1 - METHOD BACKGROUND			
NAME OR CODE			**RHS – River Habitat Survey**
COUNTRY			England and Wales
KEY REFERENCE			Raven et al. (1997)
WEBPAGE			http://www.environment-agency.gov.uk/research/library/publications/123383.aspx
CATEGORY			It is a method designed to characterize and assess, in broad terms, the physical structure of freshwater streams and rivers (physical habitat assessment). Its primary objective is to allow a context-setting, but it can be also used in general surveillance as well as site specific survey
2 - METHOD CHARACTERISTICS			
A - SOURCE OF INFORMATION / DATA COLLECTION		Maps/Remote sensing	The method does not directly use maps and Remote Sensing analysis
		Field survey	The method records information (presence/absence criteria) st 2 scales of analysis: the first focuses on general river characteristics, the second is more detailed on habitats characterization. Only some information concerning large scale characteristics is collected
		Rapid field assessment	The method could be a rapid field assessment method only for well-trained operators
		Existing database	The method uses existing database on reference sites
		Modelling	NOT APPLICABLE
B - SPATIAL SCALE	HIERACHICAL SPATIAL SCALE	River catchment/Water body/ Reach/Cross Section	Analyses are carried out at the site scale (SWEEP-UP) and for representative transect 10 m wide (SPOT-CHECK)
	LONGITUDINAL SPATIAL SCALE	Fixed length	The method uses a fixed length, the reach SWEEP-UP = 500 m. Observations are made at 10 SPOT CHECK = 10 m wide, equally spaced
		Scaled to channel width	NOT APPLICABLE
		Variable length	NOT APPLICABLE
	LATERAL SPATIAL SCALE	Channel	The physical attributes of the channel (called wetted channel area) are entirely assessed in a 1 m wide transect (within the Spot-check)
		Banks/Riparian zones	Some characteristics (vegetation) are recorded at the bank face and within 1 m on banktop (Spot-Check)
		Floodplain	Some characteristics (bank profile, land use) are recorded within 5-50 m in the floodplain (Sweep-up)
C - TEMPORAL SCALE		Physical and morphological assessment	No historical data are used. Because of the parameters which are measured, it is not possible to add historical states of sites to the database
		Hydrological assessment	NOT APPLICABLE
D - TYPE OF METHOD		Characterization/classification	The method characterizes in detail physical features and makes also an inventory of some features, e.g. channel forms, bed morphology (n. of pool and riffle), artificial features, etc.
		Assessment by index	The method is developed to obtain 2 different final indexes: Habitat Quality Assessment (HQA) and Habitat Modification Score (HMS)
		Deviation from reference	Calibration of habitat quality is obtained by comparison with reference sites surveyed using RHS and previously scored by experts judgment (as reference sites for the UK)
		General assessment / Design framework	NOT APPLICABLE
		Modelling status / Scenario	The method does not provide and/or use models, but data collected could be potentially used for the application of habitat models
		Final expert judgment	Habitat Quality Assessment reflects the diversity of natural features based on expert opinion
		Links with other systems	The method could be used in conjunction with RIVPACS; it also collects information required by SERCON (System for Evaluating Rivers for Conservation)
E - REFERENCE CONDITIONS			Data collected and included in the database are used for the definition of the deviation from reference conditions through a *"a posteriori"* statistical approach; reference sites have been identified by experts
F - GENERAL INFORMATION	RIVER TYPOLOGY		Typology is based on cluster analysis of all sites in the initial dataset: clusters were evaluated by experts and tested in the field to determine the end-typologies used
	TYPOLOGY LIMITATIONS		The method in itself (original version) is mainly applicable to relative low energy systems, mostly single-thread and transitional systems, not to temporary systems and large rivers
	TYPE-SPECIFIC (Protocol / Assessment method)		A different protocol/method has been lately developed for Urban streams (URS, Davenport et al., 2004)
	BASIS FOR STANDARDS / THRESHOLDS		The HQA is divided in 5 classes (from 1=very good (reference) to 5=bad); the HMS is in 6 different classes (from 0=pristine to > 45 = severely modified). The classification is based on quintile divisions derived from the reference sites score (obtained by the application of the RHS)
	REACH SCALE SURVEY STRATEGY		10 representative sites (Spot-checks within a 500m reach)
	TIMING AND FREQUENCY		About 1 hour for the field survey per site (experienced surveyors who have received two days of training); poor repeatability of the method through time
	DATA PRESENTATION (OUTPUT/LAYOUT)		The method provides: data to entry in the database; an index of habitat quality (HQA); a scoring system to assess the habitat modification (HMS); all data in the RHS database can also be visualised through use of GIS
	METHOD SUPPORT / APPLICATION TOOLS		It does exist a RHS database where all surveys accomplished with the method are entered; there are also booklets available with examples and photos of features to be scored; the method uses a field compilation form
	SPATIAL COMPARISON		The system relies on comparison of sites for the scoring system of quality (same type); habitat modification system is not linked to a specific river type
	CONNECTION TO ECOLOGY		The method could supply a framework to set biological surveys
	USERS		The method does not require specialist geomorphological or botanical expertise, but recognition of vegetation types and an understanding of basic geomorphological principles and processes are needed; training is mandatory for surveyors
	SCALE INFORMATION		The method is applicable at individual site level, it gives only few information at larger spatial scales; multiple sites can be combined into water body data
	NUMBER OF END PARAMETERS		63 parameters (+sub parameters) divided into 15 categories

3. RECORDED FEATURES			
A - CATCHMENT / VALLEY	LARGE SCALE CHARACTERISTICS		Altitude; slope; geology; height of source; valley form; distinct flat valley bottom; natural terraces
	HYDROLOGICAL REGIME	Hydrological conditions	The method checks only the flow conditions at the time of observation
		Metrics of hydrological regime	NOT APPLICABLE
		Hydro-peaking	NOT APPLICABLE
	VALLEY FORM / FEATURES		Predominant valley form; distinct flat valley bottom; natural terraces
B - CHANNEL	CHANNEL PATTERN / PLANFORM		NOT APPLICABLE (but, indirectly, it records for example the number of sub-channels for braided rivers, point bar characteristics for meandering rivers)
	CHANNEL FORMS		Not visible, none, exposed bedrock --> mature island, trash (urban debris) + presence of e.g. side channels, backwaters
	BED CONFIGURATION		The number of pools and riffles; the presence of waterfalls and cascades
	CHANNEL DIMENSIONS		Banks (height, embanked height, etc.); channel (depth, width, etc.); trashline; extent of channel and bank features
	FLOW-TYPE		Not visible, free fall --> smooth, no perceptible, no flow (dry)
	PHYSICAL / HYDRAULIC VARIABLES		NOT APPLICABLE
	SUBSTRATE		Only substrate type is recorded: not visible, bedrock --> clay, peat, earth, artificial; consolidation of bed material
	IN-CHANNEL VEGETATION		Mosses/lichens, emergent broad-leaved, submerged broad/linear/fine-leaved, amphibious, etc.
