# Supplement of
# Meso- and microplastic distribution and spatial connections to heavy metal contaminations in highly cultivated and urbanised floodplain soilscapes – a case study from the Nidda River (Germany)

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The supporting information includes additional figures and tables facilitate further visualizations of:

- Sampling sites, including detailed maps (Figure S1) and land use changes (Figure S2, S3)
- Laboratory work, including sample and density separation parameters (Figure S4) as well as additional information on blank samples (Figure S5)
- Macroplastics on soil surfaces (Figure S6 and Table S1)
- Additional result visualisations (Figure S7, Figure S8, Figure S9, Figure S10)
- Polymer types abbreviations (Table T2)

The research data on which the results and figures within the paper are based are deposited in the following public repository: Collin J. Weber (2022): Meso- and microplastic distribution and heavy metal contaminations in floodplains of the Nidda River (Germany) available under 10.6084/m9.figshare.17714909

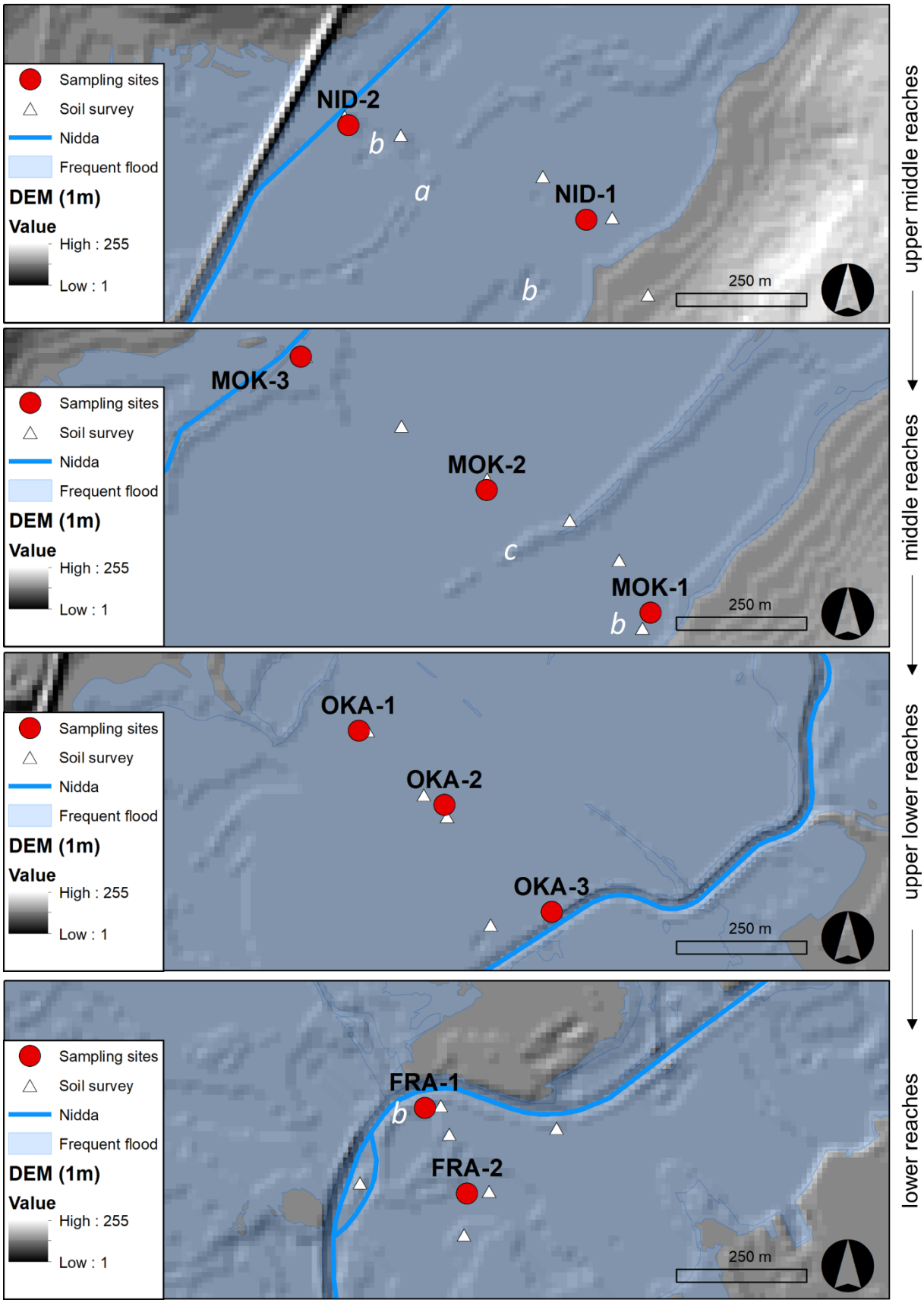


**Figure S1:** Detailed maps of transect sites NID, MOK, OKA and FRA with a: inactive flood channels; b: river renaturation structures; c: flood protection dam. Data source: © OpenStreetMap contributors 2021. Distributed under the Open Data Commons Open Database License (ODbL) v1.0. and Hessian Administration for Soil Management and Geoinformation 2021.

