The Tennessee Valley Authority's Kingston coal plant dumped an estimated 140,000 pounds of arsenic into the Emory River in 2008—more than twice the reported amount discharged to U.S. waterways from all power plants in 2007. Arsenic and other toxic metals were contained in the estimated one billion gallons of coal ash that spilled when the Kingston impoundment dikes burst on December 22, 2008. These toxic pollutants are hazardous to both human health and fish and other aquatic life. *See* page 3.

TVA's report, filed with the U.S. Environmental Protection Agency (EPA), also shows that the Kingston ash spill deposited nearly 320 *tons* of vanadium in the Emory River, or more than seven times the total discharge of this toxic pollutant from all power plants in 2007. In addition to vanadium and arsenic, Kingston singlehandedly discharged more chromium, lead, manganese, and nickel into the Emory River last year than reported discharges of those pollutants from the entire industry in 2007:

Comparison of 2008 Kingston Coal Ash Discharges to 2007 Industry Discharges

Toxic Pollutant	2008 Discharge to Emory River from TVA Kingston (lbs/year)	2007 Discharges from All Power Plants to Surface Water (lbs/year)	2007 Discharge from TVA Kingston to all Surface Waters (lbs/year)
Arsenic	140,000	58,769	2,700
Barium	650,000	710,947	44,000
Chromium	63,000	29,781	1,600
Copper	94,000	296,142	4,000
Lead	71,000	16,040	0
Manganese	750,000	521,502	0
Mercury	400	414	0
Nickel	73,000	68,586	250
Vanadium	640,000	90,506	3,400
Zinc	180,000	247,709	4,000
Total	**2,661,400**	**2,040,396**	**59,950**

Source: U.S. EPA, Toxics Release Inventory (TRI), Kingston Fossil Plant (Facility ID: 37763STVKNSWANP) (2008); U.S. EPA, TRI, Total Surface Water Discharges for Electric Utility Industry (NAICS: 2211) (2007); U.S. EPA, TRI, Surface Water Discharges from Kingston Fossil Plant (2007)(this includes Emory River and Clinch River) *available at* http://www.epa.gov/tri/tridata/index.htm.

It is impossible to quantify the amount of toxic metals released from Kingston's toxic coal ash into the Emory River before settling to the bottom of the river, and how much more may be released over time. Sampling by the state of Tennessee, Appalachian State University and environmental organizations in the weeks after the spill documented

levels of arsenic and other pollutants in the river that exceeded water quality standards for human health and aquatic toxicity. More recent samples by the state of Tennessee appear to show lower levels of arsenic and other metals at water quality monitoring stations.[1] Yet as the Emory River is dredged to help reduce the volume of toxic ash in the river, toxic metals like arsenic may leach into the water from any remaining ash on the river bottom over time, carrying contaminants further downstream, e.g., into the Clinch or Tennessee Rivers.

Tennessee's Department of Environmental Conservation (TDEC) warns that even relatively "clean" water quality samples may not adequately measure contaminated sediments that can poison fish and the people who eat them:

> Contaminants in streams or lakes can…settle to the bottom and accumulate in sediment and not be detected by water sampling. For chemicals that bioaccumulate (build up to higher concentrations) or biomagnify (accumulate at higher concentrations in the upper part of the food chain, including humans) this can create a possibly undetected human health or environmental threat.[2]

Tissue sampling can help to determine whether fish are accumulating dangerous levels of toxins. Initial testing by TDEC in the spring of 2009 ultimately concluded that: "The implications of the ash spill are profound and it may take months for toxicity or bioaccumulation to be documented."[3] It takes time for toxins to move up the food chain, and additional tissue sampling is required to determine the full impact of the spill.

Toxic metals are notoriously difficult to cleanup from ground and surface waters and the aquatic ecosystem. Although TVA has reported that it will spend close to a billion dollars to clean up the Kingston site,[4] it remains to be seen whether this cleanup will be effective. In addition, TVA owns nearly 3,000 acres of ash ponds at its other coal plants in Tennessee, Kentucky and Alabama, four of which are rated as "high hazard" sites by U.S. EPA.[5] These ash disposal sites also leak their toxic cargo into groundwater, or discharge it directly into rivers, creeks and lakes as runoff or through permitted outfalls. There are no federal rules setting standards for the safe disposal of ash, or limiting the discharge of toxic ash leachate into our waterways.

