Environmental Pollution 191 (2014) 253–255

Contents lists available at ScienceDirect

Environmental Pollution

journal homepage: www.elsevier.com/locate/envpol

Commentary

An urgent need for an EPA standard for disposal of coal ash

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ARTICLE INFO

Article history:
Received 22 April 2014
Accepted 24 April 2014
Available online 14 May 2014

Keywords:
Coal ash
Selenium
Surface impoundment disposal
Toxicity to fish
Poisoning
Deformities
Teratogenic
EPA
North Carolina

ABSTRACT

EPA, the White House, and electric utilities are stalled in a struggle over a proposed new rule on coal ash disposal. Although this rule is long overdue, EPA now stands on the cusp of bringing forward a landmark decision that could benefit aquatic resources in the USA for decades to come and also set an important regulatory leadership example for the international community to follow. However, multi-million dollar wildlife losses are continuing to pile up as things stall in Washington. In this commentary I use a newly reported example, Wildlife Damage Case 23, to further illustrate serious flaws in the National Pollutant Discharge Elimination System that EPA's new rule can address. Case 23 provides additional impetus for EPA and the White House to move swiftly and decisively to end surface impoundment disposal of coal ash and the associated toxic impacts to wildlife.

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1. Policy needs

Wildlife toxicity and the associated monetary cost of wastewater from surface-impounded coal ash are a longstanding environmental problem and regulatory issue in the USA, dating back to at least 1967. In 2012 I reported on 22 environmental damage cases as part of a policy analysis of EPA's proposed first-ever national coal ash disposal regulations (Lemly and Skorupa, 2012, Fig. 1). Based on over $2 billion in documented environmental damage cost, I called on EPA to end surface disposal of ash and, thereby, stop the 45 + year litany of fish and wildlife poisoning associated with the practice. Since 2008, EPA, the White House (US Office of Management and Budget) and the electric utility industry have exchanged information and ideas on the proposed new EPA rule, which was initially expected to be rolled out by 2010 (King and Smith, 2010). However, after over 5 years of planning, proposing, and negotiating, EPA has yet to issue a final rule which, last October, prompted a federal judge to call on EPA to at least produce a timeline. There is no reason for these continued delays other than the political and corporate industry weight being tossed back and forth in Washington. Multi-million dollar wildlife losses are continuing to pile up as things stall in the regulatory arena. Persistent regulatory shortcomings at the state level and new damage cases underscore the need for EPA and OMB to move swiftly and decisively on a policy to end surface impoundment disposal of coal ash and the associated toxic impacts to fish and wildlife.

2. Damage case 23: Lake Sutton, NC

I recently published a report on a new case of wildlife poisoning that has resulted from surface impoundment disposal of coal ash at Lake Sutton, NC (Lemly, 2014). Duke Energy Progress uses Lake Sutton as a cooling reservoir for the L.V. Sutton Steam Plant, a coal-fired (now gas-fired) electric generating facility. Located adjacent to the Cape Fear River about 8 km northwest of Wilmington NC, the 445 ha lake is used as a disposal site for wastewater from the power plant's coal ash disposal ponds and it is also managed by the North Carolina Division of Inland Fisheries as a public fishing reservoir. Fish populations and chemical contamination have been monitored in Lake Sutton since the late 1980's. Lake Sutton is polluted by the trace element selenium, which is a well-documented contaminant in coal ash wastewater. Selenium bioaccumulates and causes developmental abnormalities and reproductive failure in fish and wildlife. I conducted a biological assessment to determine toxic impacts of selenium on fish in Lake Sutton. Key findings of that investigation were:

- Bioaccumulated selenium exceeded toxic thresholds for fish by a factor of 5–10
- A large portion of fish (28.9%) had selenium-induced deformity of the spine and/or head

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http://dx.doi.org/10.1016/j.envpol.2014.04.029
0269-7491/Published by Elsevier Ltd.

