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Aquatic Life Ambient Water Quality Criteria for Ammonia - Freshwater (2013)

Summary

EPA has published national recommended ambient water quality criteria for the protection of aquatic life from the toxic effects of ammonia, a constituent of nitrogen pollution. These recommended criteria will help States, Territories, and authorized Tribes update their water quality standards with concentration levels for ammonia in surface waters at or below which aquatic organisms will be protected, if not exceeded more frequently than once every three years on average. Acute and chronic criteria were developed to protect organisms from both immediate effects, such as mortality, and longer-term effects on reproduction, growth and survival, respectively.

EPA's final *Aquatic Life Ambient Water Quality Criteria for Ammonia – Freshwater* (2013) incorporate scientific views received on EPA's 2009 draft updated ammonia criteria and supersede EPA's previously recommended 1999 ammonia criteria.

What are national recommended aquatic life ambient water quality criteria?

Ambient water quality criteria for the protection of aquatic life are numeric concentrations of pollutants, with specific associated duration and frequency information, in surface waters that are protective of aquatic life designated uses. Under Clean Water Act section 304(a), EPA is required 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.

What is ammonia?

Ammonia is one of several forms of nitrogen that exist in aquatic environments. Unlike other forms of nitrogen, which can cause nutrient over-enrichment of a water body at elevated concentrations and indirect effects on aquatic life, ammonia causes direct toxic effects on aquatic life.

Ammonia is produced for commercial fertilizers and other industrial applications. Natural sources of ammonia include the decomposition or breakdown of organic waste matter, gas exchange with the atmosphere, forest fires, animal and human waste, and nitrogen fixation processes.

How does ammonia enter surface waters?

Ammonia can enter the aquatic environment via direct means such as municipal effluent discharges and the excretion of nitrogenous wastes from animals, and indirect means such as nitrogen fixation, air deposition, and runoff from agricultural lands.

How does ammonia affect aquatic life?

When ammonia is present in water at high enough levels, it is difficult for aquatic organisms to sufficiently excrete the toxicant, leading to toxic buildup in internal tissues and blood, and potentially death. Environmental factors, such as pH and temperature, can affect ammonia toxicity to aquatic animals.

What is the history of EPA's development of ammonia criteria?

EPA first published ammonia criteria for the protection of aquatic life in 1976. The criteria were then updated in 1985 and 1999 to reflect scientific information available at that time. The 1999 recommended aquatic life criteria for ammonia were based on the most sensitive endpoints known at the time: the acute criterion was based on salmonid fish toxicity information, and the chronic criterion was based on bluegill sunfish early life stage toxicity.

In 2003, EPA became aware of new toxicity studies indicating the relative sensitivity of freshwater mussels to ammonia and began to update the 1999 criteria to reflect this new information. In 2009, following external peer review, EPA published draft recommended ammonia criteria, for waters with and without mussels. Since the publication of the draft 2009 ammonia criteria, additional toxicity testing has validated information on the effects of ammonia on sensitive freshwater gill-breathing snail species. In April 2013, EPA finalized the updated ammonia criteria that are applicable nationally, taking into account the latest toxicity information for freshwater species, including unionid mussels and gill-breathing snails. The 2013 criteria incorporate scientific views received on the draft (2009) ammonia criteria and supersede EPA's previously recommended 1999 criteria.

What are the 2013 recommended water quality criteria for ammonia?

EPA recommends an acute criterion magnitude of 17 mg Total Ammonia Nitrogen (TAN) per liter at pH 7 and 20°C for a one-hour average duration, not to be exceeded more than once every three years on average. EPA recommends a chronic criterion magnitude of 1.9 mg TAN/L at pH 7 and 20°C for a 30-day average duration, not to be exceeded more than once every three years on average. In addition, the highest four-day average within a 30-day period should not exceed 2.5 times the chronic criterion magnitude (e.g. 1.9 mg TAN/L x 2.5 = 4.8 mg TAN/L at pH 7 and 20°C) more than once in three years on average.

How do the 2013 criteria compare to the previously recommended 1999 criteria and the draft 2009 criteria?

The 2013 ammonia criteria recommendations take into account the latest freshwater toxicity information for ammonia, including toxicity studies for sensitive unionid mussels and gill-breathing snails. These new criteria are based on robust toxicity data available for 69 genera (acute) and 16 genera (chronic). The updated criteria magnitudes are more stringent than the previously recommended 1999 criteria magnitudes (see *Table 1*). The duration components of the 1999, 2009 and 2013 criteria remain the same - a one-hour average duration for the acute criterion and 30-day average duration for the chronic criterion. The frequency component for the acute and chronic criteria remains once in three years on average.

Table 1. Comparison of past and current EPA-recommended aquatic life water quality criteria magnitudes for ammonia. Criteria magnitudes are expressed as total ammonia nitrogen (mg TAN/L) at pH 7 and 20°C.

Criterion Duration	1999 Criteria	2009 Draft Updated Criteria	2013 Final Updated Criteria
Acute (1-hour average)	24	19	17
Chronic (30-day rolling average)	4.5*	0.91*	1.9*
*Not to exceed 2.5 times the criterion continuous concentration as a 4-day average within a 30-day period.			
Criteria frequency: Not to be exceeded more than once in three years on average.			

Additional EPA Resources

EPA has developed three supporting documents to aid states considering adoption of the 2013 recommended ammonia criteria.

Flexibilities for States Applying EPA's Ammonia Criteria Recommendations provides an overview of a number of implementation approaches available for state consideration, including the recalculation procedure for site-specific criteria derivation, variances, revisions to designated uses, dilution allowances, and compliance schedules. The document describes how each of these flexibilities fits within a state's water quality standards adoption and implementation processes.

EPA has also developed a *Revised Deletion Process for the Site-Specific Recalculation Procedure for Aquatic Life Criteria* that describes a recalculation procedure and includes a spreadsheet that may be used to derive site-specific water quality criteria for the protection of aquatic life in order to best reflect the organisms that reside at a specific site.

A third document, which EPA expects to publish in 2013, *Technical Support Document for Conducting and Reviewing Freshwater Mussel Studies for the Development of Site-specific Water Quality Criteria for Ammonia,* will help states determine if sensitive freshwater mussels are present in their waters. Commonly-used mussel sampling methods will be described and an overview will be provided of various study approaches, considerations, and limitations, including real-life examples.

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-2009-0921, accessed at www.regulations.gov. You may also download the document and supporting information from http://water.epa.gov/scitech/swguidance/standards/criteria/aqlife/ammonia/index.cfm.

For More Information

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