

Table S2A. PCA results: first-order and second-order loadings (9–14 July 2024)

| Spectral index* | First-order PCA |          |           |           | Second-order PCA |          |          |          |
|-----------------|-----------------|----------|-----------|-----------|------------------|----------|----------|----------|
|                 | PC1, 64%        | PC2, 24% | rPC1, 46% | rPC2, 26% | rPC3, 9%         | rPC4, 7% | rPC5, 5% | rPC6, 2% |
| AC_Index        | –               | –        | 0.39      | 0.55      | –                | 0.56     | –        | –        |
| BIG2            | –               | –        | –0.46     | 0.46      | –                | –        | –        | –        |
| CIGRN           | 0.20            | –        | –         | –         | –                | –        | –        | –        |
| GLI             | –               | –        | –0.22     | 0.30      | –0.25            | –0.26    | –        | –        |
| GNDVI           | –               | –        | –         | –         | –                | –        | –0.21    | –        |
| LSWI            | 0.20            | –        | –         | –         | –                | –        | –        | –        |
| MNDW            | –               | –0.27    | –0.23     | –         | –                | –        | –        | –        |
| MSAVI           | 0.20            | –        | –         | –         | –                | –        | –        | –        |
| MTVI2           | 0.21            | –        | –         | –         | –                | –        | –        | –        |
| NBRI            | –               | –        | –         | –         | –                | –        | –        | –        |
| NDBaI           | –               | –0.20    | –0.23     | –         | –                | 0.20     | –0.36    | –        |
| NDChla          | –               | –0.22    | –         | –         | –0.30            | –0.25    | –        | –        |
| NDGCI           | –               | –        | –         | –         | –                | –        | –        | –        |
| NDI             | –               | –        | –         | –         | –                | –        | –        | –        |
| NDII            | –               | –        | –0.21     | –         | –                | 0.26     | –        | –        |
| NDIO            | –               | 0.26     | –0.30     | 0.22      | 0.23             | –        | –        | –        |
| NDNIRBlue       | –               | 0.33     | –         | –         | –                | –0.24    | –        | –        |
| NDRE            | 0.20            | –        | –         | –         | –                | –        | –        | –0.23    |
| NDREI           | –               | –        | –         | –         | –                | –        | 0.26     | –        |
| NDTI            | –               | –        | –         | –         | 0.34             | –0.27    | –        | 0.38     |
| NDTSM           | –               | –        | –         | –         | –                | –        | –        | –        |
| NDVI            | 0.20            | –        | –         | –         | –                | –        | –        | –        |
| NDWI1           | –               | –        | –         | –         | –                | –        | –        | –        |
| NDWI2           | –               | –0.31    | –0.21     | –         | 0.23             | –        | –0.21    | 0.45     |
| RBNDVI          | –               | –        | –         | –         | –                | –        | –        | –        |
| RedEdge_NDVI1   | 0.20            | –        | –         | –         | –                | –        | –        | –        |
| RedEdge_NDVI2   | 0.20            | –        | –         | –         | –                | –        | –        | –        |
| REDI            | –               | –        | –         | –         | –                | –        | –        | –0.46    |
| RENDVI          | 0.21            | –        | –         | –         | –                | –        | –        | –        |
| RI              | –               | –0.32    | –0.20     | –         | –                | –        | –        | –        |
| SIPI            | –               | –        | –         | –         | –                | –        | –        | –        |
| SVSI            | –               | 0.25     | –0.34     | –         | 0.24             | –        | –        | –        |
| TCL_BRIGHT      | –               | 0.27     | –0.24     | –0.30     | –0.42            | 0.28     | –0.34    | 0.34     |
| TCL_GREEN       | 0.21            | –        | –         | –         | –                | –        | 0.24     | –        |
| TCL_WET         | –               | –0.30    | –         | –         | 0.20             | –        | 0.27     | –0.21    |
| VARI            | –               | –0.22    | –         | –         | –0.32            | –0.24    | –        | –        |

Note: loadings with |value| &lt; 0.2 are replaced by '–'.

