

F.E.M. Research Group

Freshwater Ecology and Management

Index of riparian quality: QBR

QBR - PROTOCOL



UNIVERSITAT DE BARCELONA



Index of riparian quality: QBR

Notes to be taken in consideration previously to the index use

Steps to be followed	Notes
1 Selection of the observation area All the potential area of development of the riparian habitat should be considered in order to calculate the QBR index. The main channel and the riparian areas should be differentiated (see the drawing in the field data sheet).	Channel. Area flooded at least every two years. Is the channel zone until the bankfull Riparian area. From the bankfull until the area flooded at least once every 100 years. Includes fluvial terraces.
2 Every part is analyzed independently The QBR is a summation index of four parts. Each part is calculated independently and the individual score of each part can not be either negative or higher than 25.	
3 Calculating each part Each part has 4 main options. Only one of this could be selected beginning from the upper high scoring. The initial score obtained can be modified according to the positive or negative scoring of the conditions indicated below of each part. Every condition can be considered (one condition cannot exclude another even when they are of different sign)	Select <u>only one</u> of the four main conditions. If the final score is higher than 25 this maximum value should be retained. Negative scores are not possible and in this case a nul record will be scored. Both rivers margins should be considered as a unit for any condition.
4 Final score The final score is the addition of the 4 parts, therefore should vary between 0 and 100.	
5 Observations Bridges and roads crossing the river and used to gain access to the sampling should not be considered to calculate QBR index. If possible the QBR should be analyzed upstream or downstream of those facilities. Other bridges or roads (e.g. those parallel to the river) will be always considered.	Avoid the disturbance caused by the facilities to access to the river which can be the origin of lower values than the expect for all reaches. Several measures made along the same sampling point are more informative of the riparian status. An evaluation every 100 meters is recommended for detailed studies.

Some remarks which can help in scoring each part.

PART	General rules	Notes
1	<p>Total riparian cover</p> <p>The % of cover of any kind of plants except the annuals, is measured. Both river banks are considered.</p> <p>The connectivity between the riparian area and the terrestrial forest ecosystem is a very important attribute, consider it carefully.</p>	<p>The vegetation structure is not considered here (see the following part), only the total cover. The role of vegetation as key element of the riparian ecosystem is here emphasized.</p> <p>The roads or paths without concrete of less than 4 meters are not considered as elements that threat connectivity.</p>
2	<p>Cover structure</p> <p>Score depends on the % of cover due to the forest and, if trees are absent, the shrubs and other low lying vegetation are considered. Both margins should be taken into account.</p> <p>Linear arrangements (mostly plantations) or disconnected patches may lower the initial value, while helophytes in the channel or the presence of shrubs below the forest increase the score.</p>	<p>The main objective of this part is to measure the complexity of the system that can favourize the biodiversity of the riparian habitat both in animals and plants.</p>
3	<p>Cover quality</p> <p>The geomorphological type of the stream section should be first established. This is made using the reverse side of the QBR field data sheet.</p> <p>The number of species of nature riparian trees should be counted and the initial score will depend from this number and the geomorphological type (1 to 3).</p> <p>Tunnel disposition of trees increase the score depending on its cover percentage, as well as the gallery structure of vegetation. Gallery is defined in this case as a succession of different species from the bankfull to the upper riparian area.</p>	<p>To establish the geomorphological type we should use the reverse side. Using the drawing provided, we will mark the score of the left and right margins according to its form and slope. Final geomorphological score is the sum of both margins modified negatively by the presence of geomorphological structures that appear in low gradient streams, like islands, or positively by the presence of hard substrates in which the vegetation can not root. The final score is used to establish the geomorphological type (from 1 to 3) that should be used in the cover quality evaluation.</p> <p>A list of the species considered as allocthonous in the study area is provided in the reverse side of the QBR sheet. These species penalize in the index.</p>
4	<p>River channel naturalness</p> <p>The morphological changes produced in the alluvial terraces, including the channel reduction due to agricultural activities lower the score. The elimination of meanders and river linearization is also considered.</p> <p>Concrete structures along the riparian habitat are strongly negative marked, while only some penalization is made if small concrete structures (like weirs or walls) are present.</p>	<p>The bridges and small disturbances or ways used to gain access to the river are not considered.</p>

