, fish, or shellfish tainted with algal toxins, exposure to algal toxins through recreational activities, or inhalation of aerosolized toxins.
- Several algal toxins are believed to be either carcinogens or tumor promoters, although more research on long-term impacts is needed.
- Because of potential human health risks freshwater algal toxins are on the U.S. EPA drinking water contaminant candidate list (CCL).

HAB Briefing Sheet
June 2006

HAB Occurrence in the Midwestern United States

The Midwest, including the state of Kansas, has experienced HABs in important drinking water supplies and recreational resources.

- Marion, Kansas and surrounding communities shut down water treatment facilities and had to truck in water during a potentially toxic algal bloom in Marion Reservoir during June 2003.
- Wichita, Kansas spent several million dollars to install ozone technology in its drinking-water treatment facility with the specific aim of decreasing taste-and-odor episodes caused by algae in Cheney Reservoir.
- Olathe, Kansas discontinued use of Lake Olathe as a water supply in 2006 after a study by the U.S. Geological Survey (USGS) identified the potential causes of persistent taste-and-odor episodes.

Algal sample from a toxic HAB in Nebraska that killed pets and wildlife during Memorial Day weekend, 2006.

- Water One, the drinking water supplier for Johnson County, Kansas, decreases water use from the Kansas River during summer months to minimize the occurrence of taste-and-odor episodes in drinking water caused by algae.
- Nebraska monitors state beaches for the presence of algal toxins and closes beaches when toxin levels are considered unsafe. The Nebraska beach monitoring program was initiated after dog deaths in summer 2004.
- Several domestic and wild animals died in late May and early June 2006 after exposure to algal toxins in a lake in the Omaha, Nebraska area.

Research needs

The USGS is engaged in HAB research in the state of Kansas and throughout the nation. The study of HABs is an active area of developing research, but HAB research to date has emphasized marine ecosystems. There is a need for comparable work in freshwater systems.

- The occurrence of HABs, particularly those producing toxins or taste-and-odor compounds, is not well documented in the United States.
- Reliable analytical techniques for the analysis of toxins, taste-and-odor compounds, and algal identification and enumeration are required.
- Long-term studies in individual lakes, reservoirs, and rivers are needed to identify the environmental factors driving HAB formation and to document the influence of changing environmental conditions on HAB occurrence.
- The development of methods for early detection and predictive models would allow resource managers time to respond to potentially harmful conditions.

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