

NewFields Note

Natural Source Zone Depletion (NSZD) -

Role of LNAPL Fingerprinting in Quantifying NSZD Rates & Effects

NewFields Note: Technical information in a condensed, easily digestible format that is intended to promote environmental science education, knowledge transfer, and empowerment ... *one note at a time.*

Natural Source Zone Depletion studies examine the natural, passive LNAPL mass loss that occur in the subsurface through the combined effects of volatilization, dissolution and biodegradation, the latter of which was only recently recognized to contribute significantly anaerobically. To date, monitoring NSZD rates mostly rely upon the *indirect* measurement subsurface gas or thermal fluxes from which the NSZD rate(s) is calculated stoichiometrically. The calculated NSZD rate can be balanced against loss achievable from active remediation, which is both more costly and environmentally disruptive. However, NSZD rates determined via indirect methods can vary widely due to site-specific variables (e.g., soil respiration, barometric pumping, soil grain size and moisture, paved surfaces, diffusion heterogeneities).

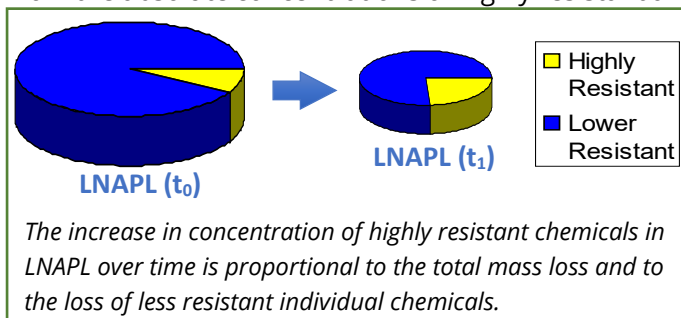
On the other hand, **LNAPL fingerprinting** provides a *direct* measure of NSZD rates, thereby complimenting indirect methods while also revealing "*what exactly is and is not being degraded?*". The total mass and individual chemical (BTEX, PAHs, etc.) losses in a LNAPL can be calculated from the absolute concentrations of highly resistant and susceptible chemicals over time using simple algebraic

Direct Measure of NSZD

- Chemical fingerprinting of LNAPLs to calculate total mass loss and individual chemicals or groups over time.

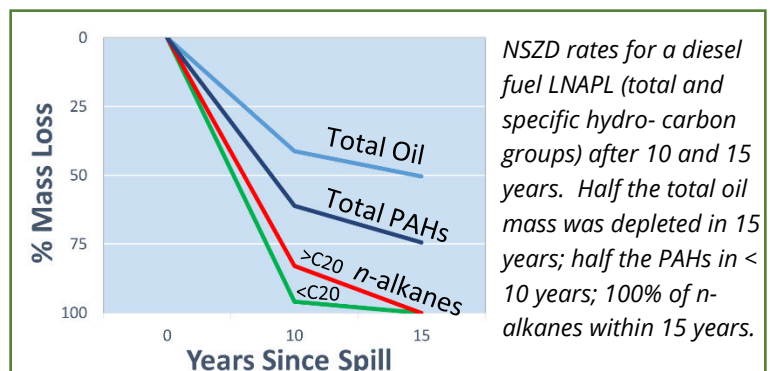
Indirect Methods of NSZD

- Gas (O_2 , CO_2 , CH_4 , VOCs) gradient method
- Dynamic chamber method
- Carbon capture method
- Thermodynamic gradient method



LNAPL fingerprinting provides the only direct measure of the total mass and constituent-specific NSZD rates that inherently includes all natural processes: volatilization, dissolution, and aerobic and anaerobic biodegradation.

expressions developed by NewFields scientist (Douglas et al. 1996), to assess spilled oil weathering rates ~ 30 years ago.



For additional information, please contact your NewFields Technical Lead. Or send us an email at Science_Info@newfields.com!

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