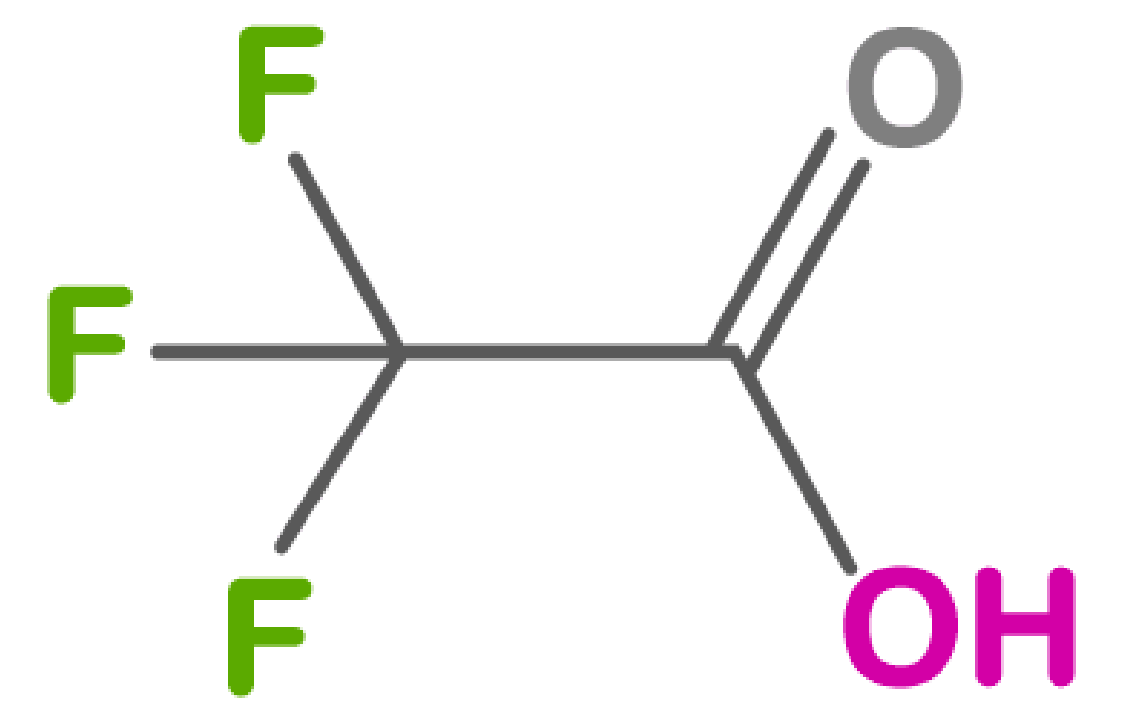


Occurrence of Trifluoroacetic Acid (TFA) in Surface Water and Groundwater from Swedish Agricultural Areas



TFA in surface water (Figure 1A):

- TFA was quantified in all 62 surface water samples (LOQ = 0.05 µg/L)
- Relatively small variations in surface water concentrations both between sites and over time (0.55-3.5 µg/L)
- Generally higher concentrations than those measured for plant protection products in these catchments.

TFA in groundwater (Figure 1B):

- TFA was quantified in 44 out of 50 (88 %) groundwater samples (LOQ = 0.05 µg/L)
- Large variations in concentrations between catchments (0-5.7 µg/L) as well as between different groundwater pipes in some of the catchments
- Smaller variations in concentrations over time in the same pipe
- Concentrations above the limit value 0.1 µg/L in 82 % of samples

