



## **Fact Sheet: Proposed Revisions to Ambient Water Quality Criteria for Cadmium**

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### **Proposed Petition P2019-03: Updated Criteria for Cadmium in Surface Waters**

The Clean Water Act requires the U.S. Environmental Protection Agency (EPA) to periodically update all ambient water quality criteria, including numeric criteria for toxic metals such as cadmium. Nevada's current aquatic-life criteria for cadmium are based on EPA's 2001 criteria. In 2016, EPA released updated numbers for ambient water quality criteria for cadmium to protect aquatic life, and the Nevada Division of Environmental Protection (NDEP) proposes to adopt EPA's updated criteria for cadmium. This update modifies the exponent values in the equations used to calculate criteria values.

### **What is the Process for Adopting Water Quality Standards in Nevada?**

- EPA publishes final criteria for a parameter
- BWQP provides public workshops to obtain public input on the proposed petition and draft regulation
- NDEP's Bureau of Water Quality Planning (BWQP) prepares a petition with new or revised criteria and submits it to the Legislative Council Bureau (LCB) for review
- State Environmental Commission (SEC) reviews and approves the draft regulation
- EPA reviews the draft regulation (used in implementing the Clean Water Act), if approved
- Draft goes to the LCB to become final and is codified into the regulations

### **Water Quality Standards Consist of Three Components:**

1. Designated **beneficial uses** for each waterbody
2. **Criteria** to protect beneficial uses
3. **Anti-degradation provision** - Requirements to maintain higher quality (RMHQs)

### **Nevada's Water Quality Standards are Provided in NAC 445A.11704 - 445A.2234**

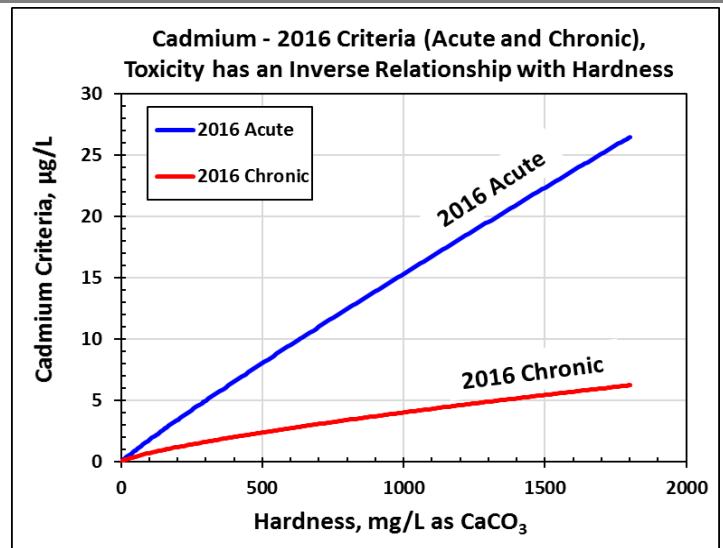
Nevada's water quality standards, define the water quality goals for a waterbody, or a portion of a waterbody, by designating beneficial uses of the water and setting criteria necessary to protect the beneficial uses. Beneficial uses include, but are not limited to, aquatic life, irrigation, recreation, and drinking water supply. Water quality criteria for cadmium represent concentrations that may not be exceeded more than once every three years (on average), in order to protect aquatic life from the toxic effects of cadmium under acute and chronic exposures. Cadmium standards are found in Nevada Administrative Code (NAC) 445A.1236.

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### **Summary**

The NDEP is proposing to amend NAC 445A.11704 – 445A.2234, Standards for Water Quality, to align with the most-current numeric criteria recommended and published by the EPA for cadmium to protect aquatic life from acute and chronic exposures to dissolved cadmium. The 2016 update published by EPA made minor changes to the formula used to calculate cadmium criteria concentrations over a range of concentrations of total hardness. As with all previous updates of criteria values for cadmium, hardness is used in the 2016 criteria to estimate the effects of all ions on the toxicity of cadmium. EPA guidelines state that when sufficient data are available to demonstrate that toxicity is related to a water-quality characteristic, such as hardness, that relationship should be taken into account when determining the criteria concentration.

