

Acute Cadmium Criteria Aquatic Life Protection

Part 1 – Intro and criteria discussion

Water Quality Standards Triennial Review 2019 – 20
Workgroup Meeting

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1. New/updated national criteria recommendations from EPA in 2016
2. Revisions proposed by Associated Industries of Missouri (AIM)
 - Separate criteria for cold water habitat (CLD) and cool or warm water habitat (CLH and WWH)

10 CSR 20-7.031



10 CSR 20-7—DEPARTMENT OF NATURAL RESOURCES

Division 20—Clean Water Commission

Table A2. Criteria for Aquatic Life Protection

POLLUTANT	CAS #	
METALS (µg/L) - Hardness Dependent		
Cadmium	7440439	Acute = $e^{(1.0166 \cdot \ln(\text{Hardness}) - 3.062490)} * (1.136672 - (\ln(\text{Hardness}) * 0.041838))$
		Chronic = $e^{(0.7977 * \ln(\text{Hardness}) - 3.909)} * (1.101672 - (\ln(\text{Hardness}) * 0.041838))$

- Chronic criteria adopted in 2018
- Existing acute criteria adopted in 2005

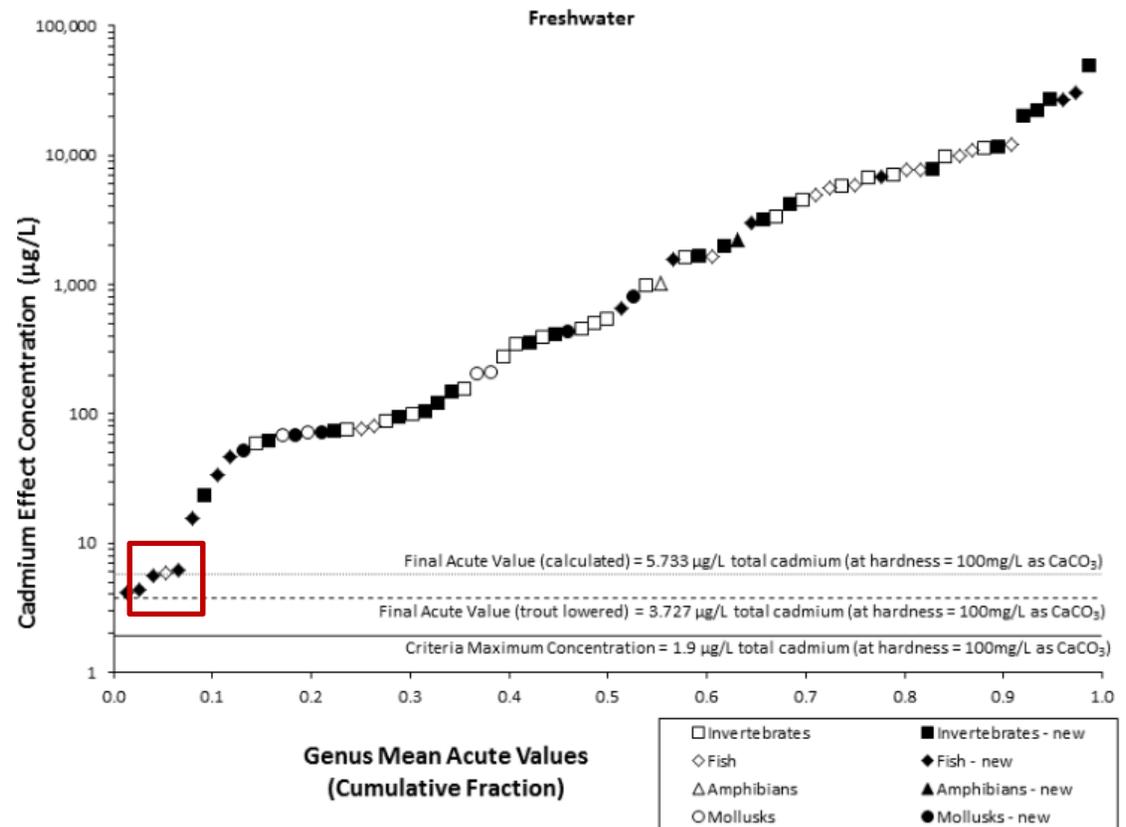
Criteria development

1. Compile acute toxicity test data for a set of species representative of an aquatic community
 - Test metric = LC_{50}



2. Use toxicity dataset to create distribution of species sensitivity
3. Derive Final Acute Value (FAV) protective of 95% of all species
 - Use values of four genera closest to the 5th percentile of the distribution

Distribution of ranked Cadmium GMAVs



Acute values

EPA 2016 National Criteria
AIM proposed CLD (includes salmonids)

Rank	Genus (common name)	GMAV* (µg/L total Cd)
2	<i>Cottus</i> (sculpins)	4.411
3	<i>Salmo</i> (brown trout)	5.642
4	<i>Morone</i> (striped bass)	5.931
5	<i>Oncorhynchus</i> (trout and salmon)	6.141