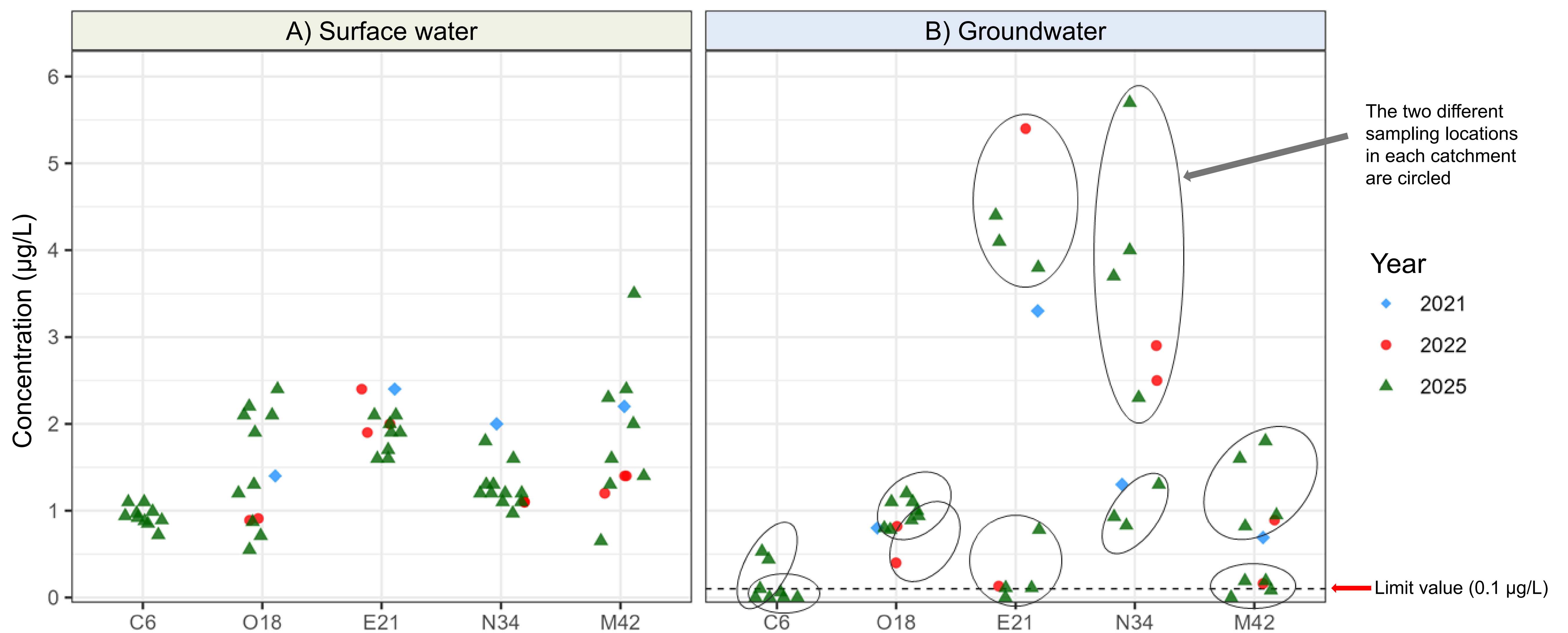


Figure 1. Concentrations (µg/L) of TFA in (A) surface water and (B) groundwater samples from monitoring catchments C6, O18, E21, N34, and M42 collected in 2021, 2022, and 2025. The two different sampling locations for groundwater within each monitoring catchment are circled in the groundwater figure. The dashed line in the groundwater figure indicates the limit value applicable to pesticides and their relevant metabolites (0.1 µg/L). In 2021, all four groundwater samples from the same monitoring catchment were pooled into a single sample. In 2022, the two groundwater samples from each sampling location within each monitoring catchment were pooled into one sample, resulting in two pooled samples per monitoring catchment (except for N34, where both samples originated from the same location).