Quality ranges according to QBR,

RIPARIAN HABITAT QUALITY LEVEL	QBR	COLOUR
<i>Riparian habitat in natural condition</i>	≥ 95	Blue
<i>Some disturbance, good quality</i>	75-90	Green
<i>Disturbance important, fair quality</i>	55-70	Yellow
<i>Strong alteration, bad quality</i>	30-50	Orange
<i>Extreme degradation, very bad quality</i>	≤ 25	Red

Further information about the index can be found at:

Munné, A.; Solà, C. & Prat, N. (1998). *QBR: Un índice rápido para la evaluación de la calidad de los ecosistemas de ribera*. Tecnología del Agua, 175: 20-37.

Munné, A.; Solà, C.; Rieradevall, M. & Prat, N. (1998). *Índex QBR. Mètode per a l'avaluació de la qualitat dels ecosistemes de ribera*. Estudis de la Qualitat Ecològica dels Rius (4). Diputació de Barcelona. Àrea de Medi Ambient.

M^a Luisa Suárez, M^a Rosario Vidal-Abarca, M^a del Mar Sánchez-Montoya, Javier Alba-Tercedor, Maruxa Álvarez, Juan Avilés, Núria Bonada, Jesús Casas, Pablo Jáimez-Cuéllar, Antoni Munné, Isabel Pardo, Narcís Prat, Maria Rieradevall, M^a Jacoba Salinas, Manuel Toro & Soledad Vivas. (2004). *Las riberas de los ríos mediterráneos y su calidad: el uso del índice QBR*. Limnetica, 21 (3-4): 35-64 (2002)

Colwell, Stephanie R.; Hix, David M. (2008). *Adaptation of the QBR index for use in riparian forests of central Ohio*. In: Jacobs, Douglass F.; Michler, Charles H., eds. 2008. Proceedings, 16th Central Hardwood Forest Conference; 2008 April 8-9; West Lafayette, IN. Gen. Tech. Rep. NRS-P-24. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station: 331-340.

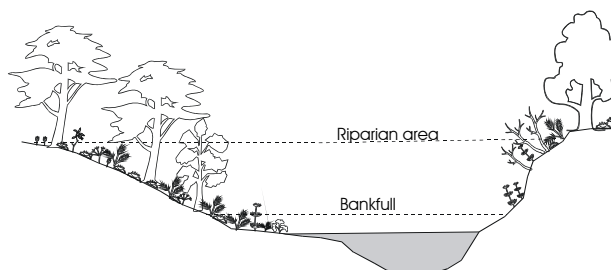
Acosta, R.; Ríos, B.; Rieradevall, M. & Prat, N. (2009). *Propuesta de un protocolo de evaluación de la calidad ecológica de ríos andinos (CERA) y su aplicación a dos cuencas en Ecuador y Perú*. Limnetica, 28 (1): 35-64.

Eva Ivits, Michael Cherleta, Wolfgang Mehla & Stefan Sommera. (2009). *Estimating the ecological status and change of riparian zones in Andalusia assessed by multi-temporal AVHRR datasets*. Ecological Indicators 9: 422 – 431.