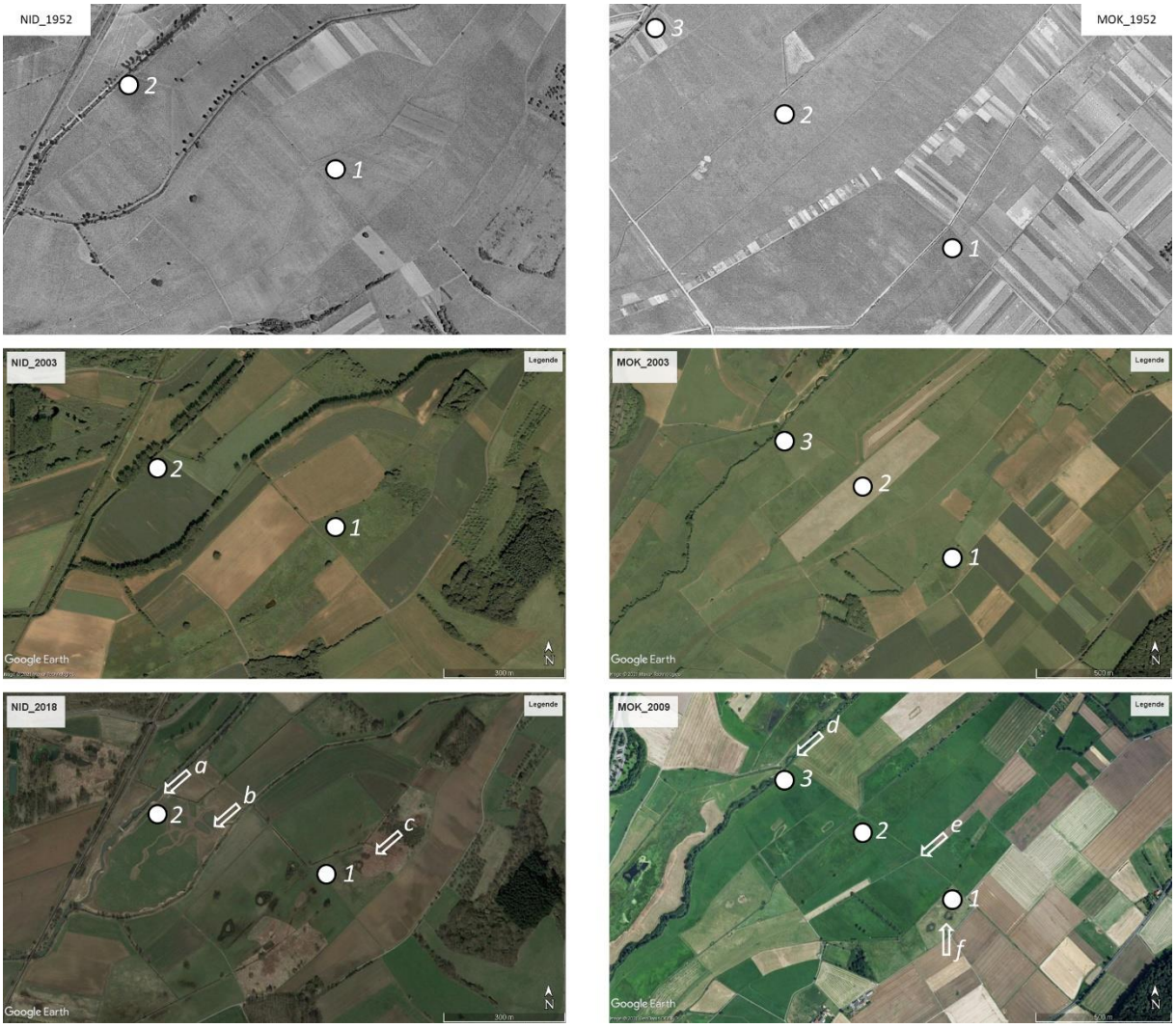


**Figure S2:** Floodplain and land use change between 1952 and 2018 for transect sites NID and MOK. Left site: Transect NID (1952, 2003, 2018) with a: river renaturation, b: floodplain renaturation (earth works) and c: floodplain renaturation. Right site: Transect MOK (1952, 2003, 2009) with d: river renaturation, e: flood protection dam and f: floodplain renaturation. Data source: © 1952 NATUREG Viewer Hessen 2021, recent images © Google Earth.