	WOODY DEBRIS		LWD extension, debris dam, leafy debris
	ARTIFICIAL FEATURES AND STRUCTURES		Not know, none, culverted, resectioned, dam, etc.
C - RIVER BANKS/ RIPARIAN ZONE	BANK PROFILE / SHAPE		Eroding/stable cliff, point bars, side bars, bank profile (natural, artificial)
	BANK MATERIAL		Not visible, natural (bedrock --> clay), artificial (concrete --> bio-engineering materials)
	RIPARIAN VEGETATION STRUCTURE		Bare, uniform --> complex
	LONGITUDINAL CONTINUITY OF RIPARIAN VEGETATION		None, isolated/scattered --> continuous; and associated features (shading of channel, fallen trees, etc.)
	RIPARIAN VEGETATION WIDTH		The method assess the land use within 5 and 50 m of banktop, therefore indirectly are given some information about the riparian vegetation width
	VEGETATION COMPOSITION, COVERAGE AND OTHER RIPARIAN VEGETATION CHARACTERISTICS		Presence of notable nuisance plan species; presence/extent and state of alders
	ARTIFICIAL FEATURES AND STRUCTURES		Bank modifications (not known, none, resectioned, embanked, etc.)
	LAND USE		Land use within 5 m of banktop (woodlands, plantation, orchard, urban development, artificial open water, park, etc.)
D - FLOODPLAIN	FLUVIAL FORMS		Natural/artificial open water, wetland (marsh, fen, etc.)
	INFO ON FLOODPLAIN FEATURES		NOT APPLICABLE
	LAND USE		Land use within 5 and 50 m of banktop (woodlands, plantation, orchard, urban development, artificial open water, park…)
4. RIVER PROCESSES			
A - LONGITUDINAL CONTINUITY		Sediment and wood	The assessment of artificial features in the channel and on the banks could be indirectly used to assess the potential longitudinal mobility of sediment
		Water flow	The assessment of artificial features in the channel could be indirectly used to assess the potential longitudinal mobility of sediment (but not to evaluate hydrological alterations)
B - LATERAL CONTINUITY		Lateral hydraulic continuity	It could be indirectly assessed (presence of fluvial forms in the floodplain)
		Sediment (and wood) lateral continuity	It could be in part indirectly assessed by for example the presence of bank modification (embankment) and land use. Hillslope-river corridor continuity and potentially erodible corridor are not assessed
C - BANK EROSION / STABILITY			Bank profiles (slope) and bank features (eroding/stable cliff) from a qualitative point of view
E - CHANNEL ADJUSTMENTS		Planimetric (pattern & width)	NOT APPLICABLE
		Vertical	NOT APPLICABLE
F - VERTICAL CONTINUITY		Groundwater connection	Indirectly assessed: Fen(s) and Flush(es) assessed as "features of special interest"
5. APPLICATION TO WFD			
OFFICIAL METHOD (WFD implementation) / COMMONLY USED METHOD (not compulsory)			The method is the most commonly used in England and Wales since 2000s in combination with aerial photo assessment and GIS datasets of flood defence infrastructure. The method development has been influenced by the WFD: the prototype was developed in anticipation of the requirements of the WFD. It allowed to collect hydromorphological data within the European STAR-project
APPLICATION TO ALL WATER BODIES			The method applies to all water bodies in England and Wales. Modifications of the original method allowed the possibility to apply the method to EU-southern water catchments (SE-RHS, CARAVAGGIO, adaptation in Portugal)
USED IN THE CLASSIFICATION OF HIGH-STATUS / OTHER STATUS CLASSES			It has been used in the River Basin Characterization Project I, 2004 (RBC1) and in the Technical Assessment method for rivers: morphological alteration, Environment Agency. It has been used to help identify reference conditions, "heavily modified" riverine water bodies
USED TO PREDICT RISK OF DETERIORATION			It has been used, through HMS, to assess the risk of habitat deterioration (EA, Technical assessment method, Hydromorphology project) and to help in identifying hydromorphological pressures affecting river catchments
USED TO IDENTIFY IMPROVEMENT TARGETS			It can be potentially used for this purpose
USED TO HELP IDENTIFY CAUSE OF ECOLOGICAL IMPACTS			Indirectly, relating habitat information to biological sampling; it can be used for the analysis of habitat suitability
KEY STRENGTHS FOR RIVER MANAGEMENT			It has specifically been developed to respond and to test WFD requirements. It is able to detect local variations in features contributing to habitat character (Raven et al., 2002)