

Evaluating Ecological Damages Associated with Coal Ash

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Abstract

There has been an increase in ecological damage claims related to coal ash. These claims are often brought pursuant to the citizen suit provisions of several environmental statutes, including the Resource Conservation and Recovery Act (RCRA) and the Clean Water Act (CWA). The increased public availability of coal ash facility data, generated through compliance with United States Environmental Protection Agency's (US EPA's) 2015 Coal Ash Rule, is expected to continue to prompt these types of lawsuits. The objective of this paper is to provide an introduction to and deepen understanding of the science behind ecological damage evaluations. A number of key technical issues need to be adequately considered when evaluating ecological damage claims, including the interpretation of chemical detections, the use of ecological screening levels, the establishment of causation, the environmental benefit of a sought remedy, and data quality. Each of these issues is discussed in the context of possible coal ash litigation.

Coal Ash Citizen Suits

Citizen suits can be brought by private citizens or groups, such as environmental activist groups, to enforce an environmental statute. Most major federal environmental laws, including RCRA, CWA, the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and the Endangered Species Act (ESA), contain citizen-suit provisions. These provisions authorize private suits against private parties that violate federal law, as well as against the US EPA Administrator (Adler, 2001). Most environmental citizen-suit provisions only provide for injunctive relief and legal costs, including attorneys' fees, for successful plaintiffs. Given their intent, an increase in citizen suits might be expected during times of less aggressive government enforcement. Others have argued that in times of budgetary constraints, citizen suits have created incentives for activist groups to pursue self-interest through settlements, remediation projects, and attorneys' fees without necessarily benefiting the environment (Adler, 2001 and references therein).

The perceived inadequacy of government action on coal ash by environmental activist groups and the aforementioned incentives to such groups are likely contributors to the numerous coal ash citizen suits that have been filed in the last few years. In addition,

US EPA's 2015 Coal Ash Rule specifically encourages the use of citizen suits as there is no authority for US EPA to enforce the minimum national standards promulgated in its rule. The public availability of data related to compliance of coal ash facilities with the US EPA's Coal Ash Rule (e.g., groundwater monitoring data) provides an "easy" source of information that can form the basis of ecological damage claims. For example, RCRA citizen suits are being used to seek remediation of and compensation for alleged environmental impacts caused by stored or transported coal ash. Similarly, CWA citizen suits are being used to seek remediation of and compensation for environmental impacts allegedly caused by coal ash facility discharge violations (e.g., effluent discharges, discharges into groundwater).

Technical Issues Related to Coal Ash Ecological Damage Evaluation

There is substantial overlap in the scientific approach to ecological risk assessment or natural resource damage assessment (e.g., at a contaminated site or following a large spill) and the evaluation of ecological damage claims associated with the storage, handling, or accidental spilling of coal ash. The scientific approach to these types of evaluations is described in federal and state guidance documents and the scientific literature. However, a number of key technical issues related to ecological damage evaluation are often misunderstood and, sometimes, misrepresented. These include, but are not limited to, the interpretation of chemical detections, the use of ecological screening levels, the determination of causation, the environmental benefit of a sought remedy, and data quality.

Chemical Detection Does Not Equal Ecological Injury

A basic principle of risk assessment is that risk requires both exposure (e.g., incidental ingestion of a chemical in soil by a bird while foraging at a coal ash facility) and hazard (e.g., chemical detected in surface soil at a coal ash facility). It is this combination of exposure and hazard that determines the magnitude of risk. Without exposure, there can be no risk.

As a hypothetical example, to evaluate an alleged ecological injury related to arsenic detected in surface soils at a coal ash facility would require the following types of information:

- What types of ecological receptors are expected to be present at the site?
- How often are these ecological receptors expected to be present/exposed?
- Which of these ecological receptors are expected to be exposed to surface soils at the site?
- Through what pathways are these ecological receptors expected to be exposed to surface soil?
- Are these ecological receptors potentially exposed to arsenic from non-facility-related sources? This could include naturally occurring levels of arsenic in facility

soils and/or exposure to arsenic from off-property sources for ecological receptors with a foraging range that is larger than the facility.

- What is the inherent toxicity of arsenic to these ecological receptors? This includes developing chemical dose-response information, identifying relevant ecological effects to be used in the evaluation, identifying and accounting for the chemical form of arsenic present at the site, *etc.*

The above information is obtained from the scientific literature, risk assessment guidance, and site-data collection. Site data may include information obtained from habitat assessments, natural resource surveys, chemical measurements, *etc.* These types of information each carry underlying uncertainty. As described further in the section on data quality below, it is critical to describe and, where possible, quantify these uncertainties since they ultimately inform the level of confidence in the ecological damage evaluation. It should be clear from this example that mere detection of arsenic in soil at a coal ash facility does not automatically equate to ecological injury unless there is demonstrated and adequate ecological exposure based on reliable data.

