ARSENIC, SELENIUM, AND ANTIMONY DISCHARGE FROM COAL-FIRED POWER PLANTS YATES AND WANLSEY TO THE CHATTAHOOCHEE-APALACHICOLA RIVER

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Introduction

Coal-fired electric power plants (CFPPs) are sited on small rivers in the Atlanta metropolitan area. Two CFPPs, Yates and Wansley, are located within 10 km of each other on the Chattahoochee River downstream of Atlanta. Storage and disposal of coal ash from these plants is by wet ash sluicing to ash retention ponds. Because metalloids in coals are efficiently volatilized during firing and mobilized to the aqueous phase during wet ash sluicing, their ash ponds exhibit high levels of the toxic trace metalloids arsenic (As), selenium (Se), and antimony (Sb). All three are on the EPA's Toxic Release Inventory (TRI) and are regulated by the Clean Water Act. These CFPPs discharge effluents from their ash ponds directly to the Chattahoochee River.

Experimental

We periodically analyzed total dissolved and particulate arsenic, selenium and antimony plus nutrients (phosphate, nitrate, nitrite, ammonia, silica) along the Chattahoochee river system in Georgia, from the spillway of Buford Dam at Lanier Reservoir downstream past Atlanta to West Point Reservoir. Combined with USGS stream flow data and integrated over an annual cycle, we estimated the dissolved and particulate release of reactive As, Se and Sb to the Chattahoochee River.

Results and Discussion

Samples upstream and downstream of two CFPP's south of Atlanta (Plants Yates and Wansley) reveal point-source inputs of these metals to the river that allow us to estimate metalloid loading from CFPPs (Fig. 1). Fluxes of As, Se, and Sb from these CFPPs can reach 200, 50, and 30 mg/s, respectively. Approximately 11% to 14% of the As-, Se-, and Sb-contents of the coal burned is transferred to receiving waters in dissolved reactive forms. About 4.1 (10), 2 (1.4) and 0.9 (0.1) metric tons of dissolved (ash particulate) As, Se and Sb (respectively) are discharged annually to the Chattahoochee River. Our data also suggest that all three elements and nutrients quickly disappear from the dissolved phase downstream of the plants, probably by incorporation into biological phases that spiral these toxic metalloid enrichments undetected farther downstream.

Conclusions

If these data are typical, then since 1982, 248 metric tons of As, 62 tons of Se, and 20 tons of Sb have been released in dissolved and particulate form from Yates and Wansley to the Chattahoochee River. Nutrient and suspended sediment profiles below the power plants suggest that after the metalloids enter the river they are quickly biologically removed through incidental uptake by algae and/or are sorbed onto suspended sediment particles. The fate of these toxic metalloids is unknown, but are almost certainly spiralled downstream toward the Apalachicola River.

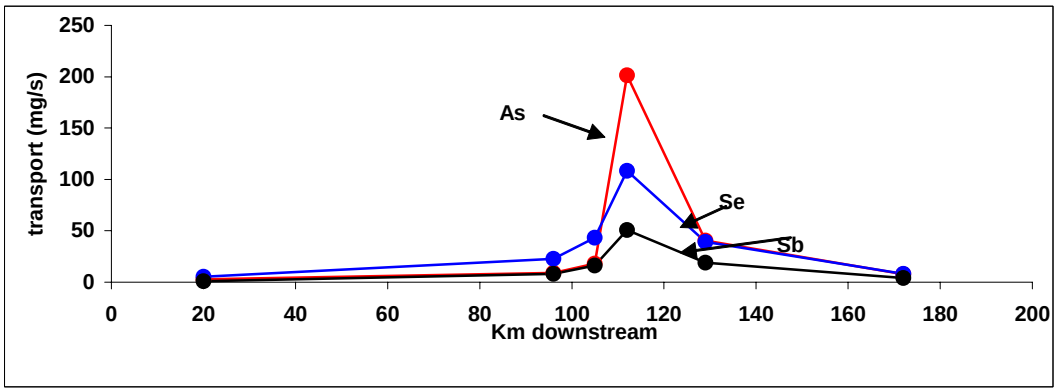

Fig. 1. Transport of dissolved metalloids through the Chattahoochee River, Atlanta: 30-60 km, Yates & Wansley: 95-109 km.