AIM proposed CLH - WWH
(excludes salmonids)

Rank	Genus (common name)	GMAV* (µg/L total Cd)
2	<i>Morone</i> (striped bass)	5.931
3	<i>Hyalella</i> (amphipod)	23
4	<i>Acipenser</i> (white sturgeon)	33.78
5	<i>Ptychocheilus</i> (pikeminnows)	46.79

N = 75 genera
FAV (µg/L total Cd) = 5.733
Adjusted FAV = 3.727
CMC = 1.9

FAV is lowered to protect commercially and recreationally important species (1985 EPA guidelines)

N = 70 genera
FAV (µg/L total Cd) = 23.79
CMC = 11.9

Adjusted FAV = 5.931
CMC = 2.966

Genus Mean Acute Value (GMAV)

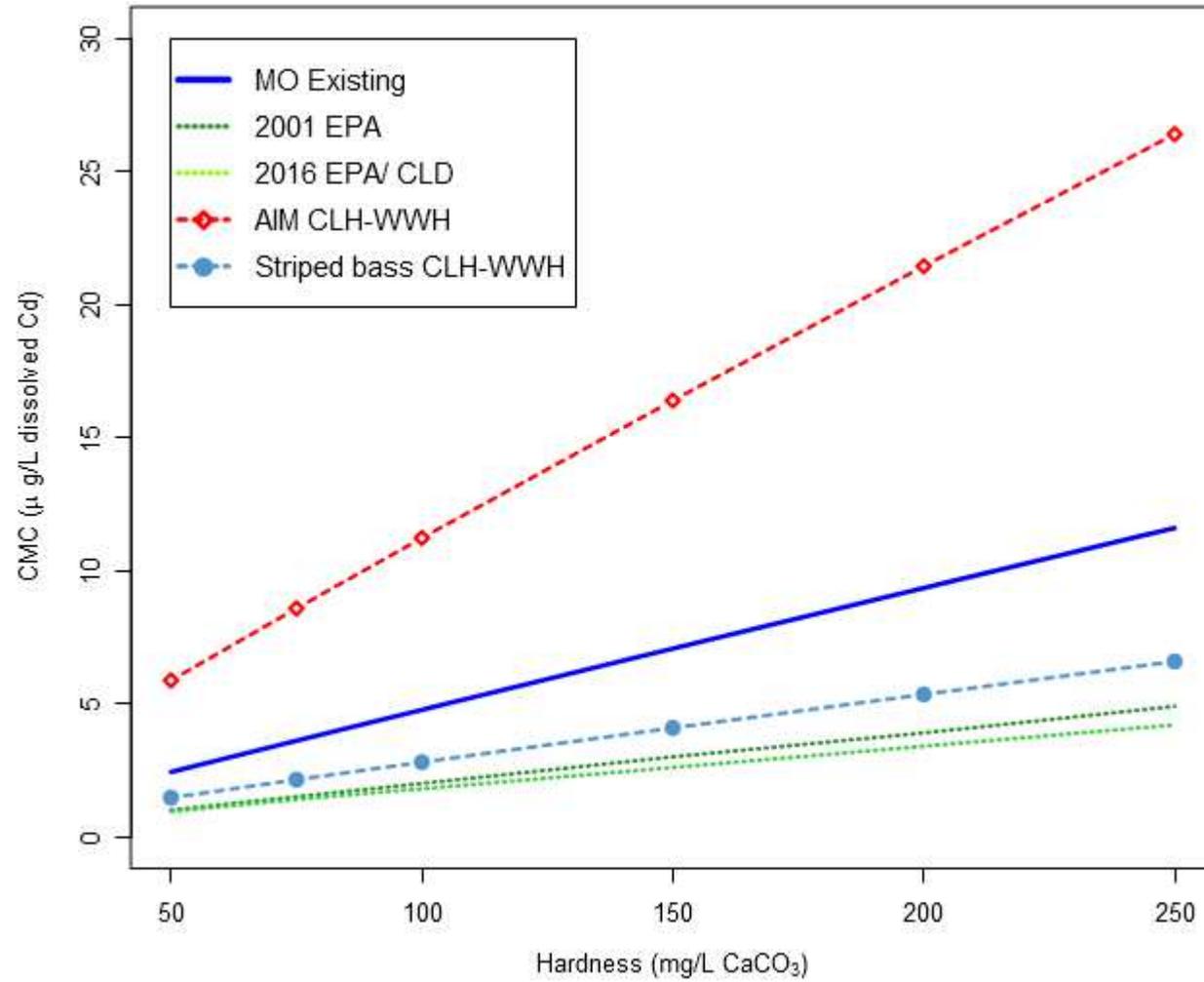
Final Acute Value (FAV)

Criterion Maximum Concentration (CMC)

* adjusted to a total hardness of 100 mg/L as CaCO₃



CMC Comparisons



Questions and Discussion

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