

1 - METHOD BACKGROUND		
NAME OR CODE	QBR - Índice de vegetación de ribera/ Qualitat del Bosc de Ribera - Riparian Forest Quality Index	
COUNTRY	Spain	
KEY REFERENCE	Munné & Prat (1998); Munné et al. (2003)	
WEBPAGE		
CATEGORY	The method aims to assess the riparian forest quality	
2 - METHOD CHARACTERISTICS		
A - SOURCE OF INFORMATION / DATA COLLECTION	Maps/Remote sensing	It could be applied from aerial photographs
	Field survey	Identification of the bankfull zone (separated in main channel and riparian area) and assessment of the main sections separately for the channel and the riparian area (4 sections: total vegetation cover, cover structure, cover quality, channel alteration); an exhaustive survey of sampling stations is needed to attribute/adjust additional criteria to scores. An additional assessment in 3 sections (slope and form of the riparian zone, presence of islands, presence of hard substrate) is applied to determine river type (headwater, headwater/midland, lowland) and to be applied to section 3 of the QBR
	Rapid field assessment	It is easy and rapid for trained surveyors (it needs knowledge of native/non-native species of riparian vegetation in the study area)
	Existing database Modelling	NOT APPLICABLE NOT APPLICABLE
B - SPATIAL SCALE	HIERACHICAL SPATIAL SCALE River catchment/Water body/ Reach/Cross Section	The analysis is at the reach scale; if longer river stretches must be assessed, they must be 100 m long
	LONGITUDINAL SPATIAL SCALE Fixed length Scaled to channel width	NOT APPLICABLE NOT APPLICABLE
	Variable length	Scaled to river type, depending on location (50 m in headwater reaches, 100 m in middle, lower reaches)
	LATERAL SPATIAL SCALE Channel	The method focuses only on the channel zone between the permanently flowing reach and the bankfull state (emerged areas)
	Banks/Riparian zones	All the riparian zone (in absence of human impact) is assessed or a 50 m wide strip in highly modified floodplains (agriculture, plantations); both river sides
	Floodplain	It considers lateral connectivity between riparian area and floodplain (land use) as well as fluvial terraces modifications
C - TEMPORAL SCALE	Physical and morphological assessment	It focuses on the present state
	Hydrological assessment	NOT APPLICABLE
D - TYPE OF METHOD	Characterization/classification	NOT APPLICABLE
	Assessment by index	The QBR is obtained from the assessment of the 4 sections: to each section, a scale of 4 scores is used (0, 5, 10, 25); additional criteria are considered to adjust the scores. In any case, the min and max scores for each section are 0 and 25 respectively, because an equal weight is attributed to each section. The QBR index is the sum of 4 scores (the total max possible = 100). An additional assessment (to define river type) is accomplished only to help in determining the cover quality of QBR (section 3). The score is converted into five quality classes of riparian habitat
	Deviation from reference General assessment / Design framework	NOT APPLICABLE
	Modelling status / Scenario	NOT APPLICABLE
	Final expert judgment	The scores for additional criteria have been defined by the expert judgment of the authors according to the importance of each criterion for the studied stream type
	Links with other systems	The method can be used with other metrics to obtain a measure of integrated quality value in streams. It is often used in conjunction with the IHF; it has been included in the HIDRI protocol for the assessment of the riparian forest
E - REFERENCE CONDITIONS		They correspond to the absence of human impact, but the method does not directly refers to reference conditions
F - GENERAL INFORMATION	RIVER TYPOLOGY	River types (headwaters, headwaters/midlands, lowlands) are defined using bank profile (slope and form of the riparian zone), the presence of islands, and the presence of rock substrate
	TYPOLOGY LIMITATIONS	It cannot be applied where riparian vegetation is lacking (e.g. high mountains above the tree line)
	TYPE-SPECIFIC (Protocol / Assessment method)	Only Cover quality (section 3) is calculated considering river types (headwater, headwater/midland, lowland). Following the authors, the use of quality classes boundaries should be checked for other geographical areas
	BASIS FOR STANDARDS / THRESHOLDS	Scores for each section and for additional elements have been defined after trials in four Mediterranean stream catchments in Catalonia (72 sampling sites), and by expert judgment of the authors. Class boundaries have been defined according to the authors' experience: <25 = bad quality, 30-50 = poor quality, 55-70 = fair quality, 5-90 = good quality, >95 = natural conditions
	REACH SCALE SURVEY STRATEGY	All the surveyed reach is assessed, as well as all the riparian strip (laterally); in highly modified floodplains, a 50 m strip is assessed
	TIMING AND FREQUENCY	The analysis of a site takes between 10 and 20 min depending on the experience of the surveyor
	DATA PRESENTATION (OUTPUT/LAYOUT) METHOD SUPPORT / APPLICATION TOOLS	Compiled filed sheets, final index, maps showing the QBR quality classes Two-sided sheet, 2 papers describing its development and functioning
	SPATIAL COMPARISON	It allows for comparison between almost all river types (Munné et al., 2003 demonstrated that it is independent of regional differences in riparian plant community types and also it considers geomorphology of the river)
	CONNECTION TO ECOLOGY	The method informs on the availability and quality of habitats for riparian and terrestrial organisms (connectivity with the floodplain, structure diversity, etc.)
	USERS	User must be familiar with the most common tree and shrub species found in the study areas
SCALE INFORMATION	Only local scale information (floodplain, reach) is provided	
NUMBER OF END PARAMETERS	To calculate the QBR: 4 main sections, organised into 16 features. To obtain river type: 3 main sections/parameters	