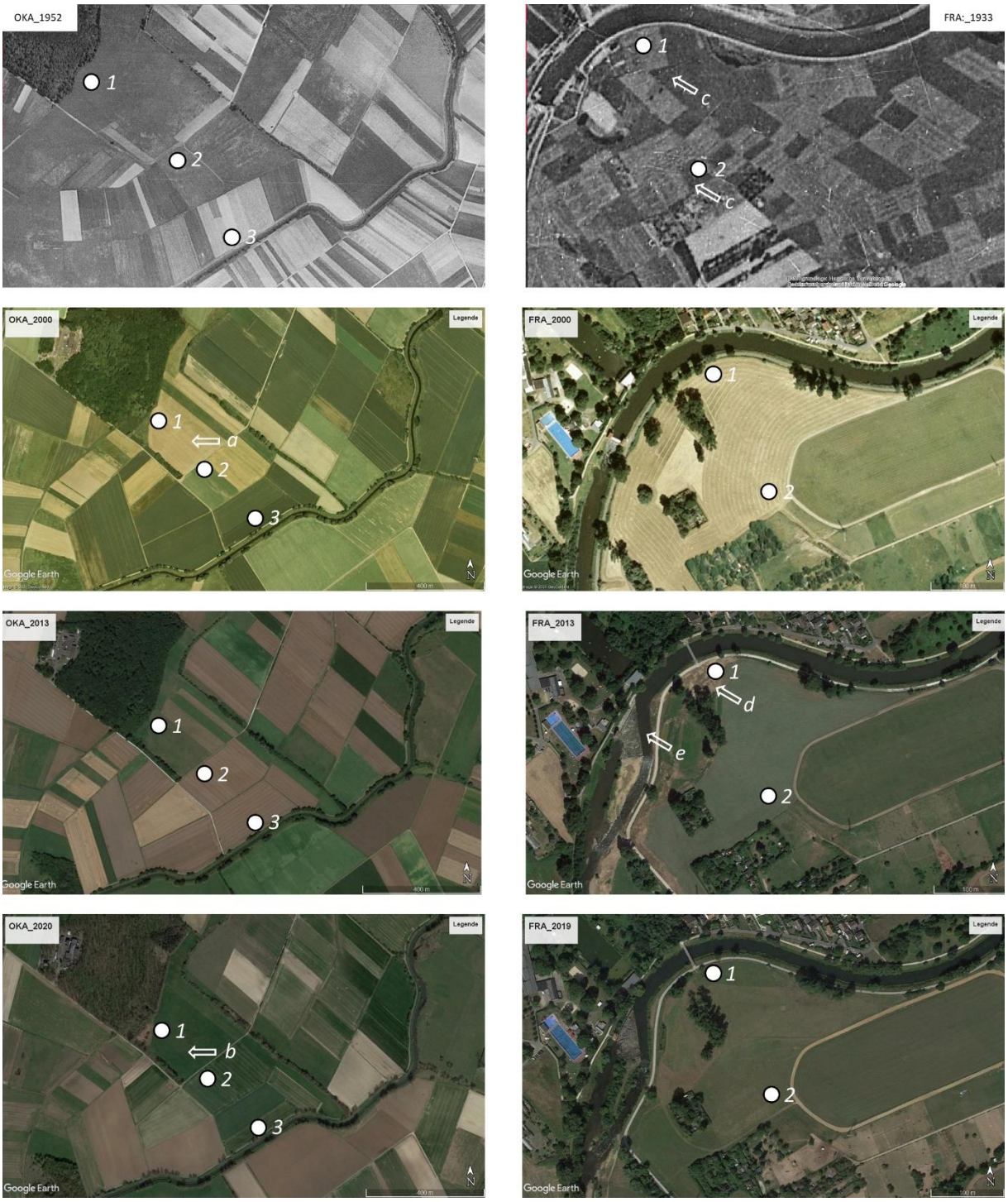


**Figure S3:** Floodplain and land use change between 1933 and 2020 for transect sites OKA and FRA. Left site: Transect OKA (1952, 2000, 2013, 2020) with a: arable land changed to b: grassland between 2000 and 2013. Right site: Transect FRA (1933, 2000, 2013, 2019) with c: arable land (small plots) changed later to grassland, d: earth works for bridge construction and e: river weir renaturation. Data source: © 1952 NATUREG Viewer Hessen 2021, recent images © Google Earth.

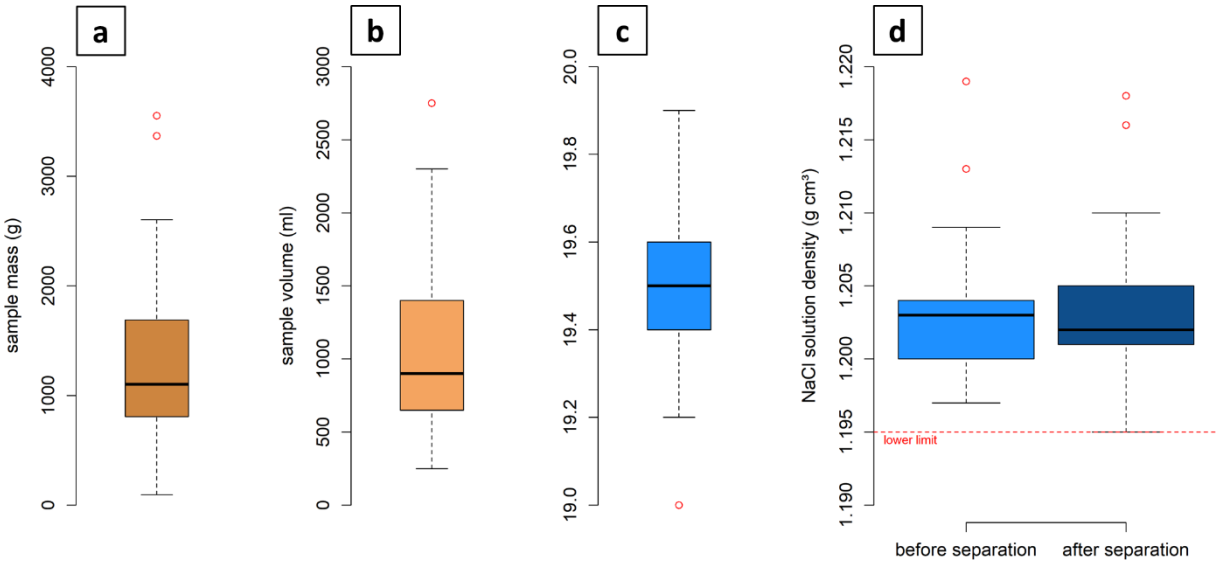


**Figure S4:** Sample and density separation parameters. a: Sample mass g which was separated (fine soil fraction <2 mm); b: Sample volume ml (fine soil fraction <2 mm); c. Density (NaCl) solution temperature before separation (°C); d: Density of NaCl solution (g/cm³) before and after separation.