QBR INDEX

Field data sheet

Riparian habitat quality



Score of each part cannot be negative or exceed 25

Station	
Observant	
Data	

Total riparian cover

Part 1 score

Score		
25	> 80 % of riparian cover (excluding annual plants)	
10	50-80 % of riparian cover	
5	10-50 % of riparian cover	
0	< 10 % of riparian cover	
+ 10	if connectivity between the riparian forest and the woodland is total	
+ 5	if the connectivity is higher than 50%	
- 5	connectivity between 25 and 50%	
- 10	connectivity lower than 25%	

Cover structure

Part 2 score

Score		
25	> 75 % of tree cover	
10	50-75 % of tree cover or 25-50 % tree cover but 25 % covered by shrubs	
5	tree cover lower than 50 % but shrub cover at least between 10 and 25 %	
0	less than 10% of either tree or shrub cover	
+ 10	at least 50 % of the channel has helophytes or shrubs	
+ 5	if 25-50 % of the channel has helophytes or shrubs	
+ 5	if trees and shrubs are in the same patches	
- 5	if trees are regularly distributed but shrubland is > 50 %	
- 5	if trees and shrubs are distributed in separate patches, without continuity	
- 10	trees distributed regularly, and shrubland < 50 %	

Cover quality (the geomorphological type should be first determined*)

Part 3 score

Score		Type 1	Type 2	Type 3	
25	number of native tree species:	> 1	> 2	> 3	
10	number of native tree species:	1	2	3	
5	number of native tree species:	0	1	1 - 2	
0	absence of native trees	-			
+ 10	if the tree community is continuous along the river and covers at least 75% of the edge riparian area				
+ 5	the tree community is nearly continuous and cover at least 50% of the riparian area				
+ 5	if the riparian community is structured in gallery				
+ 5	when the number of shrub species is:	> 2	> 3	> 4	
- 5	if there are some man-made buildings in the riparian area				
- 5	is there is some isolated species of non-native trees**				
- 10	presence of communities of non-native trees				
- 10	presence of garbage				

Channel alteration

Part 4 score






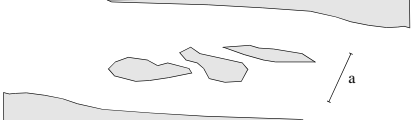

Score		
25	unmodified river channel	
10	fluvial terraces modified, constraining the river channel	
5	channel modified by discontinuous rigid structures along the margins	
0	totally channelized river	
- 10	river bed with rigid structures (e.g wells)	
- 10	transverse structures into the channel (e.g weirs)	

Final score (sum of level scores)

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*** Type of the riparian habitat (to be applied at part 3, cover quality part)**

The score is obtained by addition of the scores assigned to left and right river margins according to their slope. This value can be modified if islands or hard substrata are present.

<i>Slope and form of the riparian zone</i>	River margin:	Score	
		Left	Right
Very steep, vertical or even concave (slope > 75°) margins are not expected to be exceeded by large floods.		6	6
Similar to previous category but with a bankfull which differentiates the ordinary flooding zone from the main channel.		5	5
Slope of the margins between 45 and 75 °, with or without steps. Slope is the angle subtended by the line between the top of the riparian area and the edge of the ordinary flooding of the river. (a > b)		3	3
Slope between 20 and 45 °, with or without steps. (a < b)		2	2
Slope < 20 °, large riparian zone.		1	1
Presence of one or several islands in the river			
Width of all the islands "a" > 5 m.		- 2	
Width of all islands "a" < 5 m.		- 1	
Percentage of hard substrata that can made impossible the presence of plants with roots.			
> 80 %		Not applicable	
60 - 80 %		+ 6	
30 - 60 %		+ 4	
20 - 30 %		+ 2	
Total Score			

Geomorphological type according to the total score

> 8	Type 1	Closed riparian habitats. Riparian forest, if present, reduced to a small strip. Headwaters.
5 to 8	Type 2	Headwaters or midland riparian habitats. Forest may be large and originally in gallery.
< 5	Type 3	Large riparian habitats, and potentially extensive forests. Lower courses.

**** Allochthonous trees species in the study area**

(This should be listed for each study area)

e. g. studied area of Catalonia:

- Populus deltoides
- Populus x canadensis
- Populus nigra ssp. italica
- Salix babilonica
- Ailanthus altissima
- Celtis australis
- Robinia pseudo-acacia
- Platanus x hispanica
- All fruit trees