

**CARAVAGGIO 2008 - Core Assessment of River hAbitat VALue and hydro-morpholoGical cOndition**

**BANKS**









**BANKTOP, LAND-USE AND VEGETATION STRUCTURE (Section A)**

Banktop criteria	Description						
<b>B</b> = Break in slope	first major break in slope; negative (e.g. where cultivation or development would be possible) or positive (e.g. under an older river terrace)						
<b>S</b> = Stable use	where stable land use (e.g. houses) can be recognized						
<b>V</b> = non-hygrophilic Vegetation	break-point between hygrophilic and non-hygrophilic vegetation (e.g. <i>Alnus</i> vs <i>Quercus</i> )						
<b>T</b> = Trashline	signs of high flow level (e.g. notches)						
<b>R</b> = Rock cover discontinuous	discontinuous cover of rocks/bedrock on the banks (e.g. vegetation or soil removed from side walls during spates)						
<b>M</b> = Meander	banktop cannot be indicated because the spot-check section crosses a river meander						
examples of:	<table border="0"> <tr> <td>hygrophilic vegetation</td> <td>non-hygrophilic vegetation</td> </tr> <tr> <td><i>Alnus, Fraxinus, Myricaria</i></td> <td><i>Acer, Carpinus, Castanea, Fagus</i></td> </tr> <tr> <td><i>Nerium oleander, Populus, Salix, Tamarix</i></td> <td><i>Picea, Quercus, Tilia</i></td> </tr> </table>	hygrophilic vegetation	non-hygrophilic vegetation	<i>Alnus, Fraxinus, Myricaria</i>	<i>Acer, Carpinus, Castanea, Fagus</i>	<i>Nerium oleander, Populus, Salix, Tamarix</i>	<i>Picea, Quercus, Tilia</i>
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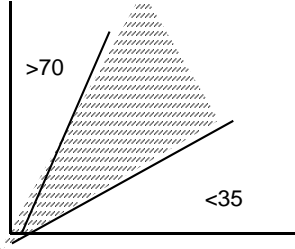
**Land-use within 5m (Section A) & 50m (Section I) of banktop**

Natural	Agriculture	Urban
<b>BL</b> = Broadleaf/mixed woodland (also semi-natural and Mediterranean forest) <b>CW</b> = Coniferous woodland (semi-natural) <b>MN</b> = Dehezza/Montado/Sugherete (semi-natural) <b>MM</b> = Mediterranean 'macchia' <b>SH</b> = Scrub & shrubs <b>TH</b> = Tall herb/rank vegetation <b>GR</b> = Natural grassland <b>MH</b> = Moorland/heat <b>RD</b> = Rock, scree or sand dunes <b>OW</b> = Natural open water <b>WL</b> = Wetland (e.g. bog, marsh, fen)	<b>BP</b> = Broadleaf/mixed plantation <b>CP</b> = Coniferous plantation <b>EU</b> = <i>Eucaliptus</i> plantation <b>PO</b> = <i>Populus</i> plantation <b>OR</b> = Orchard <b>OL</b> = Olive trees <b>VI</b> = Vineyard <b>TL</b> = Tilled land <b>RP</b> = grassland/pasture <b>WM</b> = Winter water meadows <b>RF</b> = Rice fields <b>FM</b> = Farming/Breeding	<b>UR</b> = Urban <b>IN</b> = Industry <b>SU</b> = sparse houses (Suburban development) <b>WT</b> = Water treatment plan <b>MS</b> = Main road (usually > 10.5m) <b>SR</b> = Road (usually < 10.5m) <b>WR</b> = White road/Muletrack <b>RA</b> = Railway <b>QU</b> = Quarrying <b>PG</b> = Parkland or gardens <b>AW</b> = Artificial open water

**Banktop and Bankface vegetation structure - To be assessed within a 10m wide transect (Section A)**

Banktop	Code	Description	Vegetation types
bare	B	bare earth/rock etc.	
uniform 	U	predominantly one type (no scrub or trees)	 bryophytes  short/creeping herbs or grasses
simple 	S	two or three vegetation types	 tall herbs/grasses  scrub or shrubs
complex 	C	four or more types	 saplings and trees

