



Controversies in the Use of Citizen Science

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Citizen Science is Booming

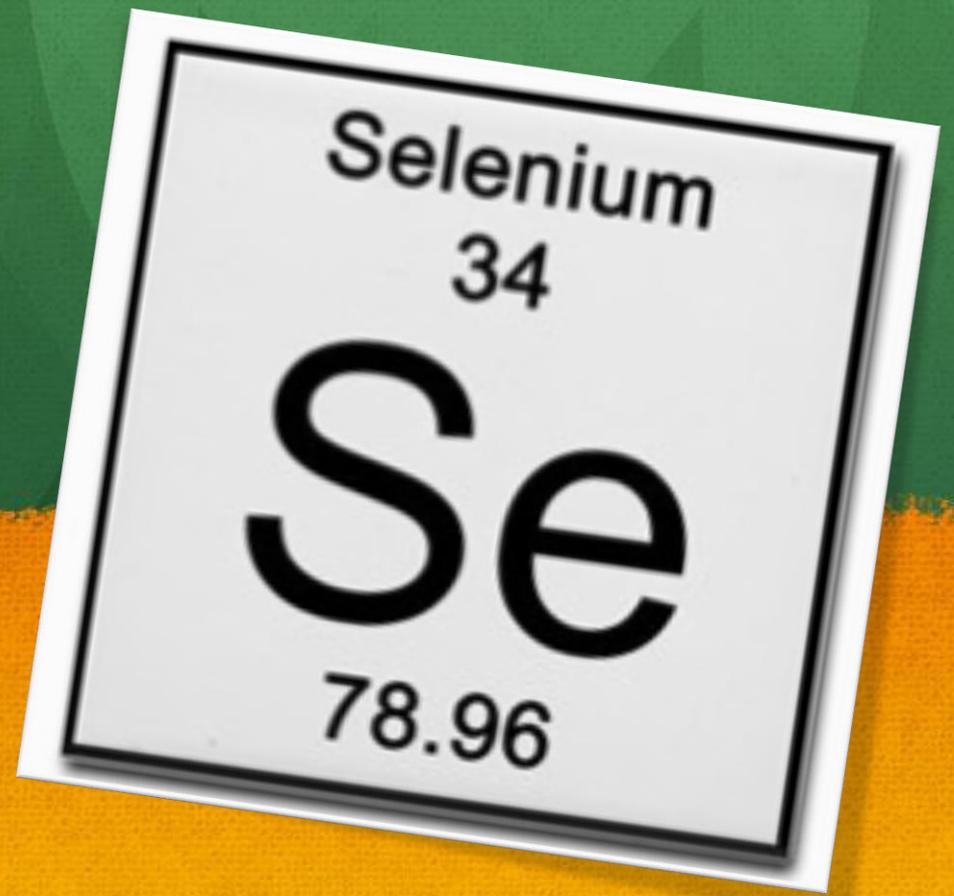
- Every day, people in the U.S. are:
 - Testing water quality in local streams
 - Tracking and monitoring air quality
 - Adding bird data to Cornell's ornithology database
 - Logging rain, snow, and other weather information
- Examples
 - The Cornell Lab of Ornithology – 200,000 active volunteer birders
 - The Natural Resource Ecology Laboratory at Colorado State University and the Cornell Lab's joint CitSci.org program
 - Running logs of citizen science projects people can join at Scientific America Magazine and Scistarter
- Newly formed Citizen Science Association held its inaugural conference in February 2015 with over 600 people from 25 countries and a wide spectrum of disciplines.



Picture from Cornell Lab of Ornithology

But what should that citizen-collected data be used for?

- Should agencies consider ease of citizen monitoring when designing standards or methodologies?
- Should state agencies use citizen-collected data? For what? Should courts rely on it?
- Today we examine:
 1. The controversy over EPA's proposed selenium water quality criteria and its relation to citizen monitoring and enforcement.
 2. Strategies citizen groups use to increase the use of their data by states and the courts.