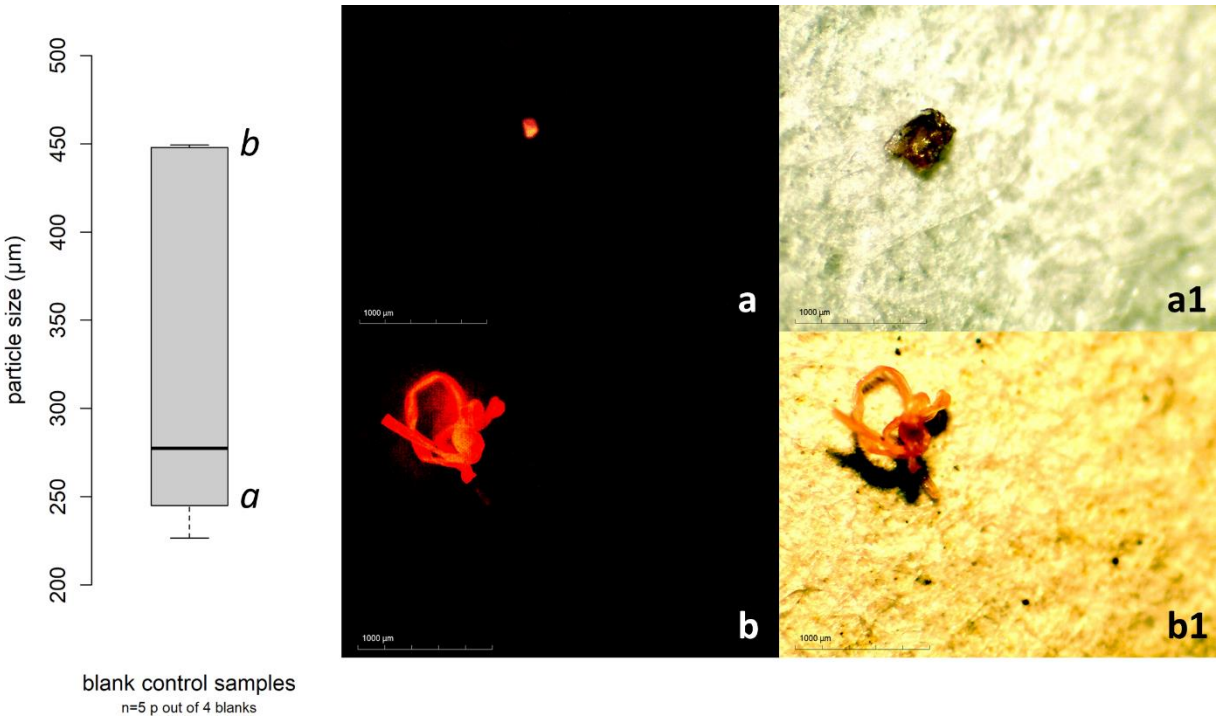


**Figure S5:** Particle sizes of particles extracted from blank samples (B1-B4, B5 clean) and examples for identified particles. a/a1: Fragment with a size of 245.0 µm; b/b1: Filament with a length of 449.4 µm.


**Figure S6:** Macroplastic particles collected from soil surfaces on sampling sites OKA-2 and OKA-3 (agricultural field). a: Primose shield, DIY store; b: Fries fork, c: Bottle cap part, d: Lollipop stick, e: Component, b1: Fries fork on soil surface, b2: Component on soil surface.

**Table S1: Macroplastics and their features from surface sampling at sampling site OKA (agricultural field).**

| FID | Site | Type | Shape[a] | Degradation state | Color | Size (mm) | Polymer | Identification | Picture |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | fragment | regular | weathered | colored | 55 | PMMA | Primose shield, DIY store | ***a*** |
| 2 | | fragment | broken | weathered | blue | 74 | PS | Fries fork | ***b*** |
| 3 | | fragment | regular | weathered | white | 25 | LD-PE | Bottle cap part | ***c*** |
| 4 | | fragment | regular | weathered | green | 75 | PP | Lollipop stick | ***d*** |
| 5 | | fragment | broken | weathered | grey | 46 | PP | Pen part | |
| 6 | | fragment | broken | weathered | grey | 100 | PVC | | |
| 7 | | fragment | broken | weathered | grey | 76 | PVC | | |
| 8 | | film | irregular | weathered | black | 100 | HD-PE | | |
| 9 | | film | irregular | weathered | black | 72 | LD-PE | | |
| 10 | | film | irregular | weathered | blue | 45 | HD-PE | | |
| 11 | OKA-2 | film | regular | fresh | blue | 14 | PVC | | |
| 12 | | film | irregular | weathered | green | 40 | HD-PE | | |
| 13 | | film | irregular | weathered | black | 36 | HD-PE | | |
| 14 | | film | regular | incipient alteration | white | 32 | PP | | |
| 15 | | film | irregular | weathered | white | 74 | LD-PE | | |
| 16 | | film | irregular | weathered | white | 60 | HD-PE | | |
| 17 | | film | irregular | weathered | white | 69 | LD-PE | | |
| 18 | | fragment | irregular | weathered | silver | 58 | Phenoxy resin | Wrap | |
| 19 | | film | irregular | weathered | transparent | 52 | PET | Bonbon wrap | |
| 20 | | film | irregular | weathered | transparent | 35 | HD-PE | | |
| 21 | | film | irregular | weathered | transparent | 80 | HD-PE | | |
| 22 | | fragment | regular | incipient alteration | black | 150 | HD-PE | Component vehicle | |
| 23 | | fragment | irregular | incipient alteration | grey | 65 | PET | Component | ***e, e1*** |
| 24 | | fragment | regular | fresh | green | 95 | PP | | |
| 25 | | fragment | regular | fresh | red | 103 | LD-PE | Bottle cap part | |
| 26 | OKA-3 | film | regular | fresh | white_red | 84 | PET | Food wrap | |
| 27 | | film | irregular | incipient alteration | white | 58 | HD-PE | | |
| 28 | | film | irregular | incipient alteration | white | 99 | HD-PE | | |
| 29 | | film | irregular | incipient alteration | white | 82 | HD-PE | | |
| 30 | | styrofoam | irregular | incipient alteration | white | 55 | Styrofoam | | |
| 31 | | styrofoam | irregular | weathered | white | 45 | Styrofoam | | |