Fig. 1. Teratogenic deformities in red shiners (Notropis lutrensis) caused by selenium poisoning from coal ash wastewater released from Duke Energy's Belews Creek Steam Station in 1980. Top individual has grossly abnormal jaws and mouth, which will not close. Middle individual exhibits "pugnose", a condition of exaggerated underbite lower jaw coupled with deformed rostrum and nasal region of the skull. Bottom individual is normal (Photo by A.D. Lemly). (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

Fig. 2. An abnormal bluegill (*Lepomis macrochirus*, top) from Lake Sutton, NC, collected in 2013, with deformities that result from teratogenic effects of selenium poisoning from coal ash wastewater released from Duke Energy's L.V. Sutton Steam Plant. This individual has multiple defects of the mouth (which is less than 20% of its normal size and permanently distended) and other craniofacial structures including "gaping" permanently deformed gill cover. Bottom individual is normal. This poisoning occurred 33 years after the selenium poisoning at Belews Lake (shown in Fig. 1), and resulted from the same type of surface-impoundment waste disposal operations conducted in the same state by the same electric utility, Duke Energy (Photo by L.P. Lemly).

- Teratogenic Deformity Index values indicated negative impacts on the fishery
- The value of fishery losses was calculated at over $US 8.6 million annually
- Cumulative losses exceeded $US 217 million, with damage dating back to 1987
- Only partial monetization of total losses was possible due to limited fish data

Results of the Case 23 study show that Lake Sutton is experiencing substantial environmental damage caused by wastewater from surface impoundment disposal of coal ash. The biological assessment indicates that discharges from the coal ash ponds at the L.V. Sutton Steam Plant are causing selenium poisoning (Fig. 2) and reducing survival of fish in Lake Sutton. The type of pollution and associated fishery impacts in Lake Sutton results in diminished natural resource values that have the potential for both short and long-term negative economic effects at the local, state and regional levels. Similar toxicity of coal ash discharges to fish populations and negative economic effects took place in North Carolina in the 1970's and 1980's (Lemly and Skorupa, 2012, Fig. 2). Adding the partially monetized cost of fishery losses determined for Lake Sutton during the period 1987–2013 ($US 217,466,700· Lemly, 2014) to the damage value calculated for other coal-ash impacted reservoirs in North Carolina (Belews Lake, damage = $US 531,153,873; Hyco Reservoir, damage = $US 864,742,344; Mayo Reservoir, damage = $US 80, 825,500· Lemly and Skorupa, 2012) yields a total damage value of $US 1,694,188,417. Documented fishery losses therefore exceed $US 1.69 billion in damage costs from the electric utilities currently operating in this state. From a national perspective, adding the partial damage value from Case 23 to the total reported in my 2012 paper (Lemly and Skorupa, 2012) brings the grand total wildlife damage cost to $2,944,591,573, based on toxicological investigation of <5% of active surface impoundment coal ash wastewater disposal sites.

3. Regulatory implications

It is quite ironic that Damage Case 23 comes from North Carolina, which could correctly be termed the "cradle of aquatic selenium toxicity". Even more ironic is the fact that Duke Energy Progress, the owner/operator of L.V. Sutton Power Plant, built and operates the Belews Creek Steam Station, site of the "cradle" (Belews Lake) where coal ash selenium poisoning extirpated virtually all fish in the 1563 ha reservoir in the 1970's (Lemly,

2002, Fig. 1). One would think that with the long history of coal-ash selenium impacts to fisheries in NC power plant reservoirs, and the recognition of those impacts by the electric utility industry (Electric Power Research Institute, 1984), both the State and utilities would have "done better", thereby avoiding Case 23 and setting an example for other states to follow. Obviously, that did not happen. The question is why? Concerns about selenium pollution and associated fisheries impacts in Lake Sutton were fully known and acknowledged by the State of NC since the 1980's (North Carolina Division of Inland Fisheries, 2013), yet coal ash pond discharges have always been allowed through the National Pollutant Discharge Elimination System (NPDES) without any specific limits on the amount of selenium released, including the current permit (North Carolina Division of Water Quality, 2011). Selenium levels were monitored in Lake Sutton beginning in the 1980's, every year showing contamination at levels toxic to fish and wildlife and alerting state biologists who noted "high hazard level and suspected reproductive failure" in their data spreadsheet (North Carolina Division of Inland Fisheries, 2013). The environmental conditions and toxic hazard have been clear for decades. Obviously, Damage Case 23 was preventable, and resulted because of "failure to act" by State of NC policy administrators. Whether or not this failure to act was brought on by pressure for "no regulatory intervention" by the electric utility industry is an open question that is currently being litigated and investigated by the US Department of Justice (Lehmert, 2014). This scenario of "no action" linked to industry pressure may very well be the underlying cause of regulatory policy stagnation with EPA at the national level as well. EPA continues to publicly acknowledge the long-standing and on-going impacts of surface impoundments on fish and wildlife (United States Environmental Protection Agency, 2007), proposes ash disposal regulations, enters into discussions with the electric utility industry and White House (King and Smith, 2010; Silverstein, 2012), and then fails to come forward with ecologically appropriate rules. The end result is that nothing meaningful changes with either regulatory policy or utility operations. It would seem reasonable on several administrative levels that 23 Cases and nearly $US 3 billion in documented wildlife damage costs (based on investigation of <5% of coal ash ponds) would provide sufficient impetus to spark the needed changes.