1. Selenium

Selenium Basics

- Naturally occurring mineral.
- Bioaccumulates in aquatic life.
- Above certain levels it can damage fish reproductive cycles and gills or other organs.
- The EPA has designated selenium a toxic pollutant.
- EPA's current recommended selenium water quality criteria, adopted in 1987, sets water column concentration values of 5 micrograms per liter (ug/L) for chronic exposures and 20 ug/L for acute exposures.



Two-headed fish that the organization Appalachian Voices states was caused by excessive selenium

Selenium is a
flashpoint in
the debate
about
Appalachian
mountain-top
removal
mining and
valley fills

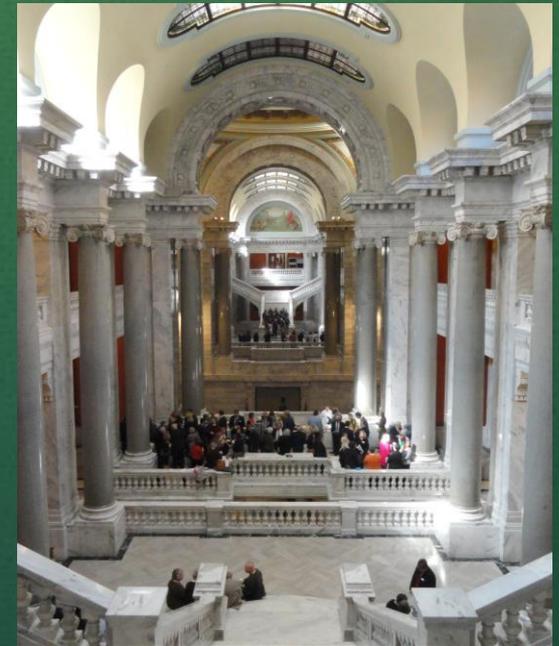


Appalachian citizen litigation and action around selenium

- Citizens conducting own testing and finding violating permit limits or downstream water quality standards
- Citizen enforcement actions against selenium discharges based on DMRs and citizen data
- Citizen advocacy to pressure Appalachian states to include selenium limits in permits and conduct more regular inspections
- Citizen pressure on states and EPA to litigate selenium violations
- Recent consent decrees between mining companies and federal and state governments on selenium

Kentucky's New Selenium Water Quality Standard

- May 31, 2013.
- Kentucky to use a new fish tissue-based water quality criteria, with the former regulatory limit of 5 $\mu\text{g}/\text{l}$ now serving as a “trigger” for when fish tissue would need to be collected in order to determine whether the concentration of selenium in the sampled tissue exceeded the new regulatory standard.
- Approved by EPA in November 2013
- Challenge to EPA's approval: *Kentucky Waterways Alliance v. McCarthy*, No. 3:13-cv-01207 (W.D. Ky) (filed Dec.13, 2013). Currently in settlement talks.



EPA's 2014 Selenium Proposal

- Role of EPA in Water Quality Standards
- On May 14, 2014, EPA released its External Peer Review Draft Aquatic Life Ambient Water Quality Criterion for Selenium.
- Proposed a new recommended selenium criterion :
 - Uses tissue-based elements and increase the water testing period from 4 to 30 days.
 - 15.2 milligram per kilogram (mg/kg) concentration limit for fish eggs or ovaries
 - 8.1 mg/kg “whole body” of a fish and 11.8 mg/kg for the muscle tissue.
 - Eggs/ovaries limit overrides others
 - Those values would override the draft water column values of 1.3 ug/L over a 30-day average for standing waters and a 4.8 ug/L limit for flowing waters.
 - Similar to Kentucky

Potential Impact on Citizen Monitoring Efforts and Enforcement Raised by Appalachian Groups

- Alliance for Appalachia calls the proposed criteria “effectively unenforceable.”
- Expense of fish tissue tests
- What if there are no fish in area?
- Complications of pinpointing fish-tissue exceedances to any one discharge point



Picture from <http://www.onegeology.org/>

Impacts to Citizen Enforcement Litigation in Appalachia

“Not only are they outdated, we are gravely concerned that the existing [selenium] criteria are unnecessarily stringent to protect aquatic life. As long as these obsolete criteria remain on the books, we are concerned that dischargers will be placed in peril of unreasonable compliance obligations, misguided enforcement actions and unfounded lawsuits. We have already seen these perils come to pass in Virginia through a wave of recent lawsuits, threatened lawsuits and end-of-pipe permit limits that are based on the old, outdated water column criteria.”