Exceeding a Screening Level Does Not Equal Ecological Injury

There are no regulatory standards or toxicity criteria that have been developed for ecological receptors, with the exception of promulgated federal and state aquatic life criteria (*e.g.*, US EPA's national recommended aquatic life criteria). This is in contrast with human health risk assessment, where states, US EPA, and other regulatory authorities have defined safe levels of chemical exposure (*e.g.*, a chemical reference dose or oral cancer slope factor reported in US EPA's Integrated Risk Information System [IRIS]).

Several federal and state agencies have developed or compiled ecological screening levels. For example, the National Oceanic and Atmospheric Administration (NOAA) developed Screening Quick Reference Tables, called SQuiRTs, to help evaluate potential ecological risks from contaminated water, sediment, or soil (Buchman, 2008). These tables include ecological screening levels for inorganic and organic contaminants in various environmental media and have been adopted by several states in their ecological risk assessment guidance. However, exceedances of ecological screening levels should not be confused with evidence of ecological injury. In the case of SQuiRTs, NOAA is explicit in stating that their screening levels are intended for preliminary screening purposes only, that they do not constitute criteria or cleanup levels, and that NOAA does not endorse their use for any purpose other than preliminary screening. Similarly, toxicity reference values (TRVs) have been compiled for many chemicals and ecological receptor groups. For example, US EPA's Superfund program derived TRVs for terrestrial wildlife to support the development of ecological soil screening levels for several inorganic and organic contaminants (US EPA, 2016).

Ecological screening levels (*e.g.*, sediment or soil screening levels, wildlife TRV) are intended for screening purposes and can be used to derive an initial risk estimate, often expressed as a hazard quotient (HQ). Using the previous hypothetical example of bird

exposures to arsenic detected in soil at a coal ash facility, a modeled (or measured) arsenic dose in a surrogate bird species (a surrogate species is selected to be representative of the types of birds that are expected to be present at the site) would be compared to the applicable arsenic avian TRV to derive an HQ. An HQ below 1 would indicate that there are no unacceptable risks to birds from arsenic in soils at the site with a high level of certainty. In the context of a RCRA imminent and substantial endangerment suit, an HQ below 1 would provide compelling evidence that arsenic in site soils is not expected to pose an imminent and substantial endangerment to birds. This high level of certainty stems from the fact that screening-level risk estimates intentionally rely on conservative exposure (e.g., screening risk estimates would typically use a highly-exposed surrogate species, assume 100% exposure at the site and 100% chemical bioavailability, etc.) and toxicity assumptions so as to not underestimate risk. An HQ exceeding 1 would indicate that unacceptable risks cannot be excluded at the screening-level stage and that further evaluation is indicated. Further evaluation could include refinement of the TRV, refinement of the exposure assessment (e.g., further data collection), site-specific studies (e.g., bioavailability assessments, toxicity studies), etc. If the refined exposure estimates substantially and significantly exceed the refined ecological toxicity values, then the risk assessor would conclude that unacceptable risks are more likely than not and that risk mitigation may be warranted to reduce exposures to below acceptable levels. In the case of our hypothetical ecological injury claim related to arsenic in soil, this would mean that arsenic cannot be excluded as a potential chemical of ecological concern. However, further evaluation would be required to establish a causal link between the estimated or measured arsenic ecological exposures and the alleged or observed ecological injury as described further below.

Ecological Injury Observed Does Not Equal Causation

The issue of ecological injury and causation is relevant both from a legal and technical perspective. From a legal perspective, in order for an individual or group to bring a CWA citizen suit, that individual or group must have "standing to sue". Standing includes the requirement to have suffered an "injury in fact." In this case, it is not ecological injury that is required but injury to a person or group, *i.e.*, an individual's/group's aesthetic or recreational interest in an allegedly injured ecological resource would be adequate to have standing. Further, there must be a causal connection between the injury and the conduct under complaint. Note that courts have not necessarily required a demonstration of specific causation. Rather, showing that a party discharged pollutants at concentrations exceeding levels stated in a permit into a river in which the plaintiffs have an interest may be sufficient if that pollutant is able to cause or contribute to the types of injuries alleged by the plaintiffs (Stack *et al.*, 2009).

From a technical perspective, several approaches to evaluating causation as it relates to ecological injury have been developed. For example, US EPA developed the Causal Analysis/Diagnosis Decision Information System or CADDIS for conducting causal assessments in aquatic systems (US EPA, 2019). It provides a logical, step-by-step framework for stressor identification based on the US EPA's Stressor Identification

Guidance Document (US EPA, 2000). The framework compiles and compares candidate causes based on weighing all available evidence for each candidate cause. In many cases, one candidate cause will clearly be more consistent with the evidence. If not, potential sources of uncertainty are identified, such as lack of data, poor data quality, poorly defined impairments, and multiple causes. The strength of this approach is that it provides a stepwise, standardized approach to evaluate candidate causes in light of an alleged ecological injury based on the totality of the evidence and the strength of the evidence. More importantly, it provides transparency and can help reduce inferential errors. In practice, however, ecosystems are complex and it is often impossible to establish specific causation. As stated in US EPA's CADDIS approach to causal inference, "we can never provide a cause, and can seldom disprove, a cause" (US EPA, 2019). Still, a structured causal analysis can provide a convincing approach for evaluating the likelihood that an alleged cause (e.g., a discharge of a chemical at concentrations above permit levels into a river) resulted in an alleged or observed injury (e.g., changes in species diversity or absence of specific species of interest in the receiving river). Identifying alternative causes to an alleged or observed ecological injury that are wholly unrelated to a defendant's action can also be important, especially in the context of a sought remedy as described in the next section.