[a] Shape classes: regular (regular shape, no broken or irregular edges), broken (broken edges), irregular (irregular shape with irregular edges, e.g., frayed edges)

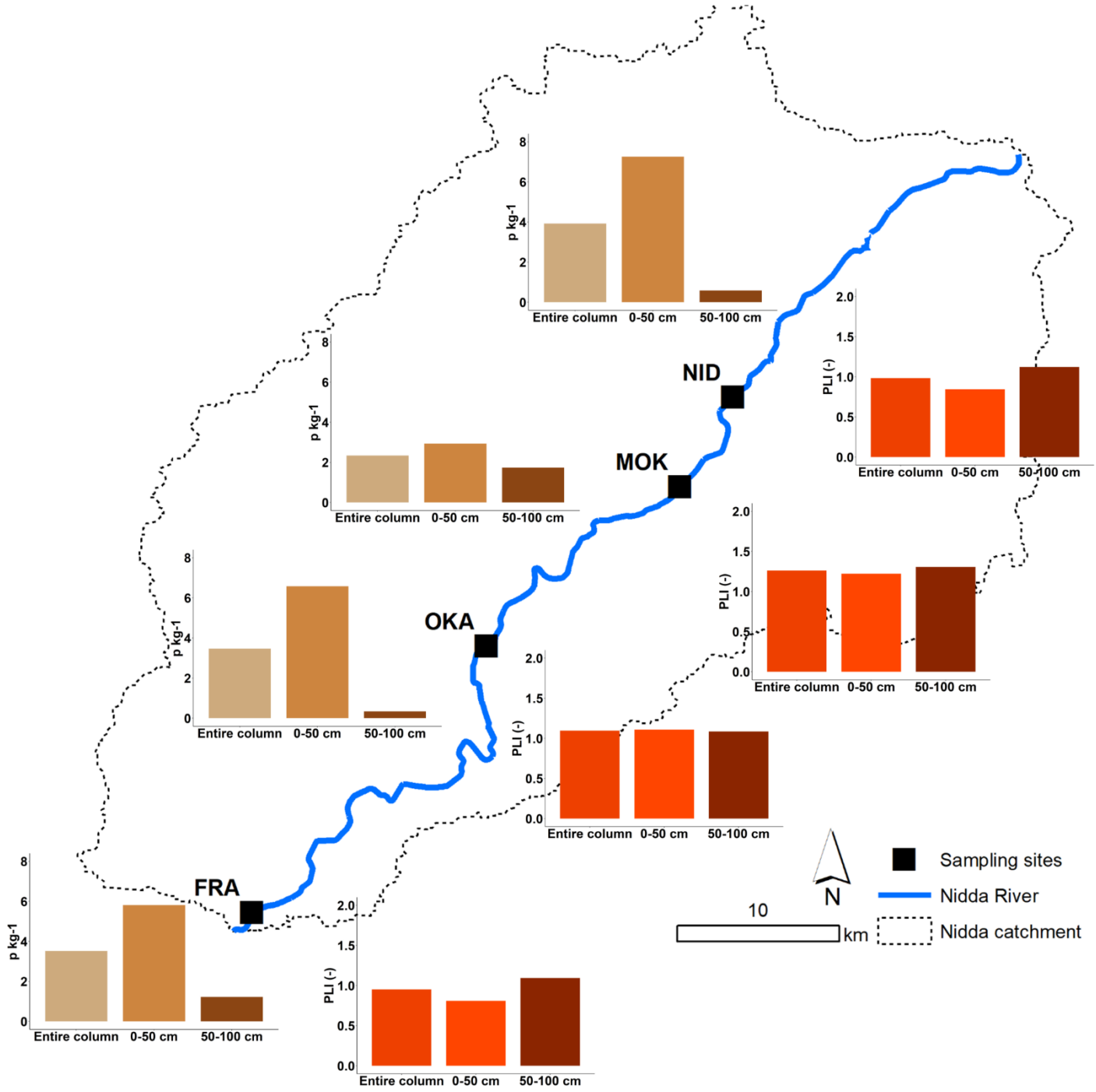


**Figure S7:** Plastic loads (p $kg^{-1}$) and Pollution load index (PLI) along the Nidda River course.

