

COPPER COMPOUNDS

CHEMICAL FACT SHEET

Formulations

Copper has been used as an aquatic herbicide and algaecide since 1950. Copper compounds for aquatic use are manufactured either as copper sulfate or as a copper chelate. Both copper compounds are under registration review, and an interim registration review decision was released in 2018. Both forms contain metallic copper as the active ingredient, but copper is combined with other compounds in the chelate forms to keep the copper in solution and active in the water longer.

Copper products are primarily used to treat algae using surface or subsurface applications. Only copper products that are approved for aquatic use can be used in aquatic environments; copper sulfate products intended for use as fungicides and other terrestrial applications are not permitted for aquatic use. Commercial formulations approved for aquatic use in Wisconsin include Captain®, Earthtec®, Cutrine®-Plus and Argos.*

Aquatic Use and Considerations

Copper is a contact herbicide (i.e., it affects plant cells on contact and does not move throughout the plant tissue). Its mechanism of action is undefined, and it does not belong to a WSSA herbicide group; however, it is believed that copper-based products work by interfering with cell processes like enzyme production, photosynthesis, nitrogen fixation and cell division. Affected plants and algae will show symptoms within hours, and plants will decompose in about a week. Large algae die-offs can deplete oxygen levels in the water quickly, which can be lethal to fish and other aquatic life. If more than one-third of the total

water area is covered in algae, treatments should be done in sections and applied in a pattern that allows fish an escape route to untreated water. Ten to fourteen days are needed between treatments to protect fish and aquatic life.

Algaecides, such as copper products, may temporarily control algae and cyanobacteria (e.g., blue-green algae) but do not fix the underlying cause of algal blooms. The predominant toxin-producing blue-green algae in Wisconsin form visible blooms and scums, which can alert the public to potentially hazardous conditions. Treating a harmful algal bloom could induce toxin release from dying cells, which may be invisible to recreational users. Releasing toxins in a single large dose could cause more harm to lake organisms than if toxins were bound up in cells. Because of the risk of toxin release to public and environmental health, and the short duration of algaecide efficacy in nutrient-enriched water bodies, permits for algaecides are issued sparingly in Wisconsin, and primarily for private ponds.

In Wisconsin, copper is typically only used to treat algae. Copper products are labeled to control planktonic (suspended) algae and filamentous (mat-forming) algae. They are also labeled to control macrophytic (plant-like) algae, such as invasive starry stonewort (*Nitellopsis obtusa*), and native muskgrasses (*Chara* spp.) and stoneworts (*Nitella* spp.).†

† May vary by formulation, application rate, and/or product. Every product label must be carefully reviewed and followed by the user.

* Product names are provided solely for your reference and should not be considered exhaustive nor endorsements.

Post-Treatment Water Use Restrictions

There are no post-treatment restrictions on treated water use for swimming, fishing, human drinking water, pet/livestock drinking water, or irrigation†.

Herbicide Degradation, Persistence and Trace Contaminants

In hard or alkaline waters, copper sulfate tends to settle to the bottom within 24 hours after application. Chelated copper remains in solution longer, allowing for longer contact time with plants. Copper chelate products are broken down by water (hydrolysis) and have a half-life (the time it takes for half of the active ingredient to degrade) of two to eight days.

Elemental copper itself does not degrade after application, but rather accumulates in the sediment. Repeated use in the same area may potentially increase toxicity risks for native biota, as well as potentially give rise to copper-resistant plant species.

Impacts on Fish and Other Aquatic Organisms

Copper sulfate is highly toxic to freshwater fish at label application rates. Chelated copper products can also be toxic to freshwater fish at label application rates, particularly to sensitive species in soft water (less than 50 parts per million (ppm) carbonate hardness).

Applications to harder water provide a greater margin of safety to fish. Copper does temporarily bioaccumulate (the process by which chemicals in the environment or in a food source are taken up by plants or animals) in fish, but more in the gills and the liver than in muscle tissue. Once the copper level in water is reduced, the copper levels in fish tissues are also reduced.

Many copper sulfate and chelated copper products are also highly toxic to freshwater invertebrates at application rates. High concentrations of copper in lake sediment are particularly toxic to benthic invertebrates (invertebrates that live on the lake bottom), which are an important source of fish food.

Copper is necessary for animal health in small

amounts but may be toxic to birds or mammals at high exposure levels. However, birds are unlikely to be exposed to dangerous levels of copper through the use of copper herbicides. Birds, like humans, can physiologically acclimate to higher concentrations of copper to slow its uptake. Even at levels far below application rates (0.07 ppm), copper sulfate can have detrimental effects on amphibians, including slowed growth rates, decreased mobility and death.

Human Health

Chemical applicators are primarily at risk of toxic effects after short-term exposure to copper herbicides. Copper products may be harmful or even fatal if swallowed, inhaled or absorbed through the skin, and may also cause irreversible eye damage. Wear proper personal protective equipment and follow label instructions while handling.

Very few health concerns associated with long-term exposure to copper herbicides have been documented. However, there is some evidence that high copper exposure may cause liver damage and impaired immune function. Copper is not carcinogenic.

For Additional Information

U.S. Environmental Protection Agency (EPA)
Office of Pesticide Programs
epa.gov/pesticides

Wisconsin Department of Agriculture, Trade,
and Consumer Protection
[datcp.wi.gov/Pages/Programs_Services/ACMOV
erview.aspx](http://datcp.wi.gov/Pages/Programs_Services/ACMOVerview.aspx)

Wisconsin Department of Natural Resources
608-266-2621
dnr.wi.gov/lakes/plants

Wisconsin Department of Health Services
dhs.wisconsin.gov

National Pesticide Information Center
1-800-858-7378
npic.orst.edu

