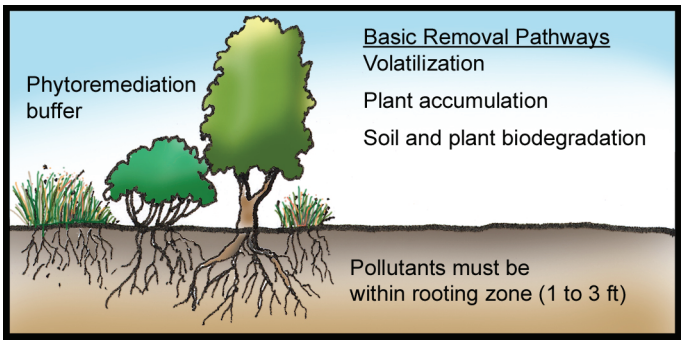

3.5 Phytoremediation buffers

Phytoremediation is the use of plants to clean up soil and water contaminated with metals, solvents, and other pollutants. Phytoremediation buffers can be used to treat brownfields, landfill leachate, mine waste, and other low to moderately polluted sites.

Limitations in using phytoremediation include the length of time required for remediation, pollutants at a level tolerable for the plants used, bioavailability of pollutants, and the level of cleanup required. Consult with appropriate environmental professionals to design an effective system.

Key design considerations

- Select vegetation that is fast growing, easy to maintain, and capable of transforming the pollutants to a non-toxic form.
- May need to conduct screening studies and field plot trials to determine suitable plants.
- Avoid monocultures to reduce risk to disease and pests.
- Pollutants need to be within the upper rooting zone. Plants with different rooting types and depths may be used together to treat a greater soil depth. A fibrous root system is usually the most efficient.
- Determine and mitigate potential exposure risks for wildlife.
- Harvesting vegetation and proper disposal may be necessary.

3.5 References

Aprill, W.; Sims, R.C. 1990. Evaluation of the use of prairie grasses for stimulating polycyclic aromatic hydrocarbon treatment in soil. Chemosphere. 20: 253-265.

Burken, J.G.; Schnoor, J.L. 1997. Uptake and metabolism of atrazine by poplar trees. Environmental Science and Technology. 31: 1399-1406.

Davis, L.C.; Castro-Diaz, S.; Zhang, Q.; Erickson, L.E. 2002. Benefits of vegetation for soils with organic contaminants. Critical Reviews in Plant Sciences. 21: 457-491.

Dickinson, N.M. 2000. Strategies for sustainable woodland on contaminated sites. Chemosphere. 41: 259-263.

Dickinson, N.M.; MacKay, J.M.; Goodman, J.M.; Putwain, P.D. 2000. Planting trees on contaminated soils: issues and guidelines. Land Contamination and Reclamation. 8: 87-102.

French, C.J.; Dickinson, N.M.; Putwain, P.D. 2006. Woody biomass phytoremediation of contaminated brownfield land. Environmental Pollution. 141: 387-395.

Glick, B.R. 2003. Phytoremediation: synergistic use of plants and bacteria to clean up the environment. Biotechnology Advances. 21: 383-393.

Kuzovkina, Y.A.; Quigley, M.F. 2005. Willows beyond wetlands: uses of *Salix* L. species for environmental projects. Water, Air, and Soil Pollution. 162: 183-204.

Licht, L.A.; Isebrands, J.G. 2005. Linking phytoremediated pollutant removal to biomass economic opportunities. Biomass and Bioenergy. 28: 203-218.

Pilon-Smits, E. 2005. Phytoremediation. Annual Review of Plant Biology. 56: 15-39.

Prasad, M.N.V. 2003. Phytoremediation of metal-polluted ecosystems: hype for commercialization. Russian Journal of Plant Physiology. 50: 686-700.

Pulford, I.D.; Watson, C. 2003. Phytoremediation of heavy metal-contaminated land by trees – a review. Environment International. 29: 529-540.

Raskin, I.; Ensley, B.D. 2000. Phytoremediation of toxic metals: using plants to clean up the environment. New York: John Wiley and Sons. 304 p.

Rockwood, D.L.; Naidu, C.V.; Carter, D.R. [and others]. 2004. Short-rotation woody crops and phytoremediation: opportunities for agroforestry? Agroforestry Systems. 61: 51-63.

Susarala, S.; Medina, V.F.; McCutcheon, S.C. 2002. Phytoremediation: an ecological solution to organic chemical contamination. Ecological Engineering. 18: 647-658.

USEPA. 2000. Introduction to phytoremediation. Pub. No. 600/R-99/107. Cincinnati, OH: U.S. Environmental Protection Agency. 104 p. http://www.cluin.org/download/remed/introphyto.pdf. [Date accessed: September 28, 2007].

Volk, T.A.; Abrahamson, L.P.; Nowak, C.A. [and others]. 2006. The development of short-rotation willow in the northeastern United States for bioenergy and bioproducts, agroforestry and phytoremediation. Biomass and Bioenergy. 30: 715-727.

Westphal, L.M.; Isebrands, J.G. 2001. Phytoremediation of Chicago's brownfields – considerations of ecological approaches and social issues. Chicago: Brownfields 2001 proceedings Brownfields. 9 p. http://ncrs.fs.fed.us/pubs/jrnl/2001/nc_2001_Westphal_001.pdf. [Date accessed: September 28, 2007].