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Water Quality - Guidance standard for assessing the hydromorphological features of rivers

Wasserbeschaffenheit - Anleitung zur Beurteilung hydromorphologischer Eigenschaften von Fließgewässern

Qualité de l'eau - Guide pour l'évaluation des caractéristiques hydromorphologiques des rivieres

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Water Quality - Guidance standard for assessing the hydromorphological features of rivers

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Foreword

This document (EN 14614:2004) has been prepared by Technical Committee CEN/TC 230 “Water analysis”, the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by May 2005, and conflicting national standards shall be withdrawn at the latest by May 2005.

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WARNING — Safety issues are paramount when surveying rivers. Surveyors should conform to EU and national Health and Safety legislation, and any additional guidelines appropriate for working in or near rivers.

Introduction

Historically, many countries in Europe have assessed river ‘quality’ simply in terms of the chemical or pollution status of the water flowing in river channels. A more comprehensive view of river habitats is needed, however, to answer pressing ecological questions such as those arising from the EC Water Framework Directive (WFD) (Commission of the European Communities, 2000) and the EC Habitats Directive, to underpin the International Convention on Biodiversity, or to assess proposed river engineering schemes and other catchment developments. In most European countries there are now pressures from statutory and voluntary environment and conservation agencies to see rivers returned to a more natural condition. This implies a need to evaluate areas deserving protection and those requiring rehabilitation, and to encourage better management of river systems throughout Europe.

1 Scope

This document provides guidance on the features to be recorded when characterising and assessing the hydromorphology of rivers. It is based on methods developed, tested, and compared in Europe. Its main aim is to improve the comparability of hydromorphological survey methods, data processing, interpretation and presentation of results. Whilst it has particular importance in relation to the reporting requirements of the WFD, it also has considerably wider scope for other applications. Although hydromorphology is dependent on hydrology and underlying geology, this standard is focused on the structural features of rivers and on river continuity. In addition, whilst recognising the important influence of hydromorphology on plant and animal ecology and, conversely, the influence of plants and animals on hydromorphology, no attempt is made to provide guidance in this area.

2 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

2.1
aquatic macrophytes
larger plants of fresh water which are easily seen with the naked eye, including all aquatic vascular plants, bryophytes, stoneworts (Characeae) and macro-algal growths

NOTE This definition includes plants associated with open water or wetlands with shallow water.

2.2
attribute
specific recorded element of a hydromorphological feature (e.g. 'boulders' and 'silt' are substrate attributes; 'sheet piling' and 'gabions' are attributes of engineered banks)

2.3
backwater
area of low velocity or static water under dry-weather flows, most commonly former river channels or flood channels within the alluvial floodplain, connected to the river channel at least in periods of high flow

2.4
bank
permanent side of a river or island, which is above the normal water level and only submerged during periods of high river flow

NOTE In the context of this standard, the top is marked by the first major break in slope, above which cultivation or development is possible.

2.5
bankfull
maximum point on banks at which floods are held within the channel before spilling over onto the floodplain

2.6
berm
natural or artificial shelf within a river that is exposed above water level during low flows, but is submerged during high flows

2.7
bog
wetland, in which the vegetation communities (frequently dominated by *Sphagnum* mosses) form peat over long periods of time

2.8
braiding
course of a river naturally divided by deposited sediment accumulations, characterised by at least two channels which often change their course regularly

2.9
bryophytes
collective term for liverworts and mosses – plants which are often abundant on boulders and bedrock of upland streams

2.10
compaction
consolidation of the river bed through physical, chemical or biological processes

2.11
contiguous survey
survey carried out along entire river reaches, with data collected from adjoining survey units

2.12
ecological status
expression of the quality of the structure and functioning of aquatic ecosystems, expressed by comparing the prevailing conditions with reference conditions

NOTE As classified in accordance with Annex V of the EC Water Framework Directive.

2.13
embankment (levee)
artificial bank built to raise the natural bank level thereby reducing the frequency of flooding of adjacent land

2.14
floodplain
valley floor adjacent to a river that is (or was historically) inundated periodically by flood waters

2.15
fluvial features
features shaped by sedimentation and erosion

2.16
gabion
wire basket containing stones, used for river-bed or bank protection

2.17
glide
moderately-flowing water with undisturbed surface other than occasional swirls or eddies, and with constant depth across part of the channel (*cf* 'run').

