

Use of Secondary Data and Geospatial Estimations To Evaluate Performance of a Phytoremediation Demonstration Site in North Carolina.

Site Location and Project Background: The site is located at the United States Coast Guard Training Facility in Elizabeth City, North Carolina. This phytoremediation project is a joint effort between NC State University, US Geological Survey, Department of Homeland Security, the U.S. Coast Guard Training Facility, and the USEPA/NCDENR 319 Program. The project uses primarily hybrid poplars but also willow and pine trees to decontaminate the soil and groundwater from petroleum hydrocarbons. The site is a former fuel farm that served as an aircraft refueling station from 1942-1991 (Cook et al, 2010).

Phytoremediation technology has been successfully employed as a viable tool for the environmental cleanup of contaminated sites. Research studies have demonstrated that trees, especially poplars and willows can effectively dissipate fuel contaminants. The technology works through several mechanisms of which one is increased rhizodegradation of contaminants. In this case, trees promote the upward movement of contaminated water through evapotranspiration. This hydraulic lift draws contaminants into aerobic soil where they can be oxidized by microorganisms associated with plant roots. This mechanism works especially well for benzene, toluene, ethylbenzene, and xylene (BTEX). When trees remove more water by evapotranspiration than infiltrates by precipitation, trees exert hydrologic control of groundwater thereby retarding or reversing the migration of contaminated water. Finally, trees can enhance the *in situ* dissipation of less-mobile fuel contaminants such as polycyclic aromatic hydrocarbons

(PAHs). Trees release organic substrates from their roots which can facilitate the microbial degradation of these recalcitrant fuel constituents.

Most sites undergoing groundwater remediation are limited by the number of groundwater wells for data collection. Primary data, such as concentrations of BTEX in groundwater or soil, are limited due to number of wells onsite. Typically, site remediation is driven by maximum contaminant levels in groundwater; these contaminant levels are the most stringent benchmarks to meet for clean-up goals. Soil sample and groundwater analyses are expensive; hence, use of secondary data, such as soil gas, to evaluate remedial performance can help evaluate site performance. At the phytoremediation demonstration site in N.C., the extent or impact of the contaminated site is greater than 10 acres with only 10 monitoring wells used to evaluate groundwater quality. These primary data provide a limited analysis of how well the trees are mitigating fuel contamination.