4. Conclusions

Damage Case 23 clearly illustrates the need for federal enforcement of rigorous national regulations that eliminate surface impoundment disposal of coal ash. As North Carolina has shown, states will generally not undertake adequate regulatory intervention on their own. As I indicated in my 2012 paper (Lemly and Skorupa, 2012), serious flaws in state administration of NPDES coupled with lax federal oversight, combine to make the situation toxic for fish and wildlife. The need for change is evident and growing. For example, a new NC case literally burst onto the scene with the February 2014 spill of over 80,000 tons of surface impounded ash, and over 27 million gallons of untreated liquid ash slurry into the Dan River (North Carolina Department of Environment and Natural Resources, 2014). North Carolina did not act in time to prevent Case 23 and the Dan River spill (Case 24). Will EPA and the White House follow the same course of inaction and, thereby, allow Case 25 and beyond to take place? EPA needs to provide appropriate regulatory leadership for the benefit of both natural resources and public health. The international community is facing the same coal ash disposal problems and many countries would benefit from science-based guidance on managing this major energy-related waste issue. Prudent steps by EPA will have positive environmental impacts on a global scale.

Acknowledgments

I thank Lucas P. Lemly for producing the photograph for Fig. 2.

References

Electric Power Research Institute, 1984. Workshop Proceedings: the Effects of Trace Elements on Aquatic Ecosystems. EPRI EA-3329, Project 1631. Electric Power Research Institute, Palo Alto, CA.

King Jr., N., Smith, R., January 9 2010. White House, EPA at odds over coal-waste rules. Wall Str. J. Available at:http://online.wsj.com/news/articles/SB126300256672322625.

Lehmert, A., February 13 2014. Federal Grand Jury to Hear from State, Duke in Coal Ash Spill. Greensboro News-Record, Available at: http://www.news-record.com/news/government/article_28b40a90-94d2-11e3-85f5-0017a43b2370.html.

Lemly, A.D., 2002. Symptoms and implications of selenium toxicity in fish: the Belews Lake case example. Aquat. Toxicol. 57, 39–49.

Lemly, A.D., Skorupa, J.P., 2012. Wildlife and the coal waste policy debate: proposed rules for coal waste disposal ignore lessons from 45 years of wildlife poisoning. Environ. Sci. Technol. 46, 595–8600.

Lemly, A.D., 2014. Teratogenic effects and monetary cost of selenium poisoning of fish in Lake Sutton, North Carolina. Ecotoxicol. Environ. Saf. 104, 160–167.

North Carolina Department of Environment and Natural Resources, 2014. Dan River Coal Ash Spill – Data Files and Ongoing Evaluation. Available at: http://portal.ncdenr.org/web/guest/dan-river-spill.

North Carolina Division of Inland Fisheries, 2013. Fisheries Research Summary – Data Spreadsheet and Graphs for Selenium in Sutton Lake. NC Department of Environment and Natural Resources, Raleigh, NC.

North Carolina Division of Water Quality, 2011. Permit NC0001422 to Discharge Wastewater Under the National Pollutant Discharge Elimination System. NC Department of Environment and Natural Resources, Raleigh, NC. Available at: http://portal.ncdenr.org/c/document_library/get_file?uuid=86a0590c-39c7-4e9a-8dc3-6a2e3b208e5b&groupId=38364.

Silverstein, K., November 19 2012. Obama may soften proposed crackdown on coal ash disposal. Forbes. Available at: http://www.forbes.com/sites/kensilverstein/2012/11/19/obama-may-comply-with-industrys-coal-ash-concerns/.

United States Environmental Protection Agency, 2007. Coal Combustion waste Damage Case Assessments. USEPA, Office of Solid Waste, Washington DC. Available at: http://graphics8.nytimes.com/packages/pdf/national/07sludge_EPA.pdf.