ARK is concerned about the impact of harvesting submerged logs on water quality, fish, and other aquatic organisms. Thanks to the generous support of one of our members, ARK identified five locations for sampling sediments to assist in determining potential release of toxic materials in the Atlamaha as a result of harvesting submerged logs. The results are summarized below. They reveal contamination that must be considered before the harvest program goes forward.

REDWING
ENVIRONMENTAL

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September 26, 2005

Mr. James Holland
Altamaha Riverkeeper
P.O. Box 2642
Darien, GA
31305

Subject: Altamaha River Sediment Testing

Dear James,

At your request I took sediment core samples at five separate locations on the Altamaha River on August 2 and 3, 2005. The purpose of the sampling was to provide a "screening" for the potential of disturbed sediments to contribute pollutants into the Altamaha River. At each location a sample was taken for analysis of Polychlorinated Biphenyls (PCBs), U.S. EPA Target Analyte List for Metals (TAL Metals), and Dioxins. The sample locations are shown on the attached maps and the final lab results are also attached.

RESULTS SUMMARY

PCBs: No PCBs were detected in any of the samples.

TAL Metals: Several analytes were detected and exceeded at each of the five locations. A summary of each location, analyte detected value, and regulatory limits are shown below. Those items noted with and asterik (*), are secondary TAL standards that are recommended by U.S. EPA but are not mandatory. Primary TAL standards were exceeded for Barium in sample 1, and lead in samples 3, 4 and 5. We chose to use drinking water standards as a reference standard though not to imply that the Altamaha River is actually used as a drinking water source.

Location	Analyte	Detected Amount	Safe Drinking Water Standard
1	Aluminum *	538 ppm	2 ppm
	Barium	19 ppm	2 ppm
	Iron *	750 ppm	300 ppm
	Manganese *	175 ppm	.05 ppm
	Zinc *	11.5 ppm	5 ppm
2	Analyte	Detected Amount	Safe Drinking Water Standard
	Aluminum *	289 ppm	2 ppm
	Iron *	527 ppm	300 ppm
	Manganese *	92.3 ppm	.05 ppm
	Zinc *	6.64 ppm	5 ppm
3	Analyte	Detected Amount	Safe Drinking Water Standard
	Aluminum *	274 ppm	2 ppm

Lead	11 ppm	.015 ppm
Iron *	668 ppm	300 ppm
Manganese *	152 ppm	.05 ppm
Zinc *	7.99 ppm	5 ppm

4	Analyte	Detected Amount	Safe Drinking Water Standard
	Aluminum *	340 ppm	2 ppm
	Lead	9.34 ppm	.015 ppm
	Iron *	601 ppm	300 ppm
	Manganese *	109 ppm	.05 ppm
	Zinc *	6.59 ppm	5 ppm

5	Analyte	Detected Amount	Safe Drinking Water Standard
	Aluminum *	332 ppm	2 ppm
	Lead	9.86 ppm	.015 ppm
	Iron *	532 ppm	300 ppm
	Manganese *	152 ppm	.05 ppm
	Zinc *	5.67 ppm	5 ppm

Aluminum: Toxicity information about aluminum is generally lacking. It has been determined that fish tend to be more sensitive to aluminum toxicity than aquatic invertebrates. Aluminum has been known to be detrimental to aquatic organisms in concentrations as low as 10 ppm but is synergistically related to the pH of the water. There are two ways in which aluminum kills fish. Firstly, it is able to reduce the ion exchange through the gills and subsequently causes a salt depletion. Aluminum also precipitates in the gills and interferes with the transport of oxygen and other ions, so that the fish literally dies of suffocation. Secondly, the fish will exude mucus to combat the aluminum in their gills. This mucus builds up and clogs the gills so that oxygen and salt transport is inhibited.

Lead: Fish exposed to high levels of lead exhibit a wide-range of effects including muscular and neurological degeneration and destruction, growth inhibition, mortality, reproductive problems, and paralysis. Lead adheres primarily to sediments, but becomes more bio-available under low pH, hardness and organic matter content (among other factors). Lead is a known bio-accumulator and exposure of freshwater fish to low concentrations of lead for a period of 30 days showed significant accumulation of lead in the blood and tissues. The lead accumulation in tissues has been found to increase with lead in water up to concentrations of 5 mg/liter, and at concentrations of 10 and 20 mg/liter the lead accumulation in the tissues, although indicating an increase, was not proportional to the concentration in water.

