

Western Coalition of Arid States

2014 Annual Conference

San Diego, California

June 19, 2014

National Ammonia Criteria: Preparing for the Impact on Your Agency

Agenda

- Ammonia Criteria - History
- State and regional implementation of current standards
- New federal criteria
- State triennial review timetables
- Potential impacts to WESTCAS Member Agencies
- What can WESTCAS/Other organizations do?
- WESTCAS Proposed Action Plan - Discussion

Federal Ammonia Criteria – History

- 1984 chronic criteria dependent on pH
- 1998 chronic criteria dependent on pH and presence of early life stages of fish
- 1999 update introduced pH/temperature relationship and more stringent standard for fish early life stages
- 2004 Federal Register Notice on re-evaluation of ammonia criteria based on data suggesting greater sensitivity of freshwater mussels
- 2005 Mussel Toxicity Testing Workshop convened to discuss data

Federal Ammonia Criteria – History

- Current Criteria Development Effort
 - Draft 2009 criteria revised downward based on greater sensitivity of juvenile mussels and introducing gill-bearing, non-pulmonate snails
 - Draft 2009 criteria also included requirement to perform mussel/snail presence-absence evaluation
 - 2013 Criteria eliminated mussel/snail presence evaluation
 - States encouraged to develop site-specific criteria for no presence
 - Criteria still temperature and pH dependent

Ammonia Standards

- Other issues
 - Beyond pH and temperature dependent toxicity, ammonia can deplete oxygen from water

State Implementation of Standards

Most acute and chronic standards are based on 1999 federal criteria.

1. Sent to EPA for review on April 23, 2014. Not yet approved.

State	1999 Fed Criteria	Most Recent Triennial Review	Implementation
Arizona	√	January 31, 2009	Numeric effluent limits in permits
California	√	Varies by region	Varies by region
Colorado	√	January 31, 2013	Numeric effluent limits in permits
Nevada	√	December 17, 2002	Numeric effluent limits in permits
New Mexico	√	December 1, 2010	Numeric effluent limits in permits
Texas	X	February 12, 2014 ¹	Current standard of 3.0 mg/L to maintain DO levels; also preclude chronic toxicity in WET tests
Illinois	√	November 8, 2002	For certain water bodies: 2.5 mg/L, Apr-Oct; 4.0 mg/l Nov-Mar.
Florida	X	August 1, 2013	Numeric effluent limits in permits

Federal Ammonia Criteria



United States
Environmental Protection
Agency

Office of Water
4304T

EPA 822-R-13-001
April 2013

AQUATIC LIFE AMBIENT WATER QUALITY CRITERIA FOR AMMONIA – FRESHWATER 2013

52192

Federal Register / Vol. 78, No. 163 / Thursday, August 22, 2013 / Notices

\$528,379, calculated from the prior collection approved by OMB.

John Mares,

Director, Collection Strategies Division,
JFR Doc. 2013-20454 Filed 8-21-13; 8:45 and
BILLING CODE 6950-50-P

ENVIRONMENTAL PROTECTION AGENCY

[EPA-HQ-OW-2009-0921; FRL-9810-4]

Final Aquatic Life Ambient Water Quality Criteria For Ammonia— Freshwater 2013

AGENCY: Environmental Protection
Agency (EPA).

ACTION: Notice of availability of final
criteria.

SUMMARY: Pursuant to section 304(a) of
the Clean Water Act (CWA), the
Environmental Protection Agency (EPA)
is announcing the availability of final
national recommended ambient water
quality criteria for the protection of
aquatic life from effects of ammonia in
freshwater (EPA 822-R-13-001). The
final criteria incorporate the latest
scientific knowledge on the toxicity of
ammonia to freshwater aquatic life. On
December 30, 2009, EPA published draft

identified by Docket ID No. EPA-HQ-
OW-2009-0921. They may be accessed
online at:

- www.regulations.gov: Follow the
on-line instructions.
- Email: OW-Docket@epa.gov.
- Mail: US Environmental Protection
Agency, EPA Docket Center (EPA/DC)
Water Docket, MC 2022T, 1200
Pennsylvania Avenue NW., Washington,
DC 20460.