Data on the use of TFA-forming pesticides is available

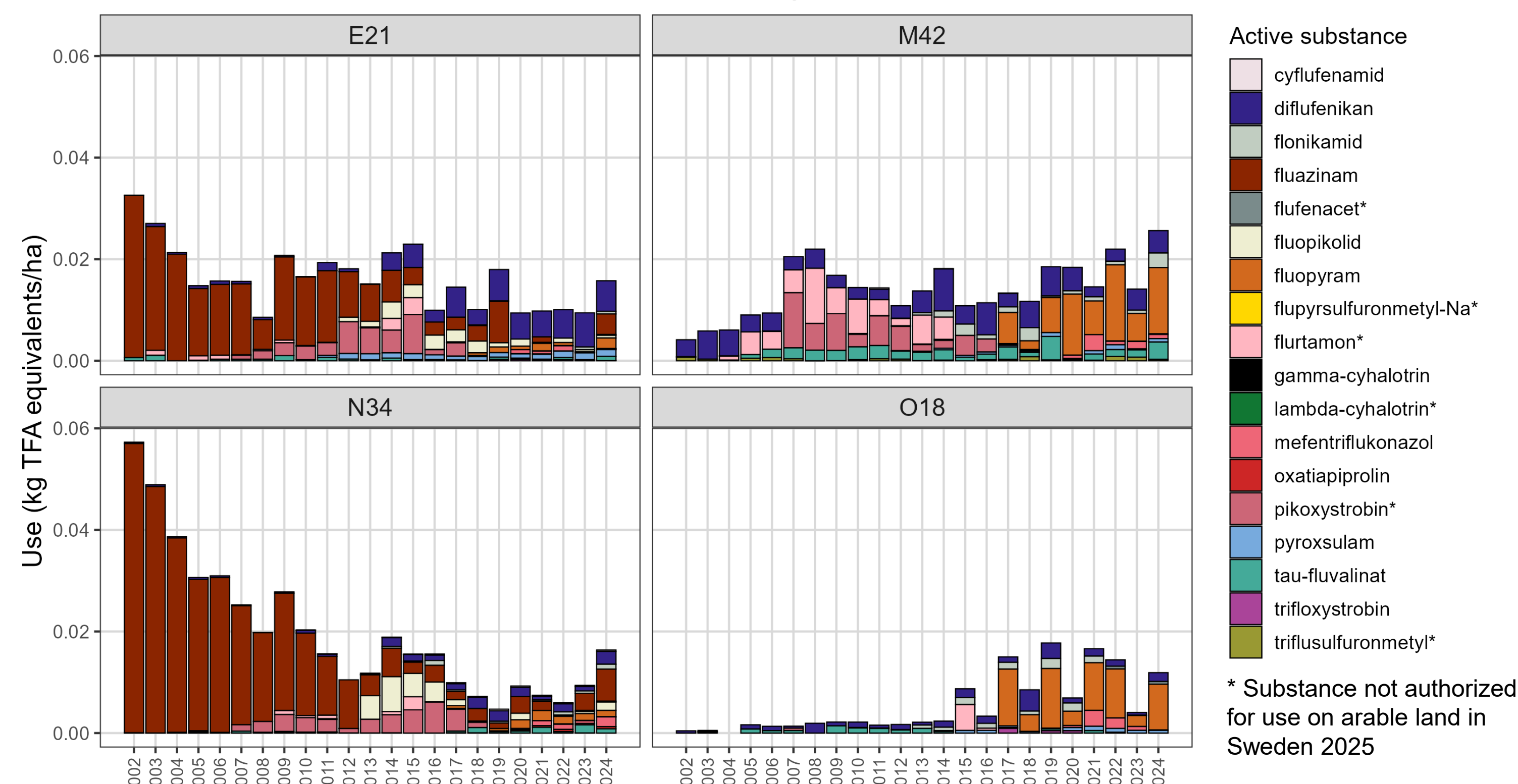


Figure 2. Use of TFA-forming plant protection products per year, in estimated TFA equivalents (Johnsen et al., 2024), divided by the total area of the catchment. The coloured segments within each bar indicate the contribution from each parent compound.

Sampling 2025

Surface water: (47 samples)

- 5 small agricultural catchments (8-32 km², 59-92 % arable land)
- 2 times per month in May-Nov

Groundwater: (38 samples)

- 4 groundwater pipes (2-8 m deep) at 2 different locations per catchment (locations circled in Fig 1B.)
- Samples in May and Nov

Results from 2025 are shown together with results from 2021-2022 when TFA was analysed in a smaller number of samples from the same sites (20 surface water samples and 12 groundwater samples)