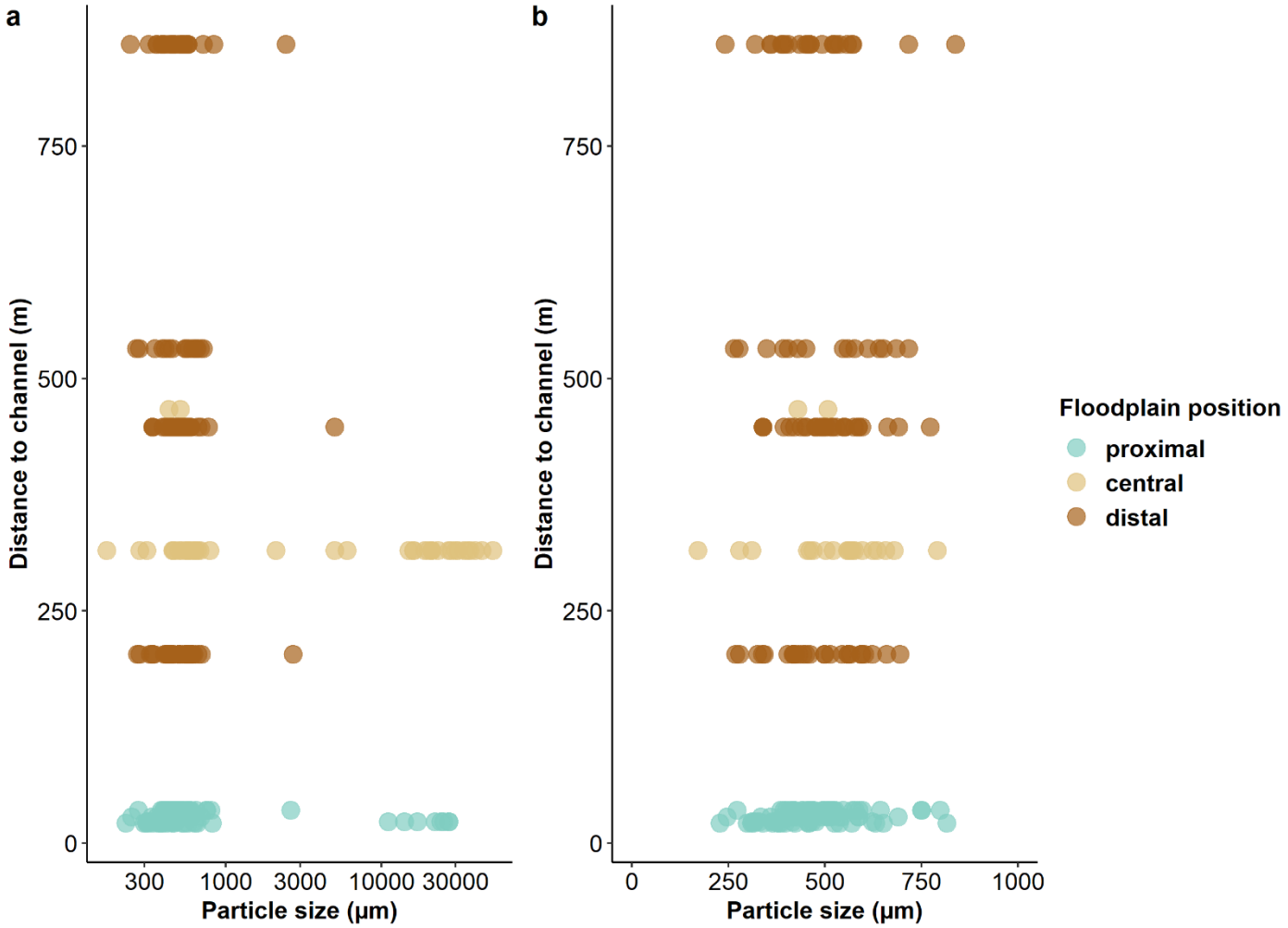


**Figure S8:** Plastic particle sizes in dependence of distance to channel (m) classified according to floodplain position with a: entire plastic particle size range and b: excerpt of sizes between 0 and 1000 µm.