- On Site: EPA Docket Center, 1301
Constitution Ave. NW., EPA West,
Room 3334, Washington, DC. This
Docket Facility is open from 8:30 a.m.
until 4:30 p.m., EST, Monday through
Friday, excluding legal holidays. The
telephone number for the Public
Reading Room is (202) 566-1744, and
the telephone number for the Office of
Water is (202) 566-2426.

For additional information about
EPA's public docket visit the EPA
Docket Center homepage at [http://
www.epa.gov/epaonline/dockets.htm](http://www.epa.gov/epaonline/dockets.htm).
FOR FURTHER INFORMATION CONTACT: Lisa
Huff, Health and Ecological Criteria
Division (4304T), U.S. EPA, 1200
Pennsylvania Ave. NW., Washington,
DC 20460; (202) 566-0787; huff.lisa@epa.gov.

SUPPLEMENTARY INFORMATION:

I. What are water quality criteria?

Water quality criteria are the minimum
levels of protection that must be
achieved to protect public health and
the environment. They are used to
develop water quality standards and
to assess the quality of water bodies.
Water quality criteria are used to
determine if water quality standards
are being achieved and to identify
areas where water quality is poor.
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EPA's recommended water quality
criteria do not substitute for the CWA or
regulations, nor are they regulations
themselves. Thus, EPA's recommended
criteria do not impose legally binding
requirements. States and authorized
Tribes have the discretion to adopt,
where appropriate, other scientifically
defensible water quality criteria that
differ from these recommendations.

II. What is ammonia and why is EPA concerned about it?

Ammonia is a constituent of nitrogen
pollution. Unlike other forms of
nitrogen, which can cause
eutrophication of a water body at
elevated concentrations, the primary
concern with ammonia is its direct toxic
effects on aquatic life, which are
exacerbated by elevated pH and
temperature. Ammonia is considered
one of the most important pollutants in
the aquatic environment not only
because of its highly toxic nature and
occurrence in surface water systems, but
also because many effluents have to be
treated in order to keep the
concentrations of ammonia in surface
waters from being unacceptably high.
Ammonia can enter the aquatic
environment via direct means such as
municipal effluent discharges and the

Federal Ammonia Criteria (from Executive Summary, EPA 822-R-13-001; April 2013)

Program this into your calculator!

$$CCC = 0.8876 \times \left(\frac{0.0278}{1 + 10^{7.688 - pH}} + \frac{1.1994}{1 + 10^{pH - 7.688}} \right) \times \left(2.126 \times 10^{0.028 \times (20 - \text{MAX}(T, 7))} \right)$$

Where CCC = Continuous Criterion Concentration (i.e. chronic criteria)

Tables have been developed.

Federal Ammonia Criteria

(from Executive Summary, EPA 822-R-13-001; April 2013)

Criterion Duration	1999 AWQC Update Criteria Magnitude		2009 Draft AWQC Update Criteria ^c Magnitude		2013 AWQC Update Criteria Magnitude
	pH 8.0, (mg TAN/L)	pH 7.0, T=20°C (mg TAN/L)	pH 8.0, T=25°C (mg TAN/L)	pH 7.0, T=20°C (mg TAN/L)	pH 7.0, T=20°C (mg TAN/L)
Acute (1-hr average)	5.6 ^a	24 ^a	2.9	19	17 ^a
Chronic (30-d rolling average)	1.2	4.5 ^b	0.26	0.91	1.9*
*Not to exceed 2.5 times CCC or 4.8 mg TAN/L (at pH 7, 20°C) as a 4-day average within the 30-days, more than once in three years on average.					
Criteria frequency: Not to be exceeded more than once in three years on average.					
^a Salmonids present					
^b Based on renormalization of data to pH 7 and 20°C					
^c Mussels present					

2013 Federal Ammonia Criteria

Table 6. Temperature and pH-Dependent Values of the CCC (Chronic Criterion Magnitude).