Iron: Studies indicate that in many aquaculture systems, the presence of iron at concentrations above 0.1mg/l, the iron will damage the gills of the fish. The gills of the fish are in effect acting as a mechanical filter, and small particles of iron with dimensions of a few microns can become trapped in the gill lamella. The presence of the small iron particles causes irritation of the gill tissues leading to gill damage and secondary bacterial and fungal infections.

Manganese: Evidence suggests that high manganese intakes from drinking water may be associated with neurological symptoms similar to those of Parkinson's disease. Some studies suggest that manganese in drinking water may be more bio-available than manganese in food. The symptoms of manganese toxicity generally appear slowly over a period of months to years. In its worst form, manganese toxicity can result in a permanent neurological disorder with symptoms similar to those of Parkinson's disease, including tremors, difficulty walking, and facial muscle spasms. This syndrome is sometimes preceded by psychiatric symptoms, such as irritability, aggressiveness, and even hallucinations

Zinc: In many types of aquatic plants and animals, growth, survival, and reproduction can all be adversely affected by elevated zinc levels. Zinc in aquatic systems tends to be partitioned into sediment and less frequently dissolved as hydrated zinc ions and organic and inorganic complexes. Zinc is toxic to plants at elevated levels, causing adverse effects on growth, survival, and reproduction. Terrestrial invertebrates show sensitivity to elevated zinc levels, with reduced survival, growth, and reproduction. Elevated zinc levels can cause mortality, pancreatic degradation, reduced growth, and decreased weight gain in birds; and elevated zinc can cause a wide range of problems in mammals including: cardiovascular, developmental, immunological, liver and kidney problems, neurological, hematological (blood problems), pancreatic, and reproductive.

Barium: The health effects of barium depend upon the water-solubility of the compounds. Barium compounds that dissolve in water can be harmful to human health. The uptake of very large amounts of barium that are water-soluble may cause paralyses and in some cases even death. Small amounts of water-soluble barium may cause a person to experience breathing difficulties, increased blood pressures, heart rhythm changes, stomach irritation, muscle weakness, changes in nerve reflexes, swelling of brains and liver, kidney and heart damage.

Dioxin: Normally, tests for dioxin focus on the most harmful form: 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD). All together, there are 75 different dioxins, or polychlorinated dibenzodioxins (PCDDs), 135 different furans, or polychlorinated dibenzofurans (PCDFs). Not all of these chemicals have dioxin-like toxicity, and the toxic ones are not equally toxic. The most potent member of this family is 2,3,7,8-tetrachlorodibenzo-p-dioxin or TCDD.

Dioxins share many physical properties that affect how they behave in the environment. They dissolve poorly in water, but very well in oils, fats, and organic solvents. They adhere strongly to organic components of soil and water and therefore do not wash out easily. Dioxins can easily re-enter the environment when muds and sediments are disturbed, such as in the dredging of a harbor or river.

The sampling performed did not detect notable levels of Dioxin, however, Dioxin is known to occur in numerous industrial waste discharges into the Altamaha River. Most notably, the Rayonier paper mill in Jesup has an NPDES permit that allows for the discharge of dioxins. Therefore, I would strongly recommend that any activity that has the potential to disturb the bottom sediments downstream of the Rayonier (or any other known dioxin discharge) should first perform bottom sediment sampling to determine the potential to release dioxins back into the water column and thus make it more bio-available.

Conclusion

Sediment samples were collected at five locations on the Altamaha River and analyzed for PCBs, Metals, and Dioxin. No PCBs were detected. Metal levels were found that exceeded primary and secondary drinking water standards and could pose a risk to aquatic life and human health if these contaminants were released during dredging of the Altamaha River. Dioxins were not detected in the samples collected but is known to be discharged into the river in the vicinity of samples 3 – 5.

The Altamaha is the largest river in Georgia and it acts as a pollutant sink for contaminants from a vast watershed. It would be prudent and advisable that dredging projects in the river should be conducted in accordance with the U.S. Army Corps of Engineers "Inland Testing Manual" to evaluate the pollutants in dredged/disturbed sediments and their potential to harm the aquatic environment and human health.

We appreciate the opportunity to be of assistance to you on this project. If you have any questions or need further help, please contact us. Thank you.

Sincerely,

Mark LaRue
Senior Biologist