Remedial Action Does Not Equal Environmental Benefit

Regulatory agencies have recognized that, in some instances, a proposed remedy at a contaminated site may cause more ecological damage than leaving a contaminant in place, particularly where rare or sensitive habitats exist and where the proposed remedy would cause widespread physical destruction or habitat alteration (NJ DEP, 2018). While excavating contaminated soils and replacing it with clean fill is generally not technically impossible, re-establishing habitat can be very difficult. For example, the success of re-establishing mature forested wetlands in New Jersey has been very limited. According to a 2002 report, "on average, 92% of proposed emergent wetland acreage was achieved, while 1% percent of proposed forested wetland acreage was achieved (NJ DEP, 2002)."

The fact that a remedial action does not necessarily equate in an environmental benefit raises two questions in the context of ecological damage claims. First, will remediating the alleged cause result in an improvement such that the alleged ecological injury no longer exists? Second, does the sought remedy have the potential to cause more ecological injury than doing nothing (or something different)? These issues are pointedly illustrated by example of a number of citizen suits that have been filed under the provisions of the CWA and the Surface Mining Control and Reclamation Act in West Virginia (WV). In these suits, plaintiff environmental groups alleged that mine operations in WV violated permits by discharging water with elevated levels of conductivity into nearby streams resulting in a violation of a WV's narrative water quality standard (WVDEP, 2016). In one such case (Civil Action No. 2:13-5006), the Court agreed that the mining company had committed at least one violation of its permits by discharging high levels of ionic pollution, as measured by conductivity, into a nearby stream and that this caused or materially contributed to a significant adverse impact to

the chemical and biological components of the receiving stream, in violation of the narrative water quality standards that are incorporated into those permits (US District Court, Southern District of West Virginia, 2015). In other words, the Court agreed that there was causation, and it supported the issuance of injunctive relief, requiring the Defendant to comply with water quality standards to protect the biological and chemical integrity of the receiving stream. The injunctive relief sought by the Plaintiffs in this case was to install a water treatment system utilizing reverse osmosis. The defendant successfully argued that such a remedy was unlikely to result in the desired relief and, additionally, that reverse osmosis would result in several potential environmental issues that had not been adequately considered, such as high energy requirements, sound issues, need for management of brine and ultra-pure water produced by the system, *etc.* In addition, the sought remedy was orders of magnitude more expensive to build, install, operate, and maintain than alternative strategies proposed by the Defendant involving a combination of water management strategies and habitat restoration. The Court gave credence to the Defendant's arguments and did not impose the remedy sought by the Plaintiffs, rather appointed a Special Master to determine an appropriate remedy.

My Data Does Not Equal Your Data

Data used to evaluate harm to ecological resources vary widely, and limited guidance exists on how the quality, reliability, and usability of such data should be evaluated. Evaluating ecological damages relies not just on analytical chemistry data, but also on non-chemistry data obtained from field observation, toxicity testing, and modeling (*e.g.*, fate-and-transport modeling, exposure modeling, and food web modeling). Despite their complexity and diversity, these datasets are often distilled down to a single numeric estimate of ecological harm (*e.g.*, an HQ as described in the hypothetical example above), giving the impression that ecological risk or injury assessment is a process that is robust, relevant, and easily reproduced. This impression is overly optimistic, at best.

A detailed discussion of the significant data quality challenges that are unique to the non-chemistry data that inform ecological risk or injury assessment, and that need to be carefully considered in the context of ecological damage claims are described by Verslycke and Wait (2017). The authors highlight the importance of understanding key data quality and reliability issues associated with environmental toxicity data in the context of environmental damage litigation. They provide a number of recommendations related to data quality in the context of ecological damage claims: *defenseless without defensible data* (*i.e.*, data cannot support or disprove an ecological damage claim without an adequate evaluation of its quality, reliability, and relevance to the claim); *having more data is not always better* (*i.e.*, data are only useful if generated on the basis of clearly defined data quality objectives and all aspects of data generation are documented properly); and *uncertainty should be recognized* (*i.e.*, properly recognizing uncertainty on the basis of an in-depth data quality evaluation is very powerful and should be a critical part of any ecological damage evaluation). They conclude with the adage that "assume nothing" is certainly *apropos* in ecological damage litigation.

Conclusions

With a rise in ecological damage claims related to coal ash, it is ever more important for operators to understand their potential liability and how such claims are evaluated in a technically sound manner.

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