

Profiles of German Stream Types

Tanja Pottgiesser & Mario Sommerhäuser

(February 2004)

Introduction

The EU Water Framework Directive (EU-WFD) demands that all assessments of surface waters must base on sound surface water typologies. The ecological status of a surface water body is described, based on the measured deviation from the type-specific reference conditions, which describe the natural or near-natural characteristics of a given water body type. The differentiation of natural surface water body types, for all categories of surface water bodies (streams, lakes, transitional waters and coastal waters) is thus a fundamental step for the implementation of the EU-WFD. The detailed description of typological entities serves to clearly differentiate between types and helps pinpoint their specific abiotic and biotic characteristics. The latter are of utter importance as delimited stream types must be biologically significant.

Also important is that the typological framework includes all sizes of water bodies relevant for the EU-WFD. For streams, these include all bodies of running water with at least 10km² catchment area, covering small, mid-sized, large and very large rivers.

The German Stream Typology

A fundamental draft for the German stream typology was laid out by Schmedtje et al. (2001). This served as a basis for discussion and numerous projects involved in developing stream assessment protocols in accordance with the implementation of the EU-WFD. This draft was developed further in several steps to the present typology. This development incorporated all relevant research projects involved in developing EU-WFD appropriate assessment protocols and was accompanied by the "Working Group of the Federal States on water problems" (LAWA) subcommittee "Biological Stream Assessment and Intercalibration in Accordance with the EU-WFD" (LAWA-Unterausschuss „Biologische Bewertung Fließgewässer und Interkalibrierung nach WRRL"). The German stream typology follows the System B approach as outlined in the EU-WFD. Obligatory and optional descriptors used to delineate German stream types include ecoregion, altitude, geology according to the river landscapes and regions (Briem 2003), stream slope and size.

The German stream typology was first developed following a "top down" approach, based on general, primarily geomorphologic landscapes in Germany and subsequently delimited in more detail, down to different size classes within stream types. Following this a "bottom up" validation of the types based on similarity analyses of large data sets from reference sites, with as little anthropogenic impairment as possible. The expertise from the federal states gained over the last few years in dealing with stream types went into developing the system and describing the stream types. Since this process is not ultimately finished, the typology and the "profiles" should be considered "living documents", subject to further iteration, which, with the increasing experience in dealing with the stream types will be updated.

At the time of writing, February 2004, a total of 24 stream types have been defined for Germany: Four in the ecoregion Alps and Alpine foothills, eight in the central highlands and eight in the northern German lowlands. Another and four ecoregion independent stream types were delineated which are spread out across several ecoregions. The appendix contains the table of "Biocoentically relevant stream types for Germany" and their short names. Four of the types are further broken down into sub types based on longitudinal differentiation.

These are stream types 1, 2, 3, 5 and 22. For technical reasons, the numbering of stream types is not continuous. As a result of further developing the first draft, some types were deleted or merged with others and their numbers are now missing in the list. On the other hand, defining new types in some cases brought on the need for decimals in some types; types defined by a decimal number can either represent a subtype or a completely independent type. The profile header gives clear definitions what the case is in each stream type with a decimal code number. Sub types are not considered in the 24 delimited types; they usually differ finely in their biocoenoses, while the basic morphological types show the same characteristics.

Map of biocoenotically relevant stream types in Germany

The stream types and subtypes are cartographically presented on the “Map of biocoenotically relevant stream types in Germany” (as of December 2003) (Pottgiesser et al. 2004). The Profiles are the detailed legend associated with the stream type map. Commissioned by the LAWA, this map depicts the network of all running waters relevant for the EU-WFD (DLM 1000 – Objektbereich Wasser: ATKIS®, DLM 1000; Copyright © Bundesamt für Kartographie und Geodäsie, 2003) and assigns each watercourse its appropriate stream type, as a linear object.

Purview and objectives of the stream type descriptions in „profiles“

The given stream type profiles serve to describe and illustrate stream types and create a common communication platform. They offer a contribution to the description of reference conditions, cannot however serve as the sole basis for describing reference conditions for biocoenotic assessment purposes. They also do not replace concrete, detailed reference taxa lists. These will be delivered by commissioned research projects in cooperation with state agencies.

The descriptions of the biocoenoses in the profiles are not complete. They cannot serve the purpose of checklists and should not be used as such. The species listed were rather selected for their specific ecological requirements, which are met by the characteristic habitat conditions found in a particular stream type. Not all species listed occur across the entire distribution of a given stream type. The authors are aware of the zoogeographic restrictions, but consider them subordinate in this context.

As in every typology, the profiles describe the ideal, typical situation and cannot meet the demands of intermediate forms or individual conformation. The profiles are not a description of the present status of our watercourses, and must not be mistaken for such.