pH	Temperature (°C)																							
	0-7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
6.5	4.9	4.6	4.3	4.1	3.8	3.6	3.3	3.1	2.9	2.8	2.6	2.4	2.3	2.1	2.0	1.9	1.8	1.6	1.5	1.5	1.4	1.3	1.2	1.1
6.6	4.8	4.5	4.3	4.0	3.8	3.5	3.3	3.1	2.9	2.7	2.5	2.4	2.2	2.1	2.0	1.8	1.7	1.6	1.5	1.4	1.3	1.3	1.2	1.1
6.7	4.8	4.5	4.2	3.9	3.7	3.5	3.2	3.0	2.8	2.7	2.5	2.3	2.2	2.1	1.9	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.2	1.1
6.8	4.6	4.4	4.1	3.8	3.6	3.4	3.2	3.0	2.8	2.6	2.4	2.3	2.1	2.0	1.9	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.1	1.1
6.9	4.5	4.2	4.0	3.7	3.5	3.3	3.1	2.9	2.7	2.5	2.4	2.2	2.1	2.0	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.2	1.1	1.0
7.0	4.4	4.1	3.8	3.6	3.4	3.2	3.0	2.8	2.6	2.4	2.3	2.2	2.0	<u>1.9</u>	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.1	1.1	0.99
7.1	4.2	3.9	3.7	3.5	3.2	3.0	2.8	2.7	2.5	2.3	2.2	2.1	1.9	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.2	1.1	1.0	0.95
7.2	4.0	3.7	3.5	3.3	3.1	2.9	2.7	2.5	2.4	2.2	2.1	2.0	1.8	1.7	1.6	1.5	1.4	1.3	1.3	1.2	1.1	1.0	0.96	0.90
7.3	3.8	3.5	3.3	3.1	2.9	2.7	2.6	2.4	2.2	2.1	2.0	1.8	1.7	1.6	1.5	1.4	1.3	1.3	1.2	1.1	1.0	0.97	0.91	0.85
7.4	3.5	3.3	3.1	2.9	2.7	2.5	2.4	2.2	2.1	2.0	1.8	1.7	1.6	1.5	1.4	1.3	1.3	1.2	1.1	1.0	0.96	0.90	0.85	0.79
7.5	3.2	3.0	2.8	2.7	2.5	2.3	2.2	2.1	1.9	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.2	1.1	1.0	0.95	0.89	0.83	0.78	0.73
7.6	2.9	2.8	2.6	2.4	2.3	2.1	2.0	1.9	1.8	1.6	1.5	1.4	1.4	1.3	1.2	1.1	1.1	0.98	0.92	0.86	0.81	0.76	0.71	0.67
7.7	2.6	2.4	2.3	2.2	2.0	1.9	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.1	1.1	1.0	0.94	0.88	0.83	0.78	0.73	0.68	0.64	0.60
7.8	2.3	2.2	2.1	1.9	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.2	1.1	1.0	0.95	0.89	0.84	0.79	0.74	0.69	0.65	0.61	0.57	0.53
7.9	2.1	1.9	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.2	1.1	1.0	0.95	0.89	0.84	0.79	0.74	0.69	0.65	0.61	0.57	0.53	0.50	0.47
8.0	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.1	1.1	1.0	0.94	0.88	0.83	0.78	0.73	0.68	0.64	0.60	0.56	0.53	0.50	0.44	0.44	0.41
8.1	1.5	1.5	1.4	1.3	1.2	1.1	1.1	0.99	0.92	0.87	0.81	0.76	0.71	0.67	0.63	0.59	0.55	0.52	0.49	0.46	0.43	0.40	0.38	0.35
8.2	1.3	1.2	1.2	1.1	1.0	0.96	0.90	0.84	0.79	0.74	0.70	0.65	0.61	0.57	0.54	0.50	0.47	0.44	0.42	0.39	0.37	0.34	0.32	0.30
8.3	1.1	1.1	0.99	0.93	0.87	0.82	0.76	0.72	0.67	0.63	0.59	0.55	0.52	0.49	0.46	0.43	0.40	0.38	0.35	0.33	0.31	0.29	0.27	0.26
8.4	0.95	0.89	0.84	0.79	0.74	0.69	0.65	0.61	0.57	0.53	0.50	0.47	0.44	0.41	0.39	0.36	0.34	0.32	0.30	0.28	0.26	0.25	0.23	0.22
8.5	0.80	0.75	0.71	0.67	0.62	0.58	0.55	0.51	0.48	0.45	0.42	0.40	0.37	0.35	0.33	0.31	0.29	0.27	0.25	0.24	0.22	0.21	0.20	0.18
8.6	0.68	0.64	0.60	0.56	0.53	0.49	0.46	0.43	0.41	0.38	0.36	0.33	0.31	0.29	0.28	0.26	0.24	0.23	0.21	0.20	0.19	0.18	0.16	0.15
8.7	0.57	0.54	0.51	0.47	0.44	0.42	0.39	0.37	0.34	0.32	0.30	0.28	0.27	0.25	0.23	0.22	0.21	0.19	0.18	0.17	0.16	0.15	0.14	0.13
8.8	0.49	0.46	0.43	0.40	0.38	0.35	0.33	0.31	0.29	0.27	0.26	0.24	0.23	0.21	0.20	0.19	0.17	0.16	0.15	0.14	0.13	0.13	0.12	0.11
8.9	0.42	0.39	0.37	0.34	0.32	0.30	0.28	0.27	0.25	0.23	0.22	0.21	0.19	0.18	0.17	0.16	0.15	0.14	0.13	0.12	0.12	0.11	0.10	0.09
9.0	0.36	0.34	0.32	0.30	0.28	0.26	0.24	0.23	0.21	0.20	0.19	0.18	0.17	0.16	0.15	0.14	0.13	0.12	0.11	0.11	0.10	0.09	0.09	0.08

