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## Type 7:

## Small coarse substrate dominated calcareous highland rivers

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

Lacustrine limestone, Lower and Middle Jurassic stones, Upper Jurassic limestone, Cretaceous rocks

**Picture:**



*Talgasse (intermittent variant of the type) (North Rhine-Westphalia).  
Photograph: T. Ehlert*

**Short description of morphology:**

Streams of this type occur in v-shaped valleys, troughs or u-shaped valleys and flow in straight to strongly sinuous channels. The channel substrates are dominated by boulders and cobbles. In calmer sections along the shore, finer sediments like sand and mud are also found. In some streams there are signs of calc-sinter deposits (limestone tuffs on rocks).

In single channel beds of the temporary streams, we find conspicuously coarse rocky substrates (flat cobbles and boulders), and after dry periods large amounts of organic matter (fallen leaves, woody debris). The alternation of riffle and pool sections, typical for most highland streams, is often not pronounced in this stream type.

**Abiotic profile:**

**Size class:** 10 - 100 km<sup>2</sup> catchment area

**Slope of the valley floor:** 10 – 50 ‰

**Flow category:** calm to quickly flowing current, in parts turbulent

**Channel substrate:** coarse cobbles and rocks dominate, finer mineral fractions and organic substrates also occur

**Physico-chemical water conditions:**

calcareous

**Conductivity [ $\mu\text{S}/\text{cm}$ ]:** 400 - 900

**pH-value:** 7,5 - 8,5

**Alkalinity [ $^{\circ}\text{dH}$ ]:** 6 - 17

**Total hardness [ $^{\circ}\text{dH}$ ]:** 8 – 34

**Flow regime & hydrology:**

Large fluctuation in discharge over the year, with dry, intermittent flow periods possible. Typical for the temporary variant of the type (karst streams) are streamsinks, where surface streams seep away and continue to flow in the limestone aquifer and reappear at the surface in karst springs. Karst springs with high discharge can often form larger streams immediately after surfacing; karst streams are often fed by water of “foreign” regions.

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<b>Characterisation of the macroinvertebrate community:</b>	<p><b>Functional groups:</b> Permanently flowing reaches often support high numbers of species and individuals. Rheophilic stone-dwelling species dominate, but strongly decline during intermittent flow periods in the temporary variants of this stream type. Temporary reaches sustain lower numbers of taxa and individuals. Characteristic are species adapted to intermittent flow patterns and those exhibiting strong tolerance of or preferences for high carbonate water concentrations and/or limestone tuff formation on substrates. During flow periods, the fauna of temporary and permanent variants of this stream type differ only minimally.</p> <p><b>Selection of type-specific species:</b> Besides many common highland stream taxa, a number of specialised species occur, which are adapted to the intermittent flow in the temporary variant of this stream type. These include the stoneflies <i>Nemoura cinerea</i> and <i>Amphinemura standfussi</i>, die caddis flies <i>Micropterna nycterobia</i>, <i>M. sequax</i> and <i>Plectrocnemia conspersa</i> as well as the black fly <i>Simulium vernum</i>. Typical species calc-sinter reaches with limestone tuffs are the aquatic beetle <i>Riolus subviolaceus</i> and the caddis flies <i>Rhyacophila pubescens</i>, <i>Tinodes unicolor</i> and <i>Melampophylax mucoreus</i>.</p>
<b>Characterisation of macrophyte and pyhtobenthos communities:</b>	<p>Higher aquatic plants are absent. The macrophyte community is composed of aquatic mosses, like <i>Fontinalis antipyretica</i>, <i>Brachythetium rivulare</i> and the calciphile species <i>Cinclidotus fontinaloides</i>.</p>
<b>Characterisation of the fish fauna:</b>	<p>As in other highland stream types, the fish fauna of this stream type is characterised by the brook trout and bullhead. Brook lamprey is rare but can occur. In the temporary variant of this stream type, the fish fauna can be completely absent depending on recurrence and length of dry periods.</p>
<b>Comments:</b>	<p>This stream type presents a limestone variant of the typical cobble bed highland stream. For EU-WFD purposes, this stream type comprises permanent and temporary carbonate rich variants, which hardly differ in fauna during the surface discharge periods.</p>
<b>Examples of typical streams</b>	<p><b>Macroinvertebrates:</b> Lipbach (Baden-Württemberg) <b>Macrophytes and phytobenthos:</b> Große Lauter (Baden-Württemberg)</p>
<b>Comparative literature (selection):</b>	<p>Briem (2003) „Fließgewässer des Lias und Dogger“, „Fließgewässer des Muschelkalks“, „Fließgewässer des Malms, LfU (1999) „Die Hügel- und Berglandgewässer des Malms (Weißjura)“, „Die Flach- und Hügellandgewässer des Muschelkalks“, LUA NRW (1999) „Karstbach“</p>