# Petroleum Exploration in Environmentally Sensitive Areas: Opportunities for Geochemical and Non-Seismic Geophysical Methods

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The petroleum potential of environmentally sensitive areas -- such as forests, wetlands and arctic environments -- is often poorly known due to restrictions limiting conventional exploration methods like seismic surveys and exploratory drilling. For such areas, surface geochemical and non-seismic methods provide an opportunity to reliably detect and map the elevated hydrocarbon concentrations and hydrocarbon-induced changes commonly associated with undiscovered oil and gas accumulations, while having minimal impact on the surface environment.

There is now a general consensus that (1) all petroleum basins exhibit some type of near-surface hydrocarbon leakage, (2) that petroleum accumulations are dynamic and their seals imperfect, (3) that hydrocarbon seepage can be active or passive, and that it can be visible (macroseepage) or only detectable analytically (microseepage). The surface and near-surface expressions of hydrocarbon migration and seepage can take many forms ranging from elevated hydrocarbon concentrations in soils to complex mineralogic, microbial, and botanical changes.

Advances in geochemical and non-seismic hydrocarbon detection methods, coupled with an improved understanding of hydrocarbon migration processes, have led to an increased usage of various remote sensing, surface geochemical, and non-seismic methods to detect and map the small but significant concentrations of hydrocarbons which occur above oil and gas accumulations. The non-invasive, low impact nature of these techniques makes them ideally suited for use in an early stage evaluation of environmentally sensitive areas. The results of such surveys can quickly identify those parts of the area possessing the highest petroleum potential. Use of such an exploration strategy protects the greater part of the area from more invasive exploration methods by focusing attention and resources on a relatively small number of high potential sites