The relationship between the independent variable (hardness) and the dependent variable (toxicity, as quantified by cadmium criteria concentrations) can be described as an inverse relationship. This means that as hardness increases, the bioavailability—hence toxicity—of dissolved cadmium decreases. Using the equation from EPA (2016), cadmium criteria concentrations are higher in waters with higher values of hardness. Higher concentrations of hardness (defined as calcium plus magnesium) protect aquatic life by mitigating the toxic effects of cadmium dissolved in the water column.

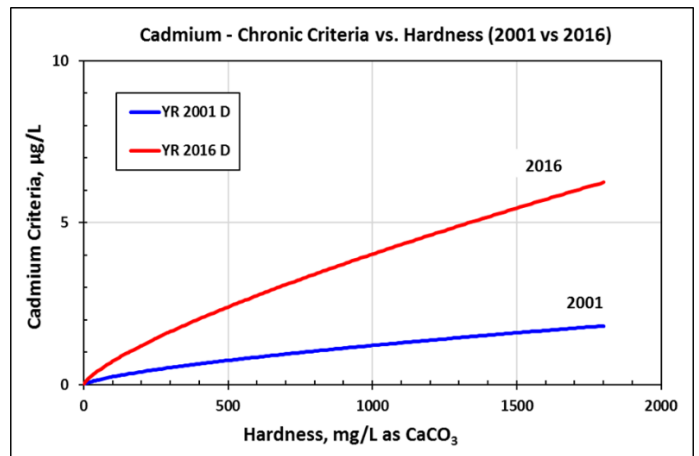
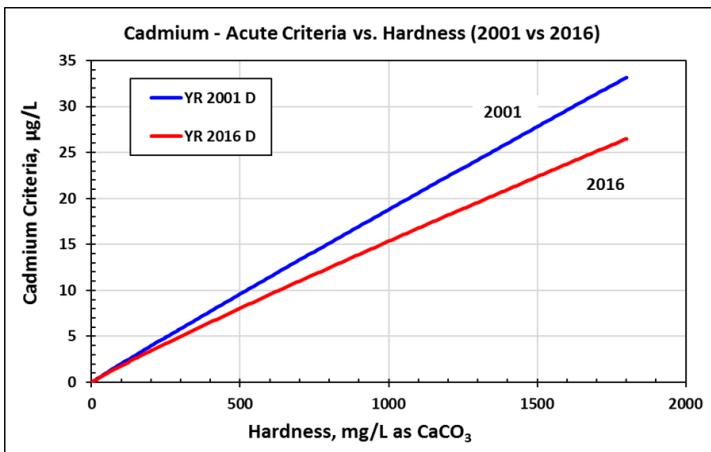


The updated equations for calculating criteria values for acute and chronic exposures are shown below.

$$\text{Acute} = 1.136672 - ((\ln \text{ hardness}) * (0.041838)) * e^{(0.9789 * (\ln \text{ hardness}) - 3.866)}$$

$$\text{Chronic} = 1.101672 - ((\ln \text{ hardness}) * (0.041838)) * e^{(0.7977 * (\ln \text{ hardness}) - 3.909)}$$

The following graphs show the difference in criteria values using the 2001 equations versus the 2016 equations, which are proposed for adoption as Nevada’s standard to protect aquatic life from cadmium in water. The updated criteria are slightly more stringent for acute exposures, but are less stringent for chronic exposures.



## References

- EPA. 2001. 2001 Update of Ambient Water Quality Criteria for Cadmium. April. EPA-822-R-01-001. 166 pp.  
 EPA. 2016. Aquatic Life Ambient Water Quality Criteria Cadmium – 2016. March. EPA-820-R-16-002.  
 EPA. 2018. Webpage for cadmium documents: <https://www.epa.gov/wqc/aquatic-life-criteria-cadmium>

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