Potential Impacts to WESTCAS Member Agencies

- What are states with WESTCAS members planning to do?
- Compare new federal criteria to WESTCAS member effluent ammonia levels
- What would be necessary to comply with new standards?

What are states planning to do?

State	Current Plan
Arizona	<p>State of Arizona still under new rule moratorium</p> <p>ADEQ planning modified Triennial Review to clean up unresolved issues from 2009 Update</p> <ul style="list-style-type: none"> - Plan to start in Fall 2014 and finish by December 2014 or early 2015 - Does not include revising standards for Ammonia or other parameters - More comprehensive Review possible in 2015, dependent on moratorium, driven by recent and upcoming federal criteria development efforts (e.g. ammonia, selenium)
California	<p>Triennial reviews conducted by Regional Water Quality Control Boards and developed into Regional Basin Plans.</p>
Colorado	<p>Water Quality Standards revision process to start early 2015</p> <p>Basic Standards Hearing planned for June 2016</p>
Nevada	<p>Nevada Department of Environmental Protection (NDEP) contemplating adopting federal criteria</p> <p>NDEP steps will include:</p> <ul style="list-style-type: none"> Evaluation of impacts of adopting federal criteria Convene public meetings probably not before September 2015
New Mexico	<p>Public Discussion Draft Triennial Review issued April 28, 2014; hearings Dec 2014-Jan 2015; does not include revisions to ammonia standard, just cosmetic changes to tables)</p>
Texas	<p>No immediate plans to revise current State standards. TCEQ waiting to get EPA approval of Triennial Review submittal dated April 23, 2014.</p>

What's all the fuss about?

- Most facilities in arid west must comply with Water Quality-based Effluent Limits (WQBELs) at the end of pipe (i.e. no opportunity for mixing)
- Arid west is unique with temps, pH and species (note that temps over 30 not included on official charts)
- More stringent standards → higher levels of treatment? → \$\$\$

Potential impact to WESTCAS members

Facility	Number of Months In Year Exceeding Given Criteria	
	1999 Federal Criteria	2013 Federal Criteria
A	0	7
B	0	0
C	0	12
D	0	0
E	0	8
F	0	2
G	0	0
H	0	0
I	0	1
J	X	X
K	X	X
L	1	2
<ul style="list-style-type: none"> • Interpolated from criteria tables • X – Not completed 		

