News Release

No. 0544009-1 (Maryland post uses poplar trees to clean up contaminants)

By Susan Phelps

Walking along a gravel road on Aberdeen Proving Ground's (APG's) J-Field site, one sees unshaven grass, newly planted trees with curious black hoses sticking out from their bases, and the Chesapeake Bay through a veil of forest. Without some background information, you might think that this 80-year-old Army installation in Maryland had planted the trees as part of some reforestation effort. These trees, however, are doing much more than repopulating the earth's forest. They are a part of APG's efforts to employ Mother Nature in helping clean up the toxic contaminants that have invaded the area's soil and the water that flows beneath it (groundwater).

From the 1940s to the 1970s, APG used J-Field as a disposal area for chemical weapons and solvents by burning the materials in open pits. Although the disposal was effective, it contaminated the soil and groundwater with the chemical solvent tetrachloroethane (TCA).

J-Field poses no immediate threat to human health or the Chesapeake Bay. The groundwater is not used for drinking and, although the site is a quarter of a mile from the Bay's shores, the groundwater's path flows parallel to the shoreline and is contained by natural barriers.

To ensure long-term human and environmental health, John Wrobel, environmental engineer at APG, began researching various remediation methods. He contacted the U.S. Environmental Protection Agency (EPA) Environmental

Response Team in Edison, NJ and asked about their work with phytoremediation. Phytoremediation is an innovative method of removing and/or stabilizing toxic contaminants in soil or groundwater with the use of plants. The EPA has been testing and developing hybrid tulip poplar trees to see if they can clean up sites contaminated with trichloroethylene (TCE) - a chemical solvent similar to TCA.

In the early spring of 1996, Wrobel decided to conduct a 3-year pilot study using the hybrid tulip poplars. With the aid of a contractor, approximately 200 trees, 15 to 20 feet in height, were planted on an acre of the J-Field site. According to Wrobel, the roots of these trees can grow up to an inch a day and absorb approximately 30,000 gallons of water daily during the summer growing season. “These trees can pump out huge amounts of water from the ground and use it. They are a natural pump and treat system,” said Wrobel.

To maximize the hybrid poplar’s pumping capabilities, the trees were planted in a special way. Normally, a tree is planted with its roots 1 to 2 feet deep so that the roots can absorb water from the earth’s surface. Wrobel and his staff, however, wanted the hybrid poplars to absorb groundwater, so they planted the trees 5 to 8 feet deep. As a result, the roots could reach the groundwater and start the pumping process. A plastic “sleeve” was planted above the top layer of the roots to encourage new roots to grow down and absorb the groundwater. A long black plastic hose was planted with each tree to act as a snorkel and provide oxygen to the tree’s roots.

Wrobel and his staff are establishing procedures to track the progress of the trees. They are conducting a variety of monitoring tests to determine if the saplings are reducing the groundwater’s TCA levels. They are also in

the process of selecting a university to conduct a study to determine the ultimate fate of the TCA.

The trees are expected to dispose of the TCA in one or more of the following three ways. One route is called “microbial degradation” where bacteria living along the tree’s roots break down the TCA before it enters the tree. Another possibility is that the tree may take up the TCA and incorporate (sequester) it into tree parts, such as bark, leaves, or roots. A third theory is that the tree will uptake the TCA, transform it, and subsequently release it as a less harmful or harmless product.

Wrobel feels confident that the hybrid poplars will be a successful addition to the TCA cleanup process. Based on studies conducted by the EPA, the trees are not expected to become toxic or release TCA directly into the air. “The chemical changes into something else,” explained Wrobel. “It’s like when we eat food. Our bodies convert the food into various by-products that make up our bodies. Most scientists, however, think that the TCA is going to adhere to the roots where the bacteria will degrade it before it enters the tree.”

If the process works, the benefits will be many. The increased uptake of water by the hybrid poplars will reduce the flow of groundwater and prevent the TCA from traveling off the site. In addition, by cycling the groundwater through the poplars, significant amounts of TCA may be removed from the groundwater.

This natural pump and treat system will also reduce remediation costs. A standard pump and treat system that is typically used to clean up such sites would cost an estimated $5 million to build and $100,000 per year to operate. The phytoremediation effort has cost APG approximately $80,000. According to Wrobel, if the groundwater were to be used for drinking water, the trees would

be an extra filter for a mechanical pump and treatment system, making the process more complete and more efficient.

If the pilot study is successful, Wrobel foresees the use of hybrid tulip poplars at other installations with TCA contamination. In the meantime, other installations are employing phytoremediation with such plants as sunflowers, algae, and mustard to remove other contaminants like metals and explosive compounds from soil and groundwater. “I think it’s got a great chance of working,” said Wrobel. “I think we’ve seen in other sites that nature seems to be able to heal itself. We’re just enhancing the process by bringing in these trees to help clean it up.”