

Fact Sheet: Draft Estuarine/Marine Copper Aquatic Life Ambient Water Quality Criteria

Summary

EPA has issued for public comment draft aquatic life criteria for copper in estuarine/marine waters. The 2016 draft criteria incorporate a recently-developed saltwater biotic ligand model (BLM) and the latest scientific information for estuarine/marine aquatic organisms. The BLM allows users to develop protective chronic and acute values based on site-specific water quality variables including temperature, dissolved organic carbon (DOC), salinity, and pH, which influence the bioavailability and toxicity of copper in estuarine/marine environments.

The updated criteria will be particularly beneficial in the adoption of water quality standards for the protection of aquatic life in and around coastal harbors and marinas, where antifouling paints and coatings on vessels and marine structures represent one of the most commonly identified sources of copper to the estuarine/marine environment.

The draft criteria underwent independent, external peer review in 2015. EPA will accept comments on the 2016 draft criteria document for 60 days upon Federal Register publication.

Background

In 2007, EPA published updated aquatic life criteria for copper in freshwater using a BLM, a model that relies on water quality input parameters to estimate the fraction of copper that is bioavailable and thus can exert a toxic effect. Estuarine/marine criteria were not updated in that publication because a BLM for estuarine/marine waters had not been sufficiently developed and tested at that time.

What is Copper?

Copper is an abundant trace element that occurs naturally in the earth's crust and surface waters. Copper can be found as a pure metal in nature and has a high thermal and electrical conductivity. Copper compounds are generally found in water as copper (II) salts.

How Does Copper Enter Marine/Estuarine Waters?

Copper is commonly found in aquatic systems as a result of both natural and anthropogenic sources. Natural sources of copper in aquatic systems include geological deposits, volcanic activity, and weathering and erosion of rocks and soils. Anthropogenic sources of copper include mining activities, agriculture, metal and electrical manufacturing, sludge from publicly-owned treatment works (POTWs), pesticide use and more. A major source of copper in the marine environment is antifouling paints, used as coatings for ship hulls, buoys, and underwater surfaces, and as a legacy contaminant from decking, pilings and some marine structures that used chromated copper arsenate (CCA) treated timbers.

How Does Copper in Saltwater Affect Aquatic Life?

Copper is an essential nutrient to aquatic organisms at low concentrations, but is toxic to aquatic organisms at higher concentrations. In addition to acute effects such as mortality, chronic exposure to copper can lead to adverse effects on survival, growth, reproduction as well as alterations of brain

function, enzyme activity, blood chemistry, and metabolism in aquatic organisms.

How Do the Draft 2016 Criteria Compare to the 2003 Draft Criteria?

New acute toxicity data for estuarine/marine species have been included in EPA's 2016 update. A total of 74 genera are used to derive the estuarine/marine criterion maximum concentration (CMC) in the 2016 update compared to the 44 genera used in EPA's 2003 draft estuarine/marine criteria for copper. The 2016 update uses the BLM to incorporate the interaction and effect of physical and chemical water parameters (pH, temperature, salinity and DOC) that affect the bioavailability of copper to aquatic organisms. Incorporation of the BLM accounts for copper bioavailability in natural aquatic systems, in contrast to the 2003 draft criteria which did not account for the interactions of these parameters on copper bioavailability and their effect on copper toxicity.

Table 1 below gives an example of what the draft 2016 water quality criteria are for waters with the following default reference conditions: Temperature=22°C, pH=8, Dissolved Organic Carbon=1.0 mg/L and Salinity=32 ppt.

Table 1. Example of Draft Estuarine/Marine Criteria for Copper Using Default Reference Conditions.

Acute ^{a,b} (1-hour average)	Chronic ^{a,b} (4-day average)
2.0 µg/L dissolved Cu	1.3 µg/L dissolved Cu

^a When Temperature=22°C, pH=8, Dissolved Organic Carbon=1.0 mg/L and Salinity=32 ppt. The water quality criteria numeric values will change in response to changes in these water quality parameters.

^b Values are recommended not to be exceeded more than once every three years on average.

What are National Recommended Aquatic Life Criteria?

Ambient water quality criteria for the protection of aquatic life are numeric concentrations of pollutants, with specific recommendations on the duration and frequency of those concentrations, in surface waters that are protective of aquatic life designated uses. Under Clean Water Act section 304(a), EPA is directed to develop and publish water quality criteria that reflect the latest scientific knowledge. Water quality criteria are based solely on data and scientific judgments about the relationship between pollutant concentrations and potential environmental and human health effects. EPA's recommended water quality criteria are not rules, nor do they automatically become part of a state's water quality standards. States must adopt into their standards water quality criteria that protect the designated uses of the water bodies within their area. These can include scientifically defensible site-specific criteria that are different from EPA's national recommended criteria, as long as the site-specific criteria are protective of the designated use. Water quality criteria are not effective under the Clean Water Act until they have been adopted into a state's water quality standards and approved by EPA.

How to View the Criteria Document and Supporting Information:

EPA has established an official public docket for this action under Docket ID No. EPA-HQ-OW-2016-0332, accessed at www.regulations.gov. You may also download the document and supporting information from EPA's aquatic life criteria website at: <https://www.epa.gov/wqc/aquatic-life-criteria-copper>

Where can I find more information?

Please contact Mike Elias by email at elias.mike@epa.gov.