Table S2B. PCA results: first-order and second-order loadings (8–13 August 2025)

| Spectral index* | First-order PCA |          |           |           | Second-order PCA |          |          |          |
|-----------------|-----------------|----------|-----------|-----------|------------------|----------|----------|----------|
|                 | PC1, 56%        | PC2, 28% | rPC1, 70% | rPC2, 13% | rPC3, 5%         | rPC4, 4% | rPC5, 3% | rPC6, 2% |
| AC_Index        | –               | –        | –0.59     | –0.27     | –                | –0.27    | 0.44     | –        |
| BIG2            | –               | –        | –         | –0.51     | –                | –0.30    | –        | –        |
| CIGRN           | 0.21            | –        | –         | –         | –0.25            | –        | –        | –        |
| GLI             | –               | –        | –         | –0.38     | –                | –        | –0.40    | –        |
| GNDVI           | 0.21            | –        | –         | –         | –                | –        | –        | –        |
| LSWI            | 0.20            | –        | –         | –         | 0.27             | –        | –        | –        |
| MNDW            | –               | –0.24    | 0.20      | –         | –                | –        | –        | –        |
| MSAVI           | 0.22            | –        | –         | –         | –0.24            | –        | –        | –        |
| MTVI2           | 0.22            | –        | –         | –         | –0.28            | –        | –        | –        |
| NBRI            | –               | –        | –         | –         | –                | –        | –        | –        |
| NDBaI           | –               | –0.24    | –         | –0.23     | –                | –        | 0.29     | –        |
| NDChla          | –               | –0.27    | –         | –         | –                | –        | –0.31    | –        |
| NDGCI           | 0.20            | –        | –         | –         | –                | –        | –        | –        |
| NDI             | –               | –        | –         | –         | –0.25            | –        | –        | –        |
| NDII            | –               | –        | 0.32      | –         | –                | –        | 0.23     | –        |
| NDIO            | –               | 0.26     | –         | –         | –                | –0.25    | –        | –        |
| NDNIRBlue       | –               | 0.30     | –         | –         | –                | –        | –0.26    | –        |
| NDRE            | 0.22            | –        | –         | –         | –                | –        | –        | –        |
| NDREI           | 0.21            | –        | –         | 0.24      | –                | –        | –        | –        |

| Spectral index* | First-order PCA |          |           |           | Second-order PCA |          |          |          |
|-----------------|-----------------|----------|-----------|-----------|------------------|----------|----------|----------|
|                 | PC1, 56%        | PC2, 28% | rPC1, 70% | rPC2, 13% | rPC3, 5%         | rPC4, 4% | rPC5, 3% | rPC6, 2% |
| NDTI            | –               | –        | –         | –         | 0.38             | –        | –        | –        |
| NDTSM           | 0.20            | –        | –         | –         | –                | –        | –        | –        |
| NDVI            | 0.22            | –        | –         | –         | –                | –        | –        | –        |
| NDWI1           | –0.21           | –        | –         | –         | –                | –        | –        | –        |
| NDWI2           | –               | –0.28    | –         | –         | 0.30             | –        | –        | –0.25    |
| RBNDVI          | 0.20            | –        | –         | –         | –                | –        | –        | –        |
| RedEdge_NDVI1   | 0.22            | –        | –         | –         | –                | –        | –        | –        |
| RedEdge_NDVI2   | 0.22            | –        | –         | –         | –                | –        | –        | –        |
| REDI            | –               | –        | –         | –         | –                | –        | –        | 0.83     |
| RENDVI          | 0.22            | –        | –         | –         | –                | –        | –        | –        |
| RI              | –               | –0.29    | 0.20      | –         | –                | –        | –        | –        |
| SIPI            | 0.21            | –        | –         | –         | –                | –        | –        | –        |
| SVSI            | –               | 0.25     | 0.22      | –         | 0.20             | –0.28    | –        | –        |
| TCL_BRIGHT      | –               | 0.21     | 0.35      | –0.28     | –                | 0.41     | –        | –        |
| TCL_GREEN       | 0.22            | –        | –         | –         | –0.23            | –0.28    | –        | –        |
| TCL_WET         | –               | –0.29    | –         | –         | –                | –0.39    | –        | –        |
| VARI            | –               | –0.27    | –         | –         | –                | –        | –0.29    | –        |

Note: loadings with |value| < 0.2 are replaced by '–'.