EPA is expected to finally propose standards for ash disposal sites by the end of December, and has promised to require the industry to meet Clean Water standards for

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[1] Tennessee Department of Environment and Conservation (TDEC) Surface Water Results, Kingston Fossil Plant, *available at* http://www.tn.gov/environment/kingston/surface_water.shtml

[2] TDEC, Fish Tissue Data Summary, Kingston Fossil Plant (Aug. 18, 2009), *available at* http://www.state.tn.us/environment/kingston/pdf/fishtissue/fish_tissue_data_summary081809.pdf

[3] *Id.*

[4] Tennessee Valley Authority (TVA), Annual Report (Form 10-K) 47 (2009) ("estimated [cleanup] costs varies from approximately $933 million to approximately $1.2 billion").

[5] U.S. EPA, Fact Sheet, *Coal Combustion Residues (CCR) - Surface Impoundments with High Hazard Potential Ratings*, EPA530-F-09-006, June 2009 (updated August 2009) *available at* http://www.epa.gov/epawaste/nonhaz/industrial/special/fossil/ccrs-fs/national.pdf (Bull Run and Cumberland in TN, and Colbert and Widows Creek in AL are rated "high hazard," which does not indicate structural integrity, but is given when ash pond failure will likely cause loss of life).

limiting toxic discharges that were supposed to take effect twenty five years ago. Let's hope these overdue regulations lead to the shutdown of unsafe and outdated ash ponds like the one that burst its banks in Tennessee one year ago this month.

Health and Ecological Impacts from Kingston Coal Ash Spill Pollutants

POLLUTANT	HUMAN HEALTH IMPACTS	ECOLOGICAL IMPACTS
Arsenic	• Inorganic arsenic is a known human carcinogen. • Arsenic is also linked to cardiovascular and dermal effects, encephalopathy, and peripheral neuropathy.	• Arsenic accumulates in freshwater plants and bivalves, where it enters the food supply.
Barium	• Barium can cause gastrointestinal disturbances and muscular weakness. • Ingesting large amounts of barium, dissolved in water, can change heart rhythm, and can cause paralysis and possibly death.	• Barium affects development of germinating bacterial spores and has a variety of effects on microorganisms, including inhibition of cellular processes.
Chromium	• Chromium VI is a known human carcinogen. • Chromium VI exposure has also caused stomach tumors in humans and animals.	• Chromium can make fish more susceptible to infection and damage/accumulate in various fish tissues and invertebrates such as snails and worms.
Copper	• High levels can cause harmful effects such as irritation of the nose, mouth and eyes, vomiting, diarrhea, stomach cramps, nausea, and even death.	• Copper has adverse reproductive, biochemical, physiological, and behavioral effects on aquatic organisms.
Manganese	• Exposure to high levels of manganese can affect the nervous system. • Very high levels of manganese may impair brain development in children.	• Nervous system and reproductive effects have been observed in animals after high oral doses of manganese.
Mercury	• High mercury levels can permanently damage the brain and other organs. • Mercury can harm developing fetus, causing brain damage, mental retardation, blindness, seizures, and inability to speak.	• Mercury is easily absorbed through organic tissues and membranes. It easily bio-accumulates and can concentrate as it progresses up food chains.
Nickel	• The International Agency for Research on Cancer (IARC) has determined that some nickel compounds are carcinogenic to humans and that metallic nickel may possibly be carcinogenic to humans.	• Nickel absorption into organisms' organs and bodies can cause growth defects.
Vanadium	• Although impacts from ingestion are unclear, workers who breathed vanadium suffered lung irritation, coughing, wheezing, chest pain, runny nose, and a sore throat.	• Animals that ingested very large doses have died. High levels of vanadium in the water of pregnant animals caused minor birth defects.
Zinc	• Ingesting large doses even for a short time can cause cramps, nausea, and vomiting. • Inhaling large amounts of zinc can cause a short-term disease called metal fume fever.	• High concentrations of zinc in water have been shown to exert adverse reproductive, biochemical, physiological and behavioral effects on a variety of aquatic organisms.

Sources: Agency for Toxic Substances and Disease Registry, ToxFAQs, *available at* http://www.atsdr.cdc.gov/toxfaq.html; World Health Organization International Programme on Chemical Safety (IPCS) INCHEM: Environmental Health Criteria, *available at* http://www.inchem.org/.