

Using Phytotechnologies to Remediate Brownfields, Landfills, and Other Urban Areas

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Urban areas requiring remedial work has prompted the use of phytotechnologies to improve water quality, soil health, and biodiversity, as well as to achieve sustainable social and economic goals.

Phytotechnologies directly use plants to clean up contaminated groundwater, soil, and sediment. While woody and herbaceous crops are candidates for such remediation systems, trees within the genera *Populus* (poplars, cottonwoods, aspens) and *Salix* (willows) are ideal given their fast growth, extensive root systems, and elevated rates of photosynthesis and transpiration. The genetic diversity within these genera substantially increases the establishment and growth potential across heterogeneous sites. We have tested these trees for more than a decade across various sites and contaminants, which has resulted in developing phyto-recurrent selection, a method utilizing multiple testing cycles to evaluate, identify, and select favorable varieties with adequate genetic variation to guard against insect/disease outbreaks and changing edaphic conditions (especially those induced by contaminated soil and water) in the field. We will present information from our studies involving the selection and growth of trees performing well across variable site conditions (generalists) or sites with specific contaminant concerns (specialists) in order to enhance the success of phytotechnologies at brownfields, landfills, and other urban areas. This effort supports scientists and resource managers to acquire information that contributes to the deployment of systems that are ecologically and economically more sustainable versus traditional technologies, while the general public maintains environmental quality and protection of the natural resource base on which local and regional recreation, agriculture, and forestry depend.

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