

AUGUST 12, 2020

TO: Idaho Department of Environmental Quality
FROM: Brad Barnhart, Ph.D., Senior Research Scientist
SUBJECT: Human health water quality criteria rulemaking for arsenic

Idaho's Department of Environmental Quality (IDEQ) is currently undergoing rulemaking for arsenic human health water quality criteria to protect recreation and domestic water supply designated uses. NCASI appreciates the opportunity to comment on this important rulemaking, and we respectfully submit these comments, focused particularly on the derivation of bioaccumulation factors for inorganic arsenic, for consideration by the Department.

NCASI is an independent, non-profit research institute that focuses on environmental topics of interest to the forest products industry. Members of NCASI represent more than 80% of the pulp and paper production in the United States. In its capacity as a research organization, NCASI has a long history of working to contribute to the science needed to address numerous environmental topics related to the forest products industry including effluent regulation, water quality management, and relationships between human and natural stressors on aquatic ecosystems. NCASI also has a long history of collaboration with state agencies and EPA on the use of sound science needed for the development and implementation of responsible environmental management practices.

Arsenic Bioaccumulation Factors are Inappropriate for Idaho Waters

EPA has previously noted that insufficient data are available to support derivation of BAFs for inorganic arsenic (USEPA 2003). In Idaho, IDEQ conducted sampling of paired water and fish tissue concentrations in 2019 to support development of appropriate bioaccumulation factors (BAFs). This was a comprehensive sampling program that included a probabilistic spatial design and 45 (non-duplicate water and fish composite) paired samples. We commend the Department for undertaking this extensive and well-designed study to learn more about field-derived relationships between water column and fish tissue concentrations of arsenic. Ultimately, and unfortunately, no clear relationships were found between concentrations of inorganic arsenic in water and those found in fish tissues (Figure 1).

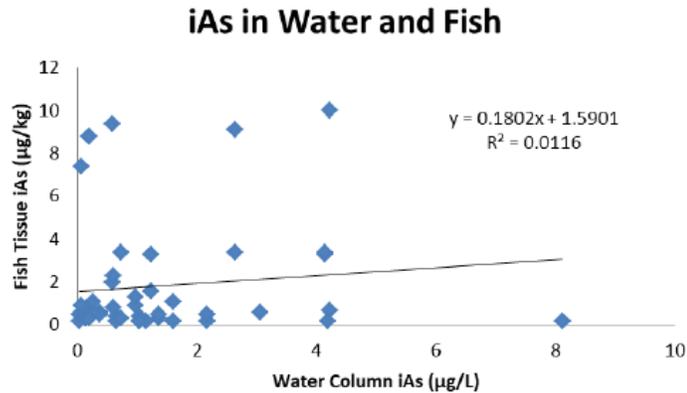


Figure 1. Paired fish tissue samples presented at IDEQ's recent rulemaking presentation (IDEQ, 2020).

Several exploratory data curation methods were also implemented by IDEQ to construct other linear regression models – for example, by removing outliers, removing values less than the minimum reporting limit, and isolating measurements by species or trophic level – but model fits were consistently low ($R^2 < 0.1$) and sometimes exhibited inverse relationships, suggesting that water column arsenic concentrations are poor indicators of fish tissue concentrations.

Despite the extensive monitoring and resulting poor fits, it would appear that these data are being used, inappropriately in our opinion, to justify a bioaccumulation factor (1.18 L/kg) using the geometric mean of ratios between water concentration and fish tissue concentrations of inorganic arsenic.

We believe these data are being misinterpreted. Rather than forcing the use of a linear relationship that is not supported by the data, it is more appropriate to allow the data to inform our understanding that there is no relationship between surface water concentrations and fish tissue concentrations for inorganic arsenic in Idaho waters. Without this relationship, use of a BAF (or bioconcentration factor) in the derivation of a water quality concentration criterion based on fish tissue consumption is not scientifically justified.

Instead, a fish tissue criterion or a narrative water quality criterion could be used to ensure safe exposure levels of inorganic arsenic through the consumption of fish in Idaho waters. With Idaho's fish consumption rate of 66.5 g/day and excess lifetime cancer risk of 10^{-5} as well as EPA's assumptions for body weight (80 kg) and toxicity [CSF: $1.5 \text{ (mg/kg-day)}^{-1}$], the fish tissue concentration would be 8 µg/kg. Such tissue-based criteria for other substances (e.g., methylmercury, selenium) have been recommended as national defaults by EPA under circumstances where water column concentration and tissue relationships are unclear or site specific.

References

IDEQ. 2020. Revision of Idaho's human health criteria for arsenic. Docket No. 58-0102-1801. Presented July 15, 2020. <https://www.deq.idaho.gov/media/60184554/58-0102-1801-ppt-revision-arsenic-human-health-criteria-0720.pdf>.

USEPA. 2003. Technical summary of information available on the bioaccumulation of arsenic in aquatic organisms. [EPA-822-R-03-032](#). Washington, DC: United States Environmental Protection Agency, Office of Science and Technology, Office of Water.