Comments of Virginia Coal and Energy Alliance.

Why move to a tissue-based standard?

“EPA's draft criteria document highlights the **natural variability in selenium accumulation in aquatic systems** as well as the natural variability in bioaccumulation of **selenium in fish, independent of the water column concentrations**. The draft criteria document also articulates that selenium toxicity to aquatic life is primarily driven by organisms consuming selenium-contaminated food rather than being directly exposed to selenium dissolved in water. Furthermore, since the water column values were derived from fish tissue concentrations by modeling selenium transfer through the food web, **the water column elements are the least accurate of the criteria elements**. Selenium impacts to fish may be governed by the intricate cycling of contaminants through the ecological system, including the food web, water, sediment, benthic organisms, fish and other aquatic life and wildlife.” *Comments of Wyoming Department of Environmental Quality.*

Can or Should EPA Consider Whether its Recommended Criteria Can be Enforced by Citizens?

- 33 U.S.C. § 1314(a) – EPA’s recommended criteria should “accurately reflect[] the latest scientific knowledge[:]”
 - A. on the kind and extent of all identifiable effects on health and welfare including, but not limited to, plankton, fish, shellfish, wildlife, plant life, shorelines, beaches, esthetics, and recreation which may be expected from the presence of pollutants in any body of water, including ground water;
 - B. on the concentration and dispersal of pollutants, or their byproducts, through biological, physical, and chemical processes; and
 - C. on the effects of pollutants on biological community diversity, productivity, and stability, including information on the factors affecting rates of eutrophication and rates of organic and inorganic sedimentation for varying types of receiving waters.
- 40 C.F.R. § 131.3(c) -- “Section 304(a) criteria are developed by EPA under authority of section 304(a) of the Act based on the latest scientific information on the relationship that the effect of a constituent concentration has on particular aquatic species and/or human health.”
- Relationship to state water quality standards



2. Strategies Used to Increase the Use of Citizen Data

Water-quality data

- Tremendous variety in use of citizen (and academic) collected water quality data by state for:
 - Development of TMDLs
 - Enforcement actions
 - Water body designations
- More widely used applications:
 - Data collection through EPA's Section 319 non-point program
 - Triggering state inspection requests

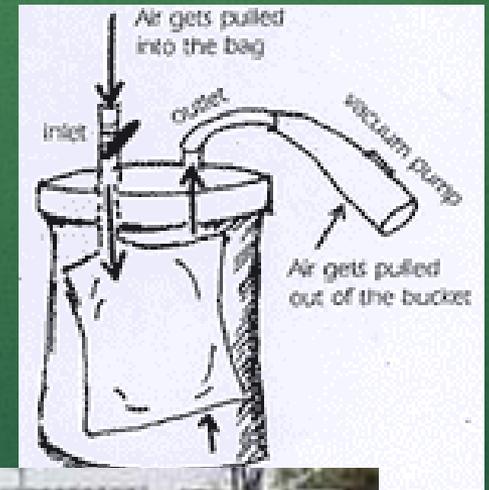
Strategies Groups Employ to Increase the Use of Their Data

- EPA's QA Process
- Going first to the courts
- Establishing agreements with states regarding protocols, QA, and methodologies
- Establishing trust based on personal credentials



Air Quality Monitoring and Sampling

- Kinds of air quality data
 - Narrative as well as quantitative
- EPA QA Standards
- Working with state devices
- Getting agencies to agree to and/or to review groups' testing protocols prior to the submission of data – “Good Neighbor Agreements.”
- Post-litigation settlements



Images from PBS Frontline



Thank you!

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