Description of profiles and parameter selection:

The **header** contains the number (code) of the stream type and the complete name. For stream types, which incorporate delimited sub types (e.g. sub type 1.1 in type 1), a comment is included in the header. The colour in the header refers to the colour by which the type represented in the “Map of biocoenotically relevant stream types in Germany”.

The common or characteristic association of stream types with certain natural physiographic regions is described in the “**Distribution of river landscapes and regions in Germany**” according to Briem (2003). The nomenclature of river landscapes and region follows Briem (2003).

The short morphological characterisation of each stream type is given as a text and complemented by a **photograph** as a means of illustration.

The **short morphological characterisation** and **abiotic profile** comprise the typical parameter conformation and characteristic stream morphological forms. The brief morphological description is text giving information on channel form, valley type and form, channel substrates, channel profile and incision, and water bodies present in the floodplain. The abiotic profile addresses parameters, which are generally fixed like catchment size (size grouping according to typology system A, EU-WFD) or valley slope, or parameters relevant for biotic colonisation like current flow and channel substrates. The numerical information given in this section, e.g. % valley slope, gives representative margins of values typical for a stream type. These margins are not absolute and are not a disqualification character for any given stream from a stream type. Between closely related stream types, these margins show overlap and intermediate forms.

Physico-chemical water conditions entails is a geological classification according to the EU-WFD (siliceous, calcareous, organic streams). "Organic" streams can form base-rich or base-poor variants (e.g. type 11 and type 12). The selection of chemical and physical water condition descriptors is limited to geogenic and geochemical parameters. In different stream types margins of values may overlap. This underlines the overlap and intermediate forms between some closely related stream types, which are not sharply delimited but rather transitional. Physical and chemical range of values are of exemplary character and not a disqualification character for any given stream from a stream type, especially since present-day water quality often differs greatly from natural, geological conditions.

The characterisation of **Flow regime and hydrology** includes information on annual patterns of discharge and comments on intermittent periods in surface discharge (summer dry or ephemeral variants)

For those stream types, where a sufficient data base exists, the characterisation of biological quality components – **macroinvertebrate community, macrophyte and phytobenthos community, fish community** – lists a number of typical species, supplemented by a description of functional groups. As requested by the LAWA, the profiles of the German stream types were to include a short characterisation of the fish fauna, and macrophyte and phytobenthos community structure. With the exception of the phytobenthos communities, this was realised.

The characterisation of biological quality components was kept general on purpose. Future data and more differentiated information are being gathered and evaluated in ongoing research projects and this knowledge will be used to supplement the present characterisations.

Acknowledgements

We wish to thank all members of the LAWA subcommittee "Biological Stream Assessment and Intercalibration in Accordance with the EU-WFD" (LAWA-Unterausschuss „Biologische Bewertung Fließgewässer und Interkalibrierung nach WRRL“) for the fruitful cooperation. Representative for all members, we extend our special thanks to the chairman Dr. Klaus Wendling. The working group "Fischereiliche Gewässerzustandsbewertung" and its chairman Dr. Rainer Berg are thanked for the very helpful and critical revision of fish fauna characterisations. We thank the photographers for allowing us to publish their material, without which the profiles would not be nearly as vivid.