Treatment Methods

- Biological (secondary) treatment
 - Can convert ammonia to nitrate and nitrite
 - Can reduce ammonia, but not necessarily to levels sufficient to eliminate toxicity
 - Examples:
 - Fixed growth
 - Trickling filters
 - Rotating Biological Contactors (RBCs)
 - Moving Bed Bioreactors (MBBRs)
 - Suspended growth
 - Activated Sludge (many variants)

Treatment Methods

- Current biological treatment may not be sufficient to meet new ammonia criteria
- Sidestreams (e.g. digested sludge centrate) may increase load of ammonia to WWTP influent
- May need to treat sidestreams (e.g. centrate treatment)

Treatment Methods

- Additions to/retrofit of secondary treatment
 - Secondary Treatment + Nitrification – Denitrification (NdeN)
 - Ammonia Stripping
 - Constructed wetlands?
- Membrane Bioreactors (MBRs) preceded with anoxic zones
- Others

Treatment Methods

- Costs of additional treatment
 - Analysis needed
 - Case-by-case
 - Any additional treatment will require additional capital and result in higher operation & maintenance costs

What States Can Do

EPA issued:

Flexibilities for States Applying EPA's Ammonia Criteria Recommendations (EPA-820-F-13-001, April 2013)



United States
Environmental Protection Agency

Office of Water
Mail Code 4305T

EPA-820-F-13-001
April 2013

Flexibilities for States Applying EPA's Ammonia Criteria Recommendations

Background

The U.S. Environmental Protection Agency (EPA) is updating its 1999 Clean Water Act (CWA) § 304(a) national ambient water quality criteria recommendations for ammonia to account for the sensitivity of freshwater mussels and snails to ammonia toxicity. The updated criteria recommendations reflect new science on juvenile mussels and gill-bearing, non-pulmonate snails. Through extensive peer review processes, reviewers agreed on the quality and acceptability of the new data EPA included in the quantitative derivations of the updated recommendations. The criteria recommendations for ammonia apply to all freshwaters for the protection of the aquatic community, including both freshwater mussels and snails.

Freshwater mussels are highly sensitive to ammonia toxicity and represent the most sensitive species in the dataset for the criteria recommendations. New science has demonstrated that freshwater snails are also sensitive to ammonia toxicity. Both mussels and snails are important to the environment because they serve as food sources for other organisms in the food web and provide vital services in improving and maintaining water quality. Specifically, mussels are filter feeders and can filter nutrients, toxics, and other pollutants out of the water, thereby helping to control the levels of these pollutants and reduce exposure to humans and other aquatic organisms. Snails feed on organic debris including algae, which helps to reduce the effects of eutrophication and keeps bottom substrates clean for other benthic organisms.

Flexibilities for Applying EPA's Ammonia Criteria Recommendations

This section describes some of the flexibilities that states¹ may want to consider in adoption and application of EPA's ammonia criteria recommendations. These flexibilities include the Recalculation Procedure for site-specific criteria derivation, variances, revisions to designated uses, dilution allowances, and compliance schedules.

1. Recalculation Procedure for Site-specific Criteria Derivation

The water quality standards (WQS) regulation at 40 CFR § 131.11(b)(1)(ii) provides states with the opportunity to adopt water quality criteria that are "...modified to reflect site-specific conditions." As with any criteria, site-specific criteria must be based on a sound scientific rationale in order to protect the designated use and are subject to review and approval or disapproval by EPA.

¹ Throughout this document, the term "states" refers to authorized tribes and U.S. territories in addition to states.