Table S2C. PCA results: first-order and second-order loadings (9 July 2024 and 14 July 2025).

| Spectral index* | First-order PCA |          |           |           | Second-order PCA |          |          |          |
|-----------------|-----------------|----------|-----------|-----------|------------------|----------|----------|----------|
|                 | PC1, 67%        | PC2, 22% | rPC1, 45% | rPC2, 19% | rPC3, 15%        | rPC4, 7% | rPC5, 6% | rPC6, 3% |
| AC_Index        | –               | –        | 0.52      | 0.51      | –                | –0.48    | –        | –        |
| BIG2            | –               | –        | –0.33     | 0.62      | –                | –        | –        | –0.21    |
| CIGRN           | –               | –        | –         | –         | –                | –0.29    | –        | –        |
| GLI             | –               | –        | –         | 0.31      | 0.26             | 0.23     | –        | –        |
| GNDVI           | –               | –        | –         | –         | –                | –        | 0.21     | –        |
| LSWI            | –               | –        | –         | –         | –0.21            | –        | –        | –        |
| MNDW            | –               | –0.27    | –0.25     | –         | –                | –        | –        | –        |
| MSAVI           | 0.20            | –        | –         | –         | –                | –        | –        | –        |
| MTVI2           | 0.20            | –        | –         | –         | –                | –        | –        | –        |
| NBRI            | –               | –        | –         | –         | –                | –        | –        | –        |
| NDBaI           | –               | –        | –         | –         | –                | –        | 0.48     | –        |
| NDChla          | –               | –        | –         | –         | 0.29             | 0.22     | –        | –        |
| NDGCI           | –               | –        | –         | –         | –                | –        | –        | –        |
| NDI             | –               | –        | –         | –         | –                | –        | –        | –        |
| NDII            | –               | –        | –0.23     | –         | –                | –0.28    | –        | –        |
| NDIO            | –               | 0.27     | –         | 0.22      | –0.27            | –        | –        | –        |
| NDNIRBlue       | –               | 0.35     | –         | –         | –                | 0.21     | –        | –        |
| NDRE            | 0.20            | –        | –         | –         | –                | –        | –        | –        |
| NDREI           | –               | –        | –         | –         | –                | –        | –0.22    | –        |
| NDTI            | –               | –        | –         | –         | –0.46            | 0.24     | –0.26    | 0.29     |
| NDTSM           | –               | –        | –         | –         | –                | –        | –        | –        |
| NDVI            | 0.20            | –        | –         | –         | –                | –        | –        | –        |
| NDWI1           | –               | –        | –         | –         | –                | –        | –        | –        |
| NDWI2           | –               | –0.31    | –0.20     | –         | –0.32            | –        | –        | 0.26     |
| RBNDVI          | –               | –        | –         | –         | –                | –        | –        | –        |
| RedEdge_NDVI1   | –               | –        | –         | –         | –                | –        | –        | –        |
| RedEdge_NDVI2   | –               | –        | –         | –         | –                | –        | –        | –        |
| REDI            | –               | –        | –         | –         | –                | –        | –        | –0.61    |
| RENDVI          | 0.20            | –        | –         | –         | –                | –        | –        | –        |
| RI              | –               | –0.33    | –0.27     | –         | –                | –        | –        | –        |
| SIPI            | –               | –        | –         | –         | –                | –        | –        | –        |
| SVSI            | –               | 0.24     | –0.29     | –         | –0.22            | –        | –        | –        |
| TCL_BRIGHT      | –               | 0.29     | –0.33     | –         | 0.24             | –        | 0.35     | 0.49     |
| TCL_GREEN       | 0.20            | –        | –         | –         | –                | –0.23    | –        | –        |
| TCL_WET         | –               | –0.31    | –         | –         | –                | –        | –        | –0.21    |
| VARI            | –               | –        | –         | –         | 0.30             | 0.20     | –        | –        |

Note: loadings with |value| < 0.2 are replaced by '–'.

Table S2D. PCA results: first-order and second-order loadings (18 August 2024 and 13 August 2025).