2.18
hydromorphology
physical and hydrological characteristics of rivers including the underlying processes from which they result

2.19
lateral connectivity
freedom for water to move between the channel and the floodplain

2.20
lateral movement
freedom for a river channel to move across a floodplain

2.21
levee
see 'embankment'

2.22
planform
view of river pattern from above (e.g. sinuous, straight)

2.23
point bar
bar of river sediment formed on the inside of a bend in a river (cf. *side bar*)

2.24
pool
habitat feature characterised by distinctly deeper parts of the channel that are usually no longer than one to three times the channel's bankfull width, and where the hollowed river bed profiles are sustained by scouring

2.25
reach
major sub-division of a river, defined by physical, hydrological, and chemical character that distinguishes it from other parts of the river system upstream and downstream

2.26
reference conditions
conditions representing a totally undisturbed state, lacking human impact, or near-natural with only minor evidence of distortion

NOTE For waters not designated as heavily modified or artificial, synonymous with 'high ecological status' in the Water Framework Directive.

2.27
revetment
facing built to reinforce a bank

2.28
riffle
fast-flowing shallow water with distinctly broken or disturbed surface over gravel/pebble or cobble substrate

2.29
riparian zone
area of land adjoining a river channel (including the river bank) capable of directly influencing the condition of the aquatic ecosystem (e.g. by shading and leaf litter input)

NOTE In this document, the term 'riparian zone' does not include the wider floodplain.

2.30
riparian zone vegetation structure
physical character of the vegetation that creates habitat on the banks and land immediately adjacent to the river; e.g. 'complex' – mixture of trees or scrub, herbaceous vegetation, etc. or 'simple' – e.g. only herbaceous vegetation

2.31
river rehabilitation
partial return of a river to a pre-disturbance condition (e.g. by changing the planform of channelised reaches, or planting riparian vegetation)

2.32
river type
group of rivers that can be broadly differentiated from other groups on the basis of their physical and chemical characteristics (e.g. lowland chalk streams; upland ultra-oligotrophic rivers)

2.33
run
fast-flowing water with a disturbed, but not broken, surface (*cf.* 'glide')

2.34
sheet piling
material used for vertical bank protection (e.g. corrugated metal sheets)

2.35
side bar
discrete sediment deposit made by the river along the sides of relatively straight reaches (cf. *point bar*)

2.36
sinuosity
degree of deviation from a straight line, defined as channel length/valley length

2.37
stream ordering
methods for classifying rivers and streams related to the complexity of the drainage basin, generally with progressively higher order numbers usually assigned to streams with greater discharge lower down the catchment

2.38
survey unit
length of river from which data are collected during field survey; this may be a fixed length (e.g. 500 m) or variable, according to the method used, but must always be defined and recorded

2.39
submerged vegetation
plants rooted to the bed and either completely submerged or with only part of their shoots floating or emergent

2.40
substrate/substratum
material making up the bed of a river

2.41
weir
structure used for controlling flow and upstream surface level, or for measuring discharge

2.42
wetlands
habitats (e.g. marsh, fen, shallow temporary water) occupying the transitional zone between permanently inundated, and generally dry, environments

3 Principle

A standard assessment protocol is described for recording the physical features of river channels, banks, riparian zones and floodplains. The range of features surveyed, and the methods used for survey, may vary according to river character and the objectives of the study. This standard provides a common framework for these different methods, details of which can be found in the references cited in the Bibliography. Guidance is given on the hydromorphological features that should be used for characterising river types and for further assessment of morphological integrity through comparisons with reference conditions. The selection of features for survey will depend upon geographical scale and on the purpose of the exercise, with some features suitable for characterising river types, some for assessment, and some for both.

4 Survey requirements

4.1 River 'types'

Describing and identifying river 'types' enables the results of hydromorphological surveys from similar types to be compared. In addition, defining 'high status', type-specific, reference conditions in rivers is a requirement of the WFD, allowing the quality of rivers to be compared in an equitable and ecologically meaningful way.

Some hydromorphological assessment methods are not linked to river types but can still provide useful information for better river management; this standard therefore includes consideration of such methods.

The core information required to define river types can usually be derived from maps or catchment-wide databases. Types may be refined by using information gathered during field surveys, or through input from expert opinion.

It is recommended that as a minimum the following factors should be considered in the definition of river types:

Size:	e.g. stream order, catchment size, distance from source;
Gradient:	channel slope;
Geology:	a minimum of three categories, preferably more – e.g. siliceous, calcareous, mixed, organic;
Geographical location:	latitude and longitude;
Altitude:	altitude of source within the catchment, altitude of the reach being assessed;
Hydrological regime:	characteristic discharge patterns

Table 1 provides an example of the way in which physical and chemical features are used to derive river types in the legislative context of the WFD. In this example, rivers are 'typed' either according to geographic location (ecoregions) together with a set of obligatory 'descriptors' (System A), or using an equivalent approach based on 'obligatory and optional factors' (System B).