

AN URBAN INVESTIGATION USING ALKANE PROFILES FOR LAND-USE DISCRIMINATION

Victoria Eaglesham, Lorna A Dawson, Lynne M Macdonald, Anna Prieur, Andrew Morrisson, Jasmine Ross and Bob Mayes: The Macaulay Institute, Craigiebuckler, Aberdeen AB15 8QH • email: a.morrisson@rgu.ac.uk

1. INTRODUCTION

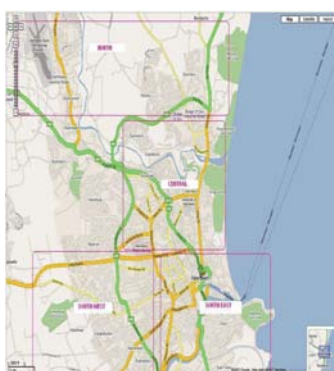
Every soil possesses a unique combination of materials making it an ideal candidate for trace evidence analysis in forensic investigations. Due to time and budget constraints, the analysis of soil as trace evidence is currently limited to serious crime investigations. Soil alkanes are largely derived from litter inputs from the overlying vegetation and can be extracted relatively easily.

Alkanes could therefore provide a novel forensic method to:

- gain investigative clues as likely vegetation cover of a soil sample of unknown origin
- provide evaluative comparison of evidence samples to a pool of soils from a relevant soil population.
- This project investigated the potential of soil alkane profiling as a novel method for differentiating groups of land-use vegetation (LUV) and individual locations in an urban context – Aberdeen city.

2. METHODS

- Surface soil was collected from 4 urban LUV x 4 sites x 4 replicates, from Aberdeen sites:
- Samples were ground and extracted for alkanes (Dawson et al. 2004) and analysed by GC
- Alkanes were identified and expressed as total concentration and relative abundance before being analysed by Canonical Variate Analysis (CVA) in order to assess the relative similarity and dissimilarities between LUV groups and between individual sites



Map of Aberdeen sampling areas



deciduous woodland (DWL)



managed park flowerbeds (MPF)



residential garden (RG)



roadside lay-bys (RSL)

Example of sampling sites

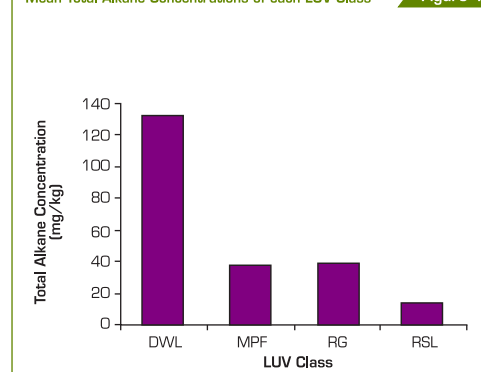
3. RESULTS

Discrimination using alkane profiles:

- Deciduous woodlands has significantly greater, and roadside lay-bys had significantly lower, alkane concentrations than the other sampled LUVs (Figure 1)
- Clear discrimination between all LUV classes was achieved with multivariate approaches of alkane profiles (Figure 2)
- Alkane profiles of deciduous woodlands differed most from the other LUVs (Figure 2)
- All sites, with the exception of 21 Tollohill Crescent and 59 Tollohill Crescent, can be discriminated (in the absence of the woodland sites) with odd chain alkane profiles (Figure 3)
- Gardens at 21 and 59 Tollohill Crescent were largely unkempt with the only plants present appearing to be opportunistic weeds.

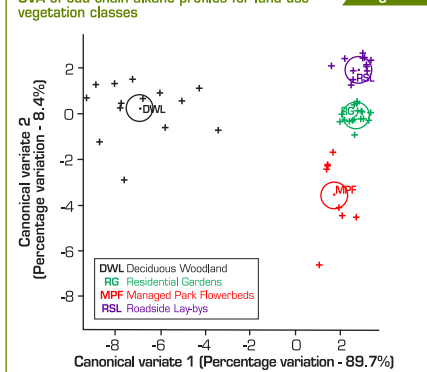
Mean Total Alkane Concentrations of each LUV Class

Figure 1



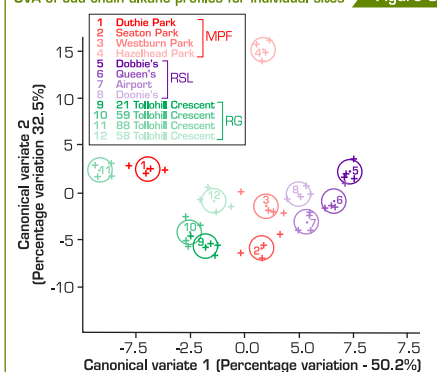
CVA of odd chain alkane profiles for land use vegetation classes

Figure 2



CVA of odd chain alkane profiles for individual sites

Figure 3



4. CONCLUSIONS

- Alkane signatures have potential for discriminating between LUV type within Aberdeen
- Alkane signatures have potential power in discriminating between most sites (Lay bys, flowerbeds, and woodlands)
- All gardens, with the exception of two apparently unmanaged sites, could be discriminated, suggesting that alkanes could potentially provide provenance dependent evaluative evidence.
- The use of alkane signatures could be a powerful tool for discrimination of surface urban soils; of significant forensic potential.