| Spectral index* | First-order PCA |             |              |              | Second-order PCA |             |             |             |             |
|-----------------|-----------------|-------------|--------------|--------------|------------------|-------------|-------------|-------------|-------------|
|                 | PC1,<br>61%     | PC2,<br>24% | rPC1,<br>47% | rPC2,<br>18% | rPC3,<br>15%     | rPC4,<br>6% | rPC5,<br>6% | rPC6,<br>4% | rPC7,<br>2% |
| AC_Index        | –               | –           | 0.43         | 0.41         | –0.36            | –           | –0.47       | –           | –           |
| BIG2            | –               | –           | –0.43        | 0.45         | –0.32            | –0.29       | –           | –           | –           |
| CIGRN           | 0.20            | –           | –            | –            | –                | –           | –0.26       | –           | –           |
| GLI             | –               | –           | –            | 0.37         | –                | –           | –           | –           | –           |
| GNDVI           | –               | –           | –            | –            | –                | 0.21        | –           | –           | –           |
| LSWI            | 0.21            | –           | –            | –            | –                | –           | –           | –           | –           |
| MNDW            | –               | 0.27        | –0.23        | –            | –                | –           | –           | –           | –           |
| MSAVI           | 0.21            | –           | –            | –            | –                | –           | –           | –           | –           |
| MTVI2           | 0.21            | –           | –            | –            | –                | –           | –           | –           | –           |
| NBRI            | 0.20            | –           | –            | –            | –                | –           | –           | –           | –           |
| NDBaI           | –               | 0.21        | –            | –            | –                | 0.47        | –           | –           | 0.22        |
| NDChla          | –               | 0.25        | –            | 0.24         | 0.21             | –           | –           | –           | –           |
| NDGCI           | –               | –           | –            | –            | –                | –           | –           | –           | –           |
| NDI             | –0.20           | –           | –            | –            | –                | –           | –           | –           | –           |
| NDII            | –               | –           | –0.24        | –            | –                | –           | –0.33       | –           | –           |
| NDIO            | –               | –0.27       | –0.21        | –            | –0.36            | –           | –           | –           | –           |
| NDNIRBlue       | –               | –0.33       | –            | –            | –                | –           | 0.21        | –           | –           |
| NDRE            | 0.21            | –           | –            | –            | –                | –           | –           | –           | 0.24        |
| NDREI           | –               | –           | –            | –            | –                | –0.22       | –           | –           | –           |
| NDTI            | –               | –           | –            | –0.20        | –0.20            | –0.26       | 0.35        | –           | –0.27       |
| NDTSM           | –               | –           | –            | –            | –                | –           | –           | –           | –           |
| NDVI            | 0.21            | –           | –            | –            | –                | –           | –           | –           | –           |
| NDWI1           | –               | –           | –            | –            | –                | –           | –           | –           | –           |
| NDWI2           | –               | 0.27        | –            | –            | –0.37            | –           | –           | –0.21       | –0.41       |
| RBNDVI          | –               | –           | –            | –            | –                | –           | –           | –           | –           |
| RedEdge_NDVI1   | 0.21            | –           | –            | –            | –                | –           | –           | –           | –           |
| RedEdge_NDVI2   | 0.21            | –           | –            | –            | –                | –           | –           | –           | –           |
| REDI            | –               | –           | –            | –            | –                | –           | –           | 0.90        | –           |
| RENDVI          | 0.21            | –           | –            | –            | –                | –           | –           | –           | 0.31        |
| RI              | –               | 0.31        | –0.22        | –            | –                | –           | –           | –           | –           |
| SIPI            | –               | –           | –            | –            | –                | –           | –           | –           | –           |
| SVSI            | –               | –0.24       | –0.29        | –            | –0.28            | –           | –           | –           | 0.21        |
| TCI_BRIGHT      | –               | –0.24       | –0.36        | –            | 0.27             | 0.32        | –           | –           | –0.40       |
| TCI_GREEN       | 0.21            | –           | –            | –            | –                | –           | –0.21       | –           | –           |
| TCI_WET         | –               | 0.29        | –            | –0.27        | –                | –           | –           | –           | 0.41        |
| VARI            | –               | 0.25        | –            | 0.25         | 0.21             | –           | –           | –           | –           |

Note: loadings with |value| &lt; 0.2 are replaced by '–'.