What states can do

- Site-specific criteria derivation
- Variances
- Revisions to designated uses
- Dilution allowances
- Compliance schedules

What states can do

- Recalculation Procedure for Site-Specific Criteria Derivation
 - No target species present or documented – use data from next most sensitive species – may result in less stringent standard
 - Available EPA Guidance
 - *Water Quality Standards Handbook* (EPA-823-B-12-002, March 2012)
 - *Revised Deletion Process for the Site-Specific Recalculation Procedure for Aquatic Life Criteria* (EPA-823-R-13-001, April 2013)
 - *Technical Support Document for Conducting and Reviewing Freshwater Mussel Occurrence Surveys for the Development of Site-Specific Water Quality Criteria for Ammonia*, EPA800-R-13-003, August 2013

What states can do

- Variances

- Where designated use is unattainable or unknown
- Does not change designated use but relaxes need to meet standard for limited time period
- Requires interim discharge limits in permits
- Requirements vary from state to state (e.g. discharger-specific, multiple dischargers, watershed-basis)
- Must meet at least one of 40 CFR §131.10(g)(1)-(6) conditions.
 - Most likely §131.10(g)(6), where imposition of water quality-based controls would result in “substantial and widespread economic and social impact

What states can do

- Revisions to Designated Uses
 - If designated use is determined to be “ultimately” unattainable”.
 - Requires Use Attainability Analysis (UAA)
 - Meet one of the conditions of 40 CFR §131.10(g)(1)-(6)

40 CFR 131.10(g)

- (g) States may remove a designated use which is *not* an existing use, as defined in §131.3, or establish sub-categories of a use if the State can demonstrate that attaining the designated use is not feasible because:
 - (1) Naturally occurring pollutant concentrations prevent the attainment of the use; or
 - (2) Natural, ephemeral, intermittent or low flow conditions or water levels prevent the attainment of the use, unless these conditions may be compensated for by the discharge of sufficient volume of effluent discharges without violating State water conservation requirements to enable uses to be met; or
 - (3) Human caused conditions or sources of pollution prevent the attainment of the use and cannot be remedied or would cause more environmental damage to correct than to leave in place; or
 - (4) Dams, diversions or other types of hydrologic modifications preclude the attainment of the use, and it is not feasible to restore the water body to its original condition or to operate such modification in a way that would result in the attainment of the use; or
 - (5) Physical conditions related to the natural features of the water body, such as the lack of a proper substrate, cover, flow, depth, pools, riffles, and the like, unrelated to water quality, preclude attainment of aquatic life protection uses; or
 - **(6) Controls more stringent than those required by sections 301(b) and 306 of the Act would result in substantial and widespread economic and social impact.**

40 CFR 131.10(h)

- (h) States may not remove designated uses if:
 - (1) They are existing uses, as defined in §131.3, unless a use requiring more stringent criteria is added; or
 - (2) Such uses will be attained by implementing effluent limits required under sections 301(b) and 306 of the Act and by implementing cost-effective and reasonable best management practices for nonpoint source control.
- (i) Where existing water quality standards specify designated uses less than those which are presently being attained, the State shall revise its standards to reflect the uses actually being attained.
- (j) A State must conduct a use attainability analysis as described in §131.3(g) whenever:
 - (1) The State designates or has designated uses that do not include the uses specified in section 101(a)(2) of the Act, or
 - (2) The State wishes to remove a designated use that is specified in section 101(a)(2) of the Act or to adopt subcategories of uses specified in section 101(a)(2) of the Act which require less stringent criteria.
- (k) A State is not required to conduct a use attainability analysis under this regulation whenever designating uses which include those specified in section 101(a)(2) of the Act.

What states can do

- Dilution Allowances
 - Applicable in states that allow mixing or dilution
 - There must be sufficient water or flow to meet the mixing or dilution requirements

What can WESTCAS/Other organizations do?

- Start talking to state environmental agencies
 - What are their short and long-term plans for SWQS revisions?
 - Do they have mussel/snail survey data?
 - Will they have to collect mussel/survey data?
- What are other organizations doing?

WESTCAS Proposed Action Plan - Discussion

- Form WESTCAS Working Group - initiated
- Develop multi-state information exchange - initiated
- Form state working groups in collaboration with others
- Work in state groups to determine extent of problem for agencies in each state
- Create state and regional white papers on impact and alternatives
- Then begin focused informal discussions with states and regions using white paper guidelines
- Use publicity and pressure judiciously as needed on state, regional and national basis
- Leverage agency/state accomplishments to gradually increase overall success

Sensitive to ammonia?



Questions?