

Phytoremediation

Project Update

Assessment of phytoremediation as an in-situ technique for cleaning petroleum-contaminated sites

ERAC - Environmental Research Advisory Council

January 2001

What is the purpose of this project?

Phytoremediation is the use of plants for the in-place treatment of contaminated soils. It is essentially ecological engineering, which capitalizes on the naturally-occurring, synergistic relationships among plants, microorganisms and the environment that have evolved over thousands of years. Phytoremediation takes advantage of the extensive root system of plants; these support surrounding bacterial populations, which hasten the biodegradation of soil contaminants.

Phytoremediation is considered a long-term remediation process limited to shallow and low-to-medium concentrations of soil contamination. Still, it appears to be a low-cost, relatively non-invasive alternative to conventional remediation techniques such as excavating and transporting soils. Given the high cost of these traditional cleanup methods, phytoremediation

may provide an ideal means of initiating and/or accelerating cleanups at hundreds of petroleum-contaminated sites.

The overall objective of this project is to evaluate the effectiveness of phytoremediation in reducing hydrocarbon concentrations in soils contaminated with historical, or weathered, oil products.

How is the project being conducted?

The specific objectives of the project are to:

- conduct a literature review to assess current phytoremediation techniques and produce a searchable database with an inventory of plants that can reduce hydrocarbon levels in soils and wetlands,
- conduct botanical surveys of weathered hydrocarbon-contaminated sites in Alberta and Saskatchewan to identify plants with phytoremediation potential,
- screen the phytoremediation potential of selected plant species,
- conduct growth chamber studies to optimise plant growth/phytoremediation variables, elucidate degradation mechanisms and develop field assessment protocols, and
- conduct field trials of selected phytoremediation technologies.

ERAC was founded in the mid-1970s by the Canadian Association of Petroleum Producers (CAPP) to initiate research and technology development on environmental issues relating to the production of crude oil and natural gas in western Canada. In the past five years, direct and in-kind contributions to ERAC from CAPP and individual member companies, federal and provincial governments, academic institutions, and research groups have totaled over \$6 million.

What are the results?

The literature review and botanical surveys in Alberta were completed in December, 1999. Reports of those results are posted on the website of the University of Saskatchewan's Department of Soil Science (<http://www.ag.usask.ca/departments/scsr/department/research/index.html>). Completed in spring 2000, the database (PhytoPet©) lists 61 plants with a demonstrated potential to phytoremediate or tolerate petroleum hydrocarbons.

Potential phytoremediation plants were chosen based on such things as their ability to phytoremediate or tolerate hydrocarbons, their previous use in native prairie restoration projects and the availability of seed. To date, 42 species have been screened, comprising native grasses, legumes and non-leguminous forbs and exotic grasses and legumes.

What happens next?

Final plant screenings and preliminary growth chamber studies will be conducted in 2001. As well, field work will be conducted at two sites to test species chosen during the screening process. Additional funding will be required to complete this phase of the project.

Project Funding

This project is being funded by the Natural Sciences and Engineering Research Council (NSERC), Environment Canada, Canadian Association of Petroleum Producers (CAPP), Program of Energy Research and Development, Saskatchewan Agriculture and Food Strategic Research Program in Soil Biology and Conservation, Veco Canada, BP Canada Energy and Imperial Oil Resources.

More information on ERAC is available on CAPP's Internet Home Page: www.capp.ca. To order the above materials, ERAC project updates, or technical reports, or be added to the mailing list for the bi-annual newsletter *ERAC Reporter*, please call CAPP at (403) 267-1100.



Canadian Association of Petroleum Producers
2100, 350 – 7 Avenue S.W.
Calgary, Alberta, Canada T2P 3N9
Phone: (403) 267-1100 Fax: (403) 261-4622