Note: \* – Aerosol Contrast Index (AC\_Index) (Komlyk *et al.*, 2024), Blue-Green Index (BIG2) (Elfanah *et al.*, 2023), Green Leaf Index (GLI) (Louhaichi *et al.*, 2001), Green NDVI (GNDVI) (Gitelson *et al.*, 1996), Land Surface Water Index (LSWI) (Chandrasekar *et al.*, 2010), Modified NDWI (MNDW) (Xu, 2006), Normalized Burn Ratio Index (NBRI) (Seydi *et al.*, 2021), Normalized Difference Bareness Index (NDBaI) (Zhao and Chen, 2005), Normalized Difference Chlorophyll-a (NDChla) (Ha *et al.*, 2017), Normalized Difference Green Chlorophyll Index (NDGCI) (Chaves *et al.*, 2020), Normalized Difference Index (NDI) (Wang *et al.*, 2019), Normalized Difference Infrared Index (NDII) (Hardisky *et al.*, 1983), Normalized Difference Iron Oxide (NDIO) (Yazdi *et al.*, 2013), Blue-normalized difference vegetation index (BNDVI) (Yang *et al.*, 2004), Normalized Difference Red Edge Index (NDRE) (Barnes *et al.*, 2000), Normalized Difference Red-Edge Improved (NDREI) (Barnes *et al.*, 2000), Normalized Difference Tillage Index (NDTI) (Van Deventer *et al.*, 1997), Normalized Difference Total Suspended Matter Index (NDTSM) (Premkumar *et al.*, 2021), Normalized Difference Vegetation Index (NDVI) (Rouse *et al.*, 1974), Normalized Difference Water Index 1 (NDWI1) (McFeeters, 1996), Normalized Difference Water Index 2 (NDWI2) (Gašparović and Singh, 2020), Red-Blue NDVI (RBNDVI) (Wang *et al.*, 2019), Red Edge NDVI 1 (RedEdge\_NDVI1) (Xie *et al.*, 2018), Red Edge NDVI 2 (RedEdge\_NDVI2) (Xie *et al.*, 2018), Red Edge Difference Index (REDI) (Addabbo *et al.*, 2016), Red Edge Normalized Difference Vegetation Index (RENDVI) (Gitelson *et al.*, 1996), Rock Index (RI) (Imbroane *et al.*, 2007), Structure Insensitive Pigment Index (SIPI) (Penuelas *et al.*, 1995), Sentinel-2 Vegetation Salinity Index (SVSI) (Lugassi *et al.*, 2017), Tasseled cap greenness, brightness, and wetness indexes (TCI GREEN, TCI BRIGHT, TCI WET) (Kauth and Thomas, 1976), Modified soil-adjusted vegetation index (MSAVI) (Huete, 1988; Qi *et al.*, 1994), Chlorophyll green (CIGRN) (Gitelson and Merzlyak, 1997), Visual atmospheric resistance index (VARI) (Gitelson *et al.*, 2002), Modified triangular vegetation index (MTVI2) (Haboudane *et al.*, 2002).

Table S3. Contingency table of plant community types (rows; geobotanical classification, 20 types) against cover types (columns; Sentinel-based surface classes, 10 types) derived using two approaches: the Procrustes-improved classification and the traditional classification. Cell values are the number of pixels assigned to each plant community–cover type combination (classes 6 and 11 correspond to water and were excluded from the vegetation inventory).

