

## Type 14:

## Small sand-dominated lowland rivers

**Distribution in river landscapes and regions according to Briem (2003):**

Outwash plains, sandy deposits, ground moraines; also in sandy regions of lower and older river terraces

**Picture:**



*Rotbach (North Rhine-Westphalia). Photograph: M. Sommerhäuser*

**Short description of morphology:**

Strongly meandering channel in a shallow trough or wide u-shaped valley. The river is more stretched when it is groundwater influenced. Besides the dominating sandy substrates, gravel can form small but well-established patches (gravel bars); locally marl and clay occur. Important secondary habitat structures include coarse woody debris, alder roots, macrophytes and fallen leaves. These organic substrates are however subordinate. The generally shallow profile exhibits deep furrows and scoured pools behind debris dams. Slip-off slopes and stable bank cliffs are well established. Eroding bank cliffs and slightly undercut banks occur. Valley bogs and fens can occur in the floodplain.

**Abiotic profile:**

<b>Size class:</b>	10 - 100 km <sup>2</sup> catchment
<b>Slope of the valley floor:</b>	2 - 7 ‰
<b>Flow category:</b>	long stretches of calm flow alternate with short turbulent sections around wood and root barriers; reversed flow in scoured pools.
<b>Channel substrates:</b>	a variety of sandy fractions dominate, often supplemented by fine and coarse gravel, some clay and marl. In the young moraines erratic cobbles or boulders occur; organic substrates; when valley bogs and fens occur in the floodplain, peat bars can occur along river banks.

**Physico-chemical water conditions:**

The type occurs in siliceous (older moraines) and calcareous (calcareous older moraines and younger moraines) variants.

	<b>siliceous</b>	<b>calcareous</b>
<b>Conductivity [<math>\mu\text{S}/\text{cm}</math>]:</b>	< 350	350 - 650
<b>pH-value:</b>	6,0 - 7,5	7,0 - 8,2
<b>Alkalinity [<math>^{\circ}\text{dH}</math>]:</b>	1 - 5	5 - 11
<b>Total hardness [<math>^{\circ}\text{dH}</math>]:</b>	3 - 8	8 - 15

**Flow regime & hydrology:**

Medium to high fluctuations in discharge over the year when streams are surface water fed, low fluctuations in groundwater influenced streams.

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### Characterisation of the macroinvertebrate community:

**Functional groups:** Besides supporting few species of the fine substrates, near-natural sand streams with gravel bars and high amounts of coarse woody debris are inhabited by hard substrate dwellers and colonisers of secondary substrates like woody debris and macrophytes. Based on the high levels of fallen leaves and woody debris, shredders are abundant in near-natural streams. Grazers feeding on small cobbles and gravel supplement the fauna. The gap system in sandy sediments supports detritus and sediment feeders, which eat fine particulate organic matter. Besides species of quickly and slowly flowing water, we find limited numbers of lenitic species. In groundwater influenced variants a higher proportion of crenal and cold-adapted species occur.

**Selection of type-specific species:** Typical are only few true sand inhabiting species like the burrowing may fly *Ephemera danica* and the stone fly *Isoptera serricornis*. More characteristic are inhabitants of secondary habitat structures like woody debris, fallen leaves and gravel bars, which are extremely important in the otherwise poorly structured sand streams. These include the caddis flies *Lasiocephala basalis*, various *Potamophylax*-species, *Sericostoma personatum* and *Notidobia ciliaris*. Common species, which occur in the local gravel bars include the caddis flies *Goera pilosa*, *Hydropsyche saxonica* and *Micropterna sequax*. A typical stonefly is *Taeniopteryx nebulosa*, a species dependent on near-natural banks and riparian structures.

### Characterisation of macrophyte and pyhtobenthos communities:

Characteristic macrophytes include *Berula erecta*, *Nasturtium officinale* and *Callitriche platycarpa* and *C. stagnalis*. The *Berula erecta*-community is limited to smaller streams (up to 5 m width).

Young moraines: macrophytes are absent or sparse. The occurring coenosis is composed mainly of elements from reed communities, Myriophyllid and pond-weed communities; plants with floating leaves occur locally. Amphibious zones are sparsely colonised, with insular reed patches. When peat occurs along the banks, some spring species may occur.

### Characterisation of the fish fauna:

Besides species, which prefer sandy substrates to spawn, phytophilic species like nine-spined sticklebacks are found in stands of submerged macrophytes. Species, which depend on the gravel bars for spawning can also occur (sandy-gravel streams with cool water temperatures in summer, are considered the "trout streams of the lowlands"). Typical are stone loach, which is dependent on coarse woody debris, and gudgeon. Also typical are brook lamprey and ammo-coete, which inhabit sandy substrates.

### Comments:

**Possible confusion with other stream types:** In the lowlands confusion is possible with degraded organic streams with a sandy riverbed. Gravel-dominated streams exhibit much higher proportions of gravel and a more sinuate than meandering channel form and typically stable undercut banks. Sometimes degraded gravel streams can resemble sand streams if the gravel fraction is removed, but host different channel form and valley slope.

**Notice:** Pure sand streams with riffle marks are often artefacts of human influence and products of centuries of continued removal of woody debris and leaves and consequently down cutting. A "typical" sand stream can have local gravel bars.

### Examples of typical streams

**Macroinvertebrates:** Angelbach (Lower Saxony), Eltingmühlenbach, Furlbach (North Rhine-Westphalia), Osterau (Schleswig-Holstein)

**Macrophytes and pyhtobenthos:** Wehrau (Schleswig-Holstein)

### Comparative literature (selection):

LANU (2001) „Sandgeprägte Fließgewässer der Sandergebiete“, LUA NRW (1999) „Sandgeprägtes Fließgewässer der Sander und sandigen Aufschüttungen“, LUA BB (2001) „Sanddominierter Bach der jung- und altglazialen Mulden- und Sohlentäler“, RASPER (2001) „Sandgeprägtes Fließgewässer des Tieflandes (mit Börden)“, SOMMERHÄUSER & SCHUHMACHER (2003)