References

- BAYERISCHES LANDESAMT FÜR WASSERWIRTSCHAFT (Hrsg.) (2002): Fließgewässerlandschaften in Bayern. Bearbeitung: E. BRIEM & J. MANGELSDORF †. – München: 96 S. + Anlage (Steckbriefe, 1 Karte, erweiterte Kartenlegende).
- BRIEM, E. (2003): Gewässerlandschaften der Bundesrepublik Deutschland. – ATV-DVWK Arbeitsbericht. Hennef: Mappe mit Textband, Steckbriefe, Kurzfassung, 4 Karten.
- FORSCHUNGSGRUPPE FLIEßGEWÄSSER (1993): Fließgewässertypologie. Ergebnisse interdisziplinärer Studien an naturnahen Fließgewässern und Auen in Baden-Württemberg mit Schwerpunkt Buntsandstein-Odenwald und Oberrheinebene. – ecomed. Landsberg am Lech: 226 S., 1 Karte.
- HOCHSCHULE VECHTA (i. A. des NLÖ) (2003): Ökologische Bewertung von Marschengewässern entsprechend den Vorgaben der EU-WRRL, Teil 1.
- ICPDR (2002): Joint Danube Survey. Technical Report of the International Commission for the Protection of the Danube River. LITERATHY, P., V. KOLLER-KREIMEL & I. LISKA (eds.). - <http://www.icpdr.org/pls/danubis/docs/folder/HOME/ICPDR/ICPDRANNUALREPORTS/2002/INDEX.HTML>
- ICPDR (2003): UNDP/GEF Danube Regional Project. Activities 1.1.2, 1.1.6 and 1.1.7. (Stress and impact analysis, typology and reference conditions, ecological status assessment) Final Report. Authors: M. SOMMERHÄUSER, S. ROBERT, S. BIRK, D. HERING, O. MOOG, I. STUBAUER & T. OFENBÖCK. - <http://www.icpdr.org/pls/danubis/docs/folder/HOME/ICPDR/ICPDRANNUALREPORTS/2003/INDEX.HTML>
- IKSR (Internationale Kommission zum Schutze des Rheins) (2004): Entwicklung einer (Abschnitts-)Typologie für den natürlichen Rheinstrom. Verfasser: T. POTTGIESSER & M. HALLE. – Koblenz (unveröffentl.).
- LANU (Landesumweltamt für Natur und Umwelt des Landes Schleswig-Holstein, Hrsg.) (2001): Gewässerlandschaften und Bachtypen. Leitbilder für die Fließgewässer in Schleswig-Holstein. Verfasser: M. SOMMERHÄUSER, A. GARNIEL & T. POTTGIESSER. – Pirwitz. Flintbek: 62 S. + 1 Karte.
- LfU (Landesanstalt für Umweltschutz Baden-Württemberg, Hrsg.) (1999): Die Gewässerlandschaften Baden-Württembergs. Verfasser: E. BRIEM. – Oberirdische Gewässer, Gewässerökologie 53: 100 S., 1 Karte.
- LUA BB (Landesumweltamt Brandenburg, Hrsg.) (2001): Morphologische Referenzzustände für Bäche im Land Brandenburg. Bearbeitung: M. MUTZ, J. SCHLIEF & C. ORENDT. – Studien und Tagungsberichte 33: 1-75.
- LUA NRW (Landesumwelt Nordrhein-Westfalen, Hrsg.) (1999): Leitbilder für kleine bis mittelgroße Fließgewässer in Nordrhein-Westfalen. Gewässerlandschaften und Fließgewässertypen. (= LUA-Merkblätter 17). Verfasser: T. TIMM †, A. VAN DEN BOOM, T. EHLERT, P. PODRAZA, H. SCHUHMACHER, & M. SOMMERHÄUSER. – Düsseldorf: 88 S., 1 Karte.
- LUA NRW (Landesumwelt Nordrhein-Westfalen, Hrsg.) (2001): Leitbilder für mittelgroße bis große Fließgewässer in Nordrhein-Westfalen – Flusstypen. (= LUA-Merkblätter 34). Verfasser: T. EHLERT, U. KOENZEN & T. POTTGIESSER. – Düsseldorf: 130 S. 1 Karte.
- LUA NRW (Landesumwelt Nordrhein-Westfalen, Hrsg.) (2004): Morphologisches Leitbild Niederrhein. (= LUA-Merkblätter 41). Verfasser: I. IHBEN. – Düsseldorf: 62 S.
- MEHL, D. & V. THIELE (1998): Fließgewässer- und Talraumtypen des Norddeutschen Tieflandes. Am Beispiel der jungglazialen Naturräume Mecklenburg-Vorpommerns. – Parey Buchverlag. Berlin/Wien: 261 S.
- POTTGIESSER, T., J. KAIL, S. SEUTER & M. HALLE (2004): Abschließende Arbeiten zur Typisierung entsprechend den Anforderungen der EU-WRRL – Teil II, Endbericht. Forschungsprojekt im Auftrag der LAWA: 1-16 + Anhang (unveröffentl.).
- RASPER, M. (2001): Morphologische Fließgewässertypen in Niedersachsen. Leitbilder und Referenzgewässer. NLÖ (Niedersächsisches Landesamt für Ökologie, Hrsg.). – Hannover: 98 S.

- SCHMEDTJE, U., M. SOMMERHÄUSER, U. BRAUKMANN, E. BRIEM, P. HASSE & D. Hering (Stand 22.11.2001): Grundlage für die Erarbeitung der wichtigsten biozönotisch relevanten Fließgewässertypen im Sinne der Wasserrahmenrichtlinie (Typentabelle) (unveröffentl.).
- SOMMERHÄUSER, M. & H. SCHUHMACHER (2003): Handbuch der Fließgewässer Norddeutschlands – Typologie, Bewertung, Management. Atlas für die limnologische Praxis. – ecomed. Landsberg am Lech: 278 S.
- TIMM, T. & M. SOMMERHÄUSER (1993): Bachtypen im Naturraum Niederrheinische Sandplatten – Ein Beitrag zur Typologie der Fließgewässer des Tieflandes. – *Limnologica* 23: 381-394.
- WOLFF, P. (1999): Vegetation und Ökologie der nährstoffarmen Fließgewässer der Pfalz. - *Pollichia-Buch* 37: 125 S.