| Method            | Plant community type* | Land cover type (Habitat according EUNIS)** |    |    |    |    |    |    |    |    |    |
|-------------------|-----------------------|---------------------------------------------|----|----|----|----|----|----|----|----|----|
|                   |                       | 1                                           | 2  | 3  | 4  | 5  | 7  | 8  | 9  | 10 | 12 |
| Procrust improved | 1                     | –                                           | –  | 36 | –  | –  | –  | –  | –  | –  | –  |
|                   | 2                     | –                                           | –  | 10 | –  | –  | –  | –  | 18 | –  | –  |
|                   | 3                     | –                                           | –  | –  | –  | –  | –  | 18 | –  | –  | 4  |
|                   | 4                     | –                                           | 1  | 15 | –  | 2  | –  | –  | –  | –  | 3  |
|                   | 5                     | –                                           | –  | –  | 20 | 2  | 8  | –  | –  | –  | –  |
|                   | 6                     | –                                           | –  | –  | 16 | –  | 21 | –  | –  | –  | –  |
|                   | 7                     | –                                           | 14 | –  | 3  | –  | 21 | 1  | 4  | –  | 18 |
|                   | 8                     | –                                           | 12 | –  | 15 | 5  | 12 | –  | 1  | –  | 3  |
|                   | 9                     | 3                                           | 21 | 7  | 15 | 23 | 18 | –  | –  | 8  | 8  |
|                   | 10                    | –                                           | 12 | –  | 12 | 6  | 14 | –  | –  | –  | –  |
|                   | 11                    | –                                           | 5  | –  | 17 | 2  | 28 | –  | –  | –  | –  |
|                   | 12                    | 1                                           | 4  | 1  | 5  | 12 | 30 | –  | –  | 4  | 2  |
|                   | 13                    | 2                                           | 5  | –  | 3  | 35 | 2  | –  | –  | 5  | 5  |
|                   | 14                    | 13                                          | 26 | –  | 3  | 9  | 1  | –  | –  | –  | 2  |
|                   | 15                    | –                                           | 4  | –  | 5  | 17 | 2  | –  | –  | –  | –  |
|                   | 16                    | –                                           | 2  | –  | 13 | 43 | –  | –  | –  | –  | –  |
|                   | 17                    | 35                                          | 27 | 1  | 1  | 3  | –  | –  | –  | 3  | 2  |
|                   | 18                    | 22                                          | 4  | –  | –  | 1  | –  | –  | –  | 1  | 1  |
|                   | 19                    | 2                                           | –  | –  | –  | –  | –  | –  | –  | 21 | –  |
|                   | 20                    | 12                                          | –  | –  | –  | 4  | –  | –  | –  | –  | –  |
| Traditional       | 1                     | –                                           | –  | 30 | –  | –  | –  | –  | –  | –  | 6  |
|                   | 2                     | –                                           | –  | 15 | –  | 1  | –  | 1  | 9  | –  | 2  |
|                   | 3                     | –                                           | –  | 1  | –  | 1  | –  | 12 | 1  | 6  | 1  |
|                   | 4                     | –                                           | 1  | 15 | –  | 4  | –  | –  | –  | –  | 1  |
|                   | 5                     | –                                           | 4  | –  | 15 | 2  | 9  | –  | –  | –  | –  |
|                   | 6                     | –                                           | –  | –  | 16 | –  | 21 | –  | –  | –  | –  |
|                   | 7                     | 2                                           | 13 | –  | 3  | 10 | 21 | 1  | 1  | 1  | 9  |
|                   | 8                     | 1                                           | 11 | –  | 14 | 5  | 13 | –  | 2  | –  | 2  |
|                   | 9                     | 2                                           | 22 | 7  | 15 | 24 | 18 | –  | –  | 6  | 9  |
|                   | 10                    | –                                           | 13 | –  | 11 | 6  | 14 | –  | –  | –  | –  |
|                   | 11                    | –                                           | 6  | –  | 17 | 2  | 27 | –  | –  | –  | –  |
|                   | 12                    | 3                                           | 5  | 1  | 6  | 12 | 28 | –  | –  | 4  | –  |
|                   | 13                    | 3                                           | 6  | 1  | 2  | 35 | 2  | –  | –  | 4  | 4  |
|                   | 14                    | 11                                          | 22 | –  | 3  | 15 | 1  | –  | –  | –  | 2  |
|                   | 15                    | 1                                           | 4  | –  | 4  | 16 | 3  | –  | –  | –  | –  |
|                   | 16                    | –                                           | 3  | –  | 12 | 42 | 1  | –  | –  | –  | –  |
|                   | 17                    | 31                                          | 25 | 2  | 1  | 10 | –  | –  | –  | 2  | 1  |
|                   | 18                    | 21                                          | 4  | 1  | –  | 2  | –  | –  | –  | –  | 1  |
|                   | 19                    | 8                                           | –  | –  | –  | 1  | –  | –  | –  | 14 | –  |
|                   | 20                    | 12                                          | –  | –  | –  | 4  | –  | –  | –  | –  | –  |

Note: \* Plant community types

#### Ruderal vegetation

- 1 – *Bromo tectorum-Corispermum leptopteri* Sissingh et Westhoff ex Sissingh 1950 corr. Dengler 2000
- 2 – *Chenopodietum stricti* (Oberd. 1957) Passarge 1964
- 3 – *Portulacetum oleracei* Felföldy 1942
- 4 – *Amarantho retroflexi-Echinochloetum cruris-galli* Bagrikova 2005

#### Wetland

- 5 – *Typhetum angustifoliae* Pignatti 1953
- 6 – *Rumici maritimi-Ranunculetum sclerati* Oberd. 1957
- 7 – BC *Cyperus fuscus* [*Eleocharition soloniensis*]
- 8 – DC *Oxybasis rubra* [*Phragmitetalia*]

#### Shrublands

- 9 – *Populetum nigro-albae* Slavnić 1952
- 10 – DC *Amorpha fruticosa* [*Phragmition australis*]