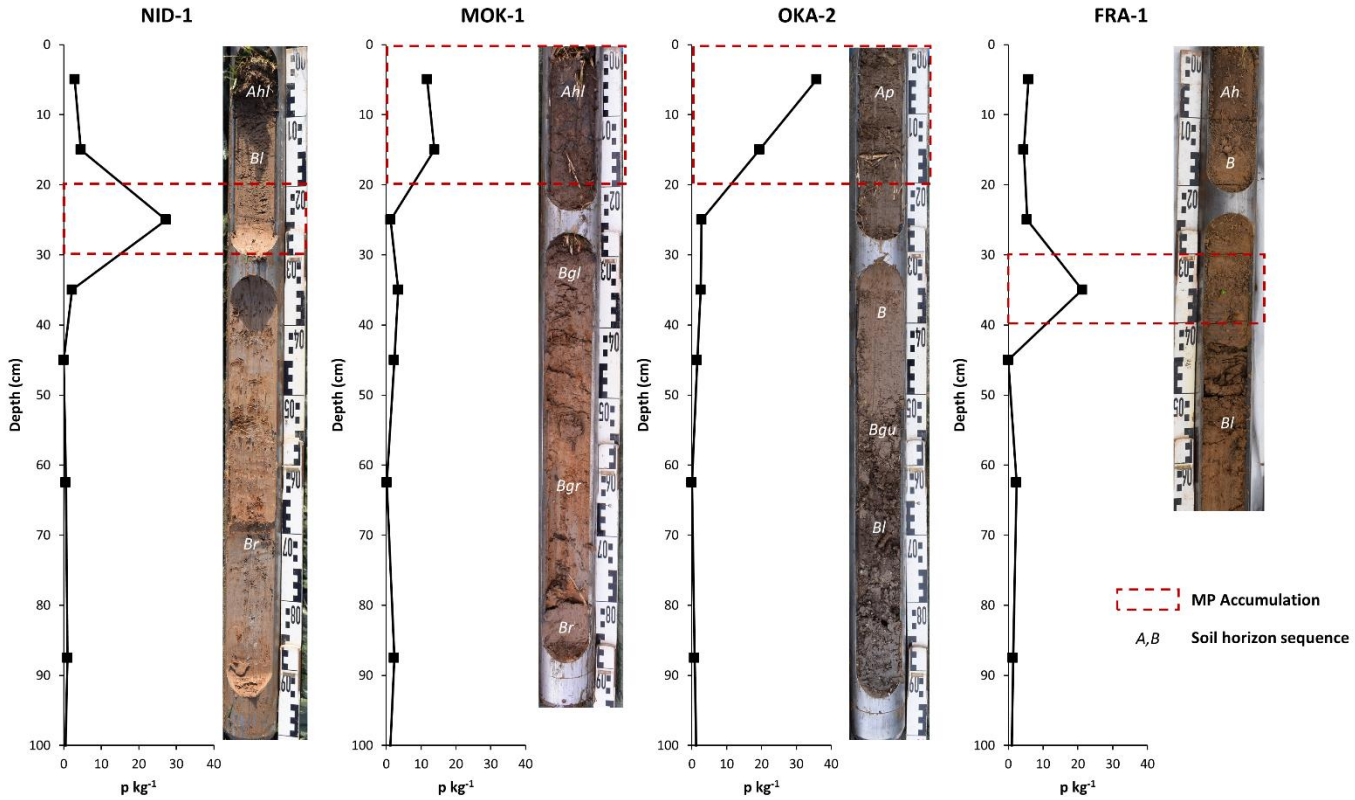


**Figure S9:** Plastic accumulations in four different floodplain soils. Plastic loads (p $kg^{-1}$) and drill core pictures for upper soil layers.

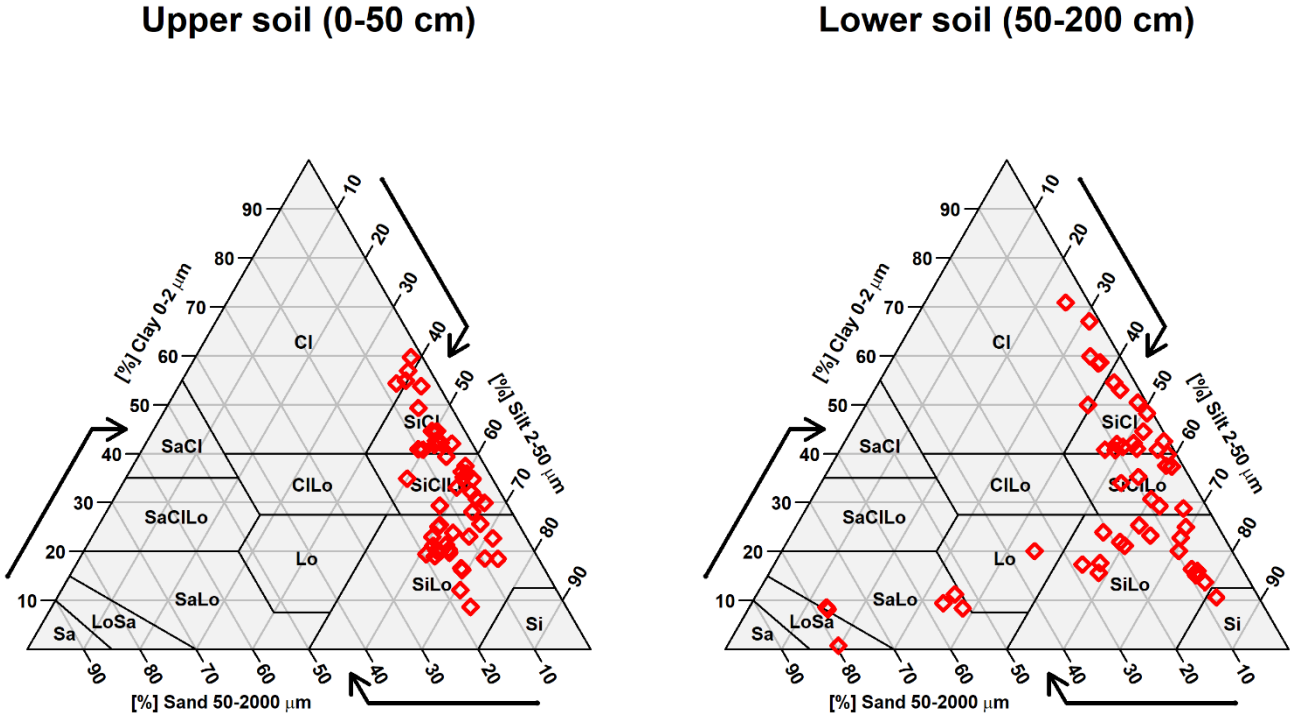


**Figure S10:** Soil textures according USDA soil texture classification for upper soil layers (left) and lower soil layers (right).