3. RECORDED FEATURES

A - CATCHMENT / VALLEY	LARGE SCALE CHARACTERISTICS	NOT APPLICABLE
	HYDROLOGICAL REGIME	NOT APPLICABLE
	VALLEY FORM / FEATURES	NOT APPLICABLE
B - CHANNEL	CHANNEL PATTERN / PLANFORM	NOT APPLICABLE
	CHANNEL FORMS	Assessment of vegetation on islands (cover, structure, quality). Width of all the islands > or < 5 m is assessed to determine river type (and help the assessment of cover quality)
	BED CONFIGURATION	NOT APPLICABLE
	CHANNEL DIMENSIONS	NOT APPLICABLE
	FLOW-TYPE	NOT APPLICABLE
	PHYSICAL / HYDRAULIC VARIABLES	NOT APPLICABLE
	SUBSTRATE	% hard substrata (negative for tree plant establishment) is assessed to determine river type (and help the assessment of cover quality)
	IN-CHANNEL VEGETATION WOODY DEBRIS	NOT APPLICABLE
C - RIVER BANKS/ RIPARIAN ZONE	ARTIFICIAL FEATURES AND STRUCTURES	Rigid structures in the riverbed and Transverse structures in the channel are assessed as additional elements (to adjust score)
	BANK PROFILE / SHAPE	Bank profile (score for each bank) is assessed to determine river type (and help the assessment of cover quality)
	BANK MATERIAL	% hard substrata (negative for tree plant establishment) is assessed to determine river type (and help the assessment of cover quality)
	RIPARIAN VEGETATION STRUCTURE	Section cover structure: % of tree and shrub cover, adjusted by the presence of helophytes + longitudinal continuity
	LONGITUDINAL CONTINUITY OF RIPARIAN VEGETATION	Longitudinal continuity is assessed as additional element (to adjust score of cover structure)
	RIPARIAN VEGETATION WIDTH	It is assessed through the total riparian cover in the riparian area (section 1), and adjusted by the degree of lateral connectivity with the floodplain
	VEGETATION COMPOSITION, COVERAGE AND OTHER RIPARIAN VEGETATION CHARACTERISTICS	Cover quality is assessed separately for each river type (presence and number of native tree species); its score is positively adjusted depending on the tree continuity and cover, on the number of shrub species and if riparian zone is structured in gallery; the score is negatively adjusted if there are human buildings, non-native species and garbage
ARTIFICIAL FEATURES AND STRUCTURES	Channel alteration section: rigid structures on margins, channelized river. Cover quality section: the presence of human buildings is used to adjust the score	
LAND USE	It is assessed through the total riparian cover in the riparian area and the connectivity between riparian area and floodplain woodland	
D - FLOODPLAIN	FLUVIAL FORMS	NOT APPLICABLE
	INFO ON FLOODPLAIN FEATURES	NOT APPLICABLE
	LAND USE	Channel alteration section: fluvial terraces modified and constraining the river. Connectivity between the riparian area and floodplain woodland is used to adjust the score of the total riparian cover

4. RIVER PROCESSES

A - LONGITUDINAL CONTINUITY	Sediment and wood Water flow	The presence of transverse structures influences the score of channel alteration
B - LATERAL CONTINUITY	Lateral hydraulic continuity	It assesses the degree of alteration of river channel (longitudinal structures, terrace modifications)
	Sediment (and wood) lateral continuity	The method considers the connectivity between the riparian area and the woodland in the floodplain
C - BANK EROSION / STABILITY		NOT APPLICABLE
E - CHANNEL ADJUSTMENTS	Planimetric (pattern & width)	NOT APPLICABLE
	Vertical	NOT APPLICABLE
F - VERTICAL CONTINUITY	Groundwater connection	NOT APPLICABLE

5. APPLICATION TO WFD

OFFICIAL METHOD (WFD implementation) / COMMONLY USED METHOD (not compulsory)	The method is widely used by Water Agencies in Spain and comply with WFD requirement, at least concerning riparian habitats
APPLICATION TO ALL WATER BODIES	In theory the method can be applied to all vegetated rivers (because it does not consider species and it takes into account river type)
USED IN THE CLASSIFICATION OF HIGH-STATUS / OTHER STATUS CLASSES	It could be used together with any other index of water quality to assess the ecological status (all classes) of streams and rivers. It may be a useful tool for defining 'high ecological status' under the WFD
USED TO PREDICT RISK OF DETERIORATION	It may be potentially used for this purpose
USED TO IDENTIFY IMPROVEMENT TARGETS	The method may be useful for local managers and for restoration targets
USED TO HELP IDENTIFY CAUSE OF ECOLOGICAL IMPACTS	It may be potentially used for this purpose, although it is addressed to assess actual structure of riparian vegetation
KEY STRENGTHS FOR RIVER MANAGEMENT	It is a tool to provide managers with a simple and very quick method to evaluate riparian vegetation conditions, with potential application from aerial photographs for monitoring purposes