#### Pioneer vegetation

- 11 – DC *Cirsium arvense* [*Phragmition australis*]
- 12 – DC *Erigeron canadensis* [*Phragmition australis*]
- 13 – *Erigeronto-Lactucetum serriolae* Lohmeyer in Oberd. 1957

#### Forest and forest edges

- 14 – *Salicetum albae* Issler 1926
- 15 – *Symphyto officinalis-Anthriscetum sylvestris* Passarge 1975
- 16 – *Myosotido sparsiflorae-Alliarietum petiolatae* Gutte 1973
- 17 – DC *Stellaria media* [*Aceri tatarici-Quercion*]

#### Psammophytic

- 18 – DC *Vicia villosa* [*Artemisio arenariae-Festucion beckeri*]
- 19 – *Secali sylvestri-Brometum tectorum* Hargitai 1940
- 20 – *Secaletum sylvestre* Popescu et Sanda 1973

#### Land cover type (Habitat according EUNIS)\*\*

- 1 – EUNIS T13 – Temperate hardwood riparian forest [Disturbed, derived oak–Tatar maple riparian hardwood woodland (ruderalised edges)]
- 2 – EUNIS T11 – Temperate *Salix* and *Populus* riparian forest
- 3 – EUNIS C3.6 – Unvegetated or sparsely vegetated shores with soft or mobile sediments
- 4 – EUNIS Q51D2 – *Typha angustifolia* beds normally without free-standing water
- 5 – EUNIS E5.43 – Shady woodland edge fringes
- 6 – EUNIS C2.3 – Permanent non-tidal, smooth-flowing watercourses
- 7 – EUNIS Q511 – *Phragmites australis* beds and EUNIS F9.35 – Riparian stands of invasive shrubs
- 8 – EUNIS C3.53 – Euro-Siberian annual river mud communities
- 9 – EUNIS Q61 – Periodically exposed shore with stable, eutrophic sediments with pioneer or ephemeral vegetation
- 10 – EUNIS R11 – Pannonian and Pontic sandy steppe
- 11 – EUNIS C3.61 – Unvegetated river sand banks
- 12 – EUNIS C3.5132 – Swards of small *Cyperus* species. Medio-European communities dominated by the annual galiniales *Cyperus flavescens*, *Cyperus fuscus* and *Cyperus michelianus*.

Table S4. Coding of clusters delineated from surface spectral characteristics in terms of EUNIS habitat types

| EUNIS        | Habitat                                                       | Dates of Sentinel-2 imagery used for clustering |                              |                         |                             |
|--------------|---------------------------------------------------------------|-------------------------------------------------|------------------------------|-------------------------|-----------------------------|
|              |                                                               | 18 August 2024 and 13 August 2025               | 9 July 2024 and 14 July 2025 | 9 July and 14 July 2024 | 8 August and 13 August 2025 |
| T13          | Temperate hardwood riparian forest                            | 1                                               | 8, 11                        | 5                       | 10                          |
| T11          | Temperate <i>Salix</i> & <i>Populus</i> riparian forest       | 2                                               | 4                            | 2                       | 3                           |
| C3.6         | Unvegetated/sparsely vegetated shores (soft/mobile sediments) | 3                                               | 3                            | 3                       | 7                           |
| Q51D2        | <i>Typha angustifolia</i> beds                                | 4                                               | 1                            | 1                       | 3                           |
| E5.43        | Shady woodland edge fringes                                   | 5                                               | 2                            | 2                       | 5                           |
| C2.3         | Permanent non-tidal, smooth-flowing watercourses              | 6                                               | 5                            | 4                       | 6                           |
| Q511 + F9.35 | <i>Phragmites</i> beds + invasive riparian shrubs             | 7                                               | 6                            | 1                       | 1                           |
| C3.53        | Euro-Siberian annual river mud communities                    | 8                                               | 10                           | 6                       | 8                           |
| Q61          | Periodically exposed eutrophic stable sediments               | 9                                               | 7, 9                         | 7                       | 4                           |
| R11          | Pannonian & Pontic sandy steppe                               | 10                                              | 8, 11                        | 3                       | 2                           |
| C3.61        | Unvegetated river sand banks                                  | 11                                              | 5                            | 4                       | 9                           |
| C3.5132      | Small <i>Cyperus</i> swards                                   | 12                                              | 2                            | 5                       | 11                          |