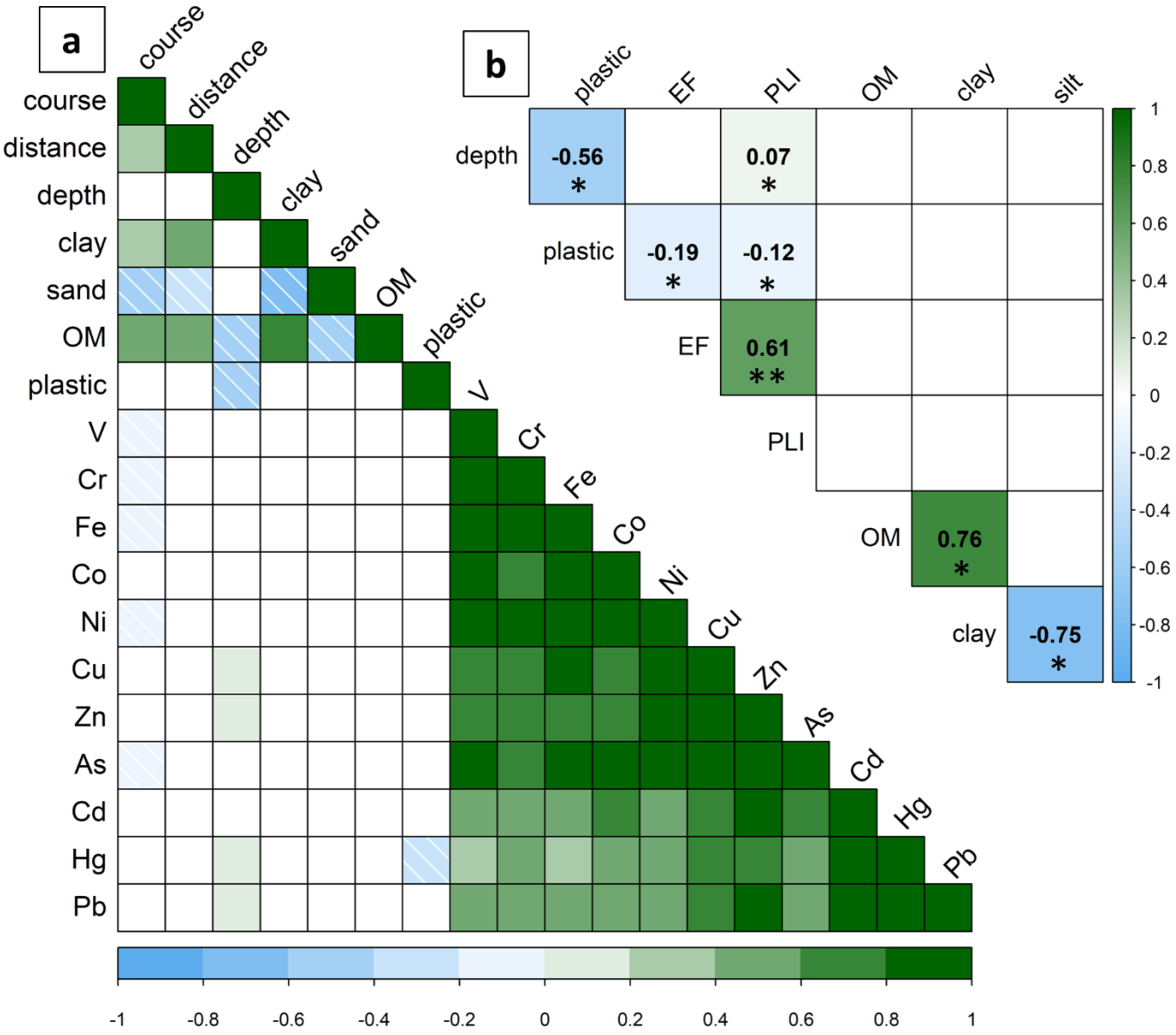


**Figure S11:** Spearman correlation coefficients of spatial features, soil properties, metals, pollution indices and plastic loads. a: Spearman correlation coefficients expressed through color scale for spatial features (course: River km, distance: distance to channel, depth: soil depth), soil properties (clay content, sand content, OM: organic matter content), plastic loads (p kg-1) and metal loads (mg kg-1) ($p > 0.05$ = blank grid section); b: Spearman correlation coefficients for plastic loads (p kg-1), Enrichment factor (EF), Pollution load index (PLI), soil depth (cm), clay content, sand content and organic matter (OM) content. Significance levels: $p \leq 0.01$ (**); $p \leq 0.05$ (*); $p > 0.05$ (blank grid section).

**Table S2:** Polymer types abbreviations (order following mention within Figure 2a)

| Abbreviation | Polymer type |
|---|---|
| PVA | Poly(vinyl alcohol) |
| PVC | Polyvinyl chloride |
| PS | Polystyrene |
| HDPE | High-density polyethylene |
| PA | Polyamides |
| PUR | Polyurethane |
| PTFE | Polytetrafluoroethylene |
| ABS | Acrylonitrile butadiene styrene |
| LDPE | Low-density polyethylene |
| PP | Polypropylene |
| PET | Polyethylene terephthalate |
| CSM | Chlorosulfonated polyethylene |
| CPE | Chlorinated polyethylene |