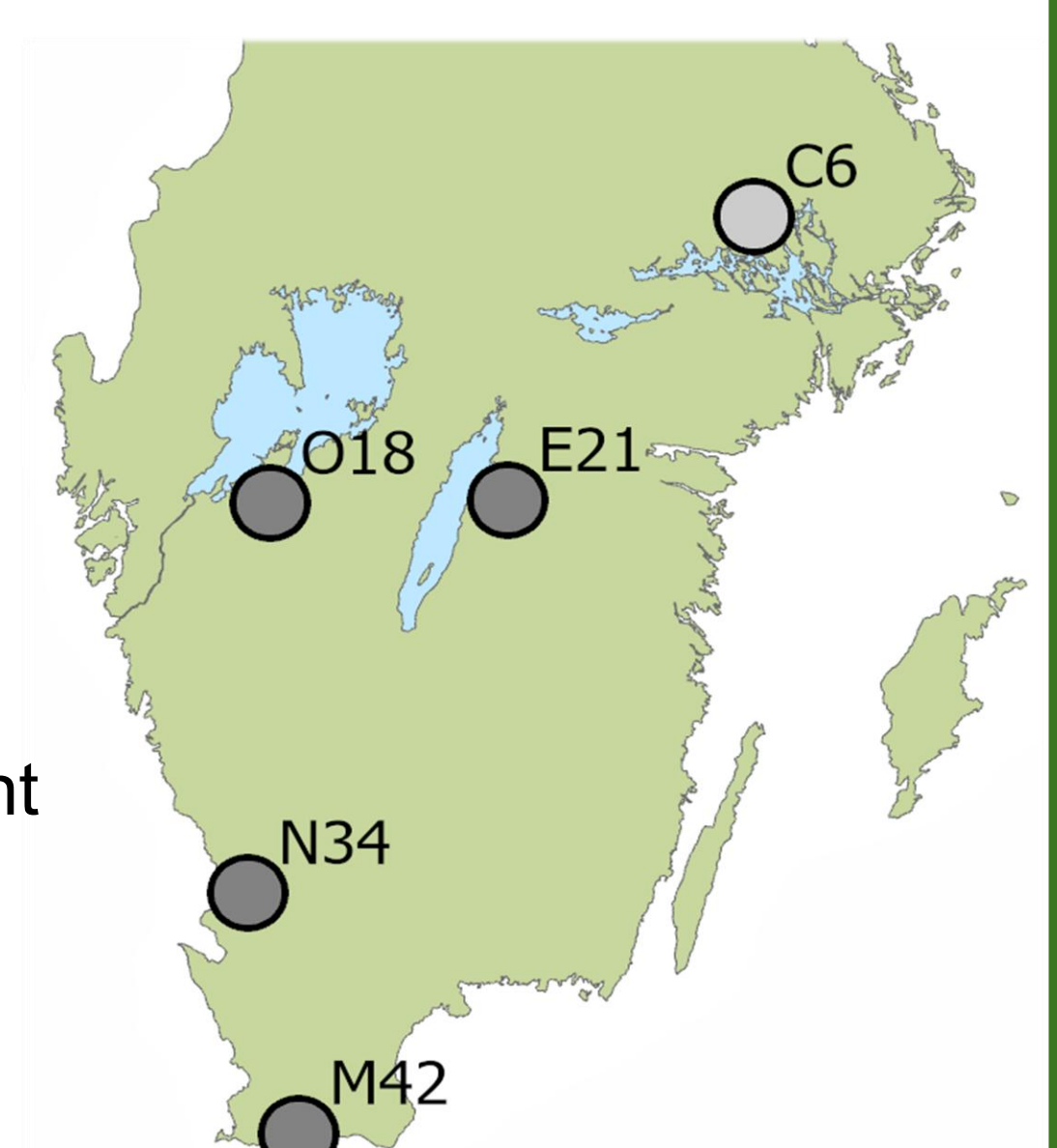


Figure 3. Map of sampling sites in the Swedish national monitoring program of pesticides, where surface water, groundwater and sediment is sampled and analysed for some 160 plant protection products since 2002. C6 not part of the ordinary program, but sampled for TFA in 2025.



Gustaf Boström
Research Engineer
gustaf.bostrom@slu.se



Kajsa Weslien
Environmental Assessment Analyst
kajsa.weslien@slu.se



Bodil Lindström
Environmental Assessment Specialist
bodil.lindstrom@slu.se



Mikaela Gönczi
Director of SLU Centre for Pesticides in the Environment (CKB)
mikaela.gonczi@slu.se



CENTRE FOR PESTICIDES IN THE ENVIRONMENT