Environmental Regulatory Science Really Exists (Newsletter)*

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Mention regulatory science and the response is always interesting. Many think the term is an oxymoron or a myth, similar to giant shrimp or Sasquatch. Yet robust science applicable to environmental regulations and their enforcement does exist even if not explicit in laws, statutes, or regulations.

Most regulatory enforcement actions and almost all challenges by NGOs opposing an operation are based on environmental data, not the language in laws, statutes, or regulations. This is particularly true with environmental chemistry, fish, and wildlife. Avoiding and effectively resolving these environmental concerns is done by providing legislators, regulators, and finders of fact in lawsuits with technically sound and legally defensible analyses of all available relevant data with interpretations based on established ecological theory.

Exceeding a maximum concentration level (MCL) for a single chemical constituent is often the reason for concern by regulators or NGOs. In aquatic ecosystems chemical constituents are much more common in multi-element molecules rather than individual ions. And factors such as pH and temperature influence chemical states; for example, low pH dissolves calcium carbonate from shells of mollusks such as snails. The concentration of an ion, or molecule such as calcium chloride, at a location and time of sampling provides no insight into the state of the ecosystem.

Toxic metals such as arsenic, cadmium, and mercury might, on occasion, have concentrations greater than the statutory MCLs. This is natural because of inherent variability in the amount of metallic ions found in water at any location or time of sampling, and not necessarily the result of the permitted operation. There are two factors that are not always considered when these metals are the subject of concern: their chemical form and their prevalence in water samples.

Arsenic ions in water, sediments, and soils exist in two forms (As3+ and As5+) with different toxicities. Mercury can be measured as metallic (inorganic) or methylated (organic) with different toxicities and greatly different concentration levels (micrograms per liter and nanograms per liter, respectively). Toxic metals tend to be present in very low concentrations, when they

can be detected at all, with infrequent high concentrations (a very skewed distribuion). Permit compliance monitoring records document that it is common that in as many as 80% of samples the presence of the metal cannot be detected. There is a lot of chemistry and toxicology (ecological and human) involved in properly assessing water quality for defined beneficial uses. Simply comparing a measured concentration with an arbitrary MCL has no value in protecting aquatic ecosystems, fish, wildlife, or humans.

Sometimes the concern raised by regulators or NGOs involves fish or wildlife. Western goshawks, greater sage grouse, marbled murrelets, and spotted frogs have been thought by regulators or NGOs to be adversely affected by a proposed or operating project. While surveys to count animals present at various locations follow well-established protocols, the animals do not always cooperate by showing up when the field crew is present. Not observing a species at a location and time is not evidence it is not present, only that it was not observed. Anyone who fishes or hunts understands this. Correctly incorporating the likelihood of the species being present but unobserved on any given time and place in not always part of the data analysis yet can affect the regulatory decision.

Population and community ecological theory, as well as existing knowledge of the species' behaviors are scientific knowledge that should be applied to the regulatory process to make decisions more technically sound and legally defensible.

While robust regulatory science may not be common, its appropriate use benefits operators, attorneys, and regulators by increasing understanding of ecosystem dynamics and promoting decisions that protect natural, economic, and societal interests.

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