**PHYSICAL ATTRIBUTES (Section B)**

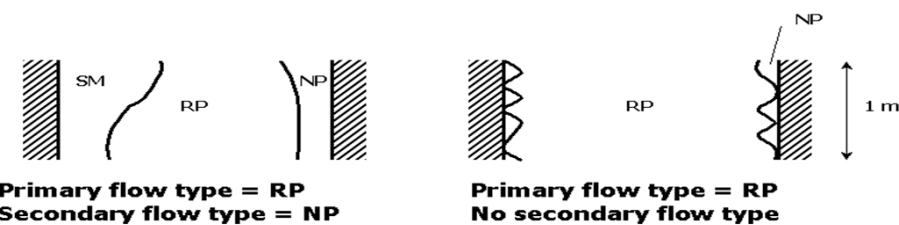
Bank material	Marginal and bank features	Slope of the bank
<b>NV</b> = Not Visible <b>BE</b> = BEdrock <b>BO</b> = BOulder <b>CO</b> = CObble <b>GS</b> = Gravel/Sand <b>EA</b> = EArth (crumbly) <b>PE</b> = PEat <b>CL</b> = sticky CLay <b>CC</b> = ConCrete <b>SP</b> = Sheet Piling <b>WP</b> = Wood Piling <b>GA</b> = GAbion <b>BR</b> = BRick/laid stone <b>RR</b> = Rip-Rap <b>TD</b> = Tipped Debris <b>FA</b> = FABric <b>LR</b> = Local Restoration <b>BI</b> = Blo-engineering materials <b>CW</b> = Crib Walls	<b>NV</b> = Not Visible (e.g. far bank) <b>NO</b> = NOne <b>CN</b> = CoNfluence <b>NB</b> = Natural Berm <b>AB</b> = Artificial Berm (two stage channel)	<b>V</b> = Vertical (>70°) <b>S</b> = Steep (35°-70°) <b>G</b> = Gentle (<35°)
	<b>Bank modifications</b> <b>NK</b> = not known <b>NO</b> = none <b>RS</b> = resectioned (reprofiled) <b>RI(N)</b> = reinforced* <b>RT(N)</b> = Reinforced Top only <b>RE(N)</b> = Reinforced toE only <b>PC(B)</b> = poached (bare) <b>EM</b> = embanked <b>TR</b> = trash  + (N) if 'naturalistic' bank reinforcement	

Selected Channel features (Section C<sub>2</sub>)

- DR** = Dry channel. River channel thread/s is/are dry.
- CN** = Confluence(s). Where a river tributary enters the river under investigation.
- CB** = Concave bar(s). Depositional feature usually located at the concave bank of a river bend (external side) , in highly dynamic or meandering streams and rivers.
- AB** = Alternate bars. Side-bars located along the opposite margins of a river, alternatively distributed on one bank and on the other.
- TB** = Transverse bar(s). Depositional feature with a diagonal arrangement in the channel, emerged or partly submerged, being a natural slope adjustment structure.
- BS** = Bedscarp. A distinct change in grade in the bottom of a stream channel that moves progressively upstream. The change in grade may form a small waterfall. Also, the location where a streambed is actively eroding downward to a new base level. Built up with unstable river materials.
- NI** = Channel Nickpoint or Headcut. An abrupt break in slope in the river bed channel that forms a (usually small) "waterfall," which causes the underlying (consolidated) soil to dramatically erode.
- ER** = Exposed Roots visible in the channel (middle). Roots exposed or visible along the banks (TP) are recorded in sections H e K.
- ED** = Eroded alluvial deposits. When the erosion (usually in the river channel, but sometimes more visible along the banks) leads to ancient, consolidated deposits to
- LE** = Local erosion. Erosion at a clearly localized area (< 3m wide) e.g. base of the bank only, foot of a bridge.
- OD** = Over-deepened channel. When a river channel shows clear signs of incision, even at a quite restricted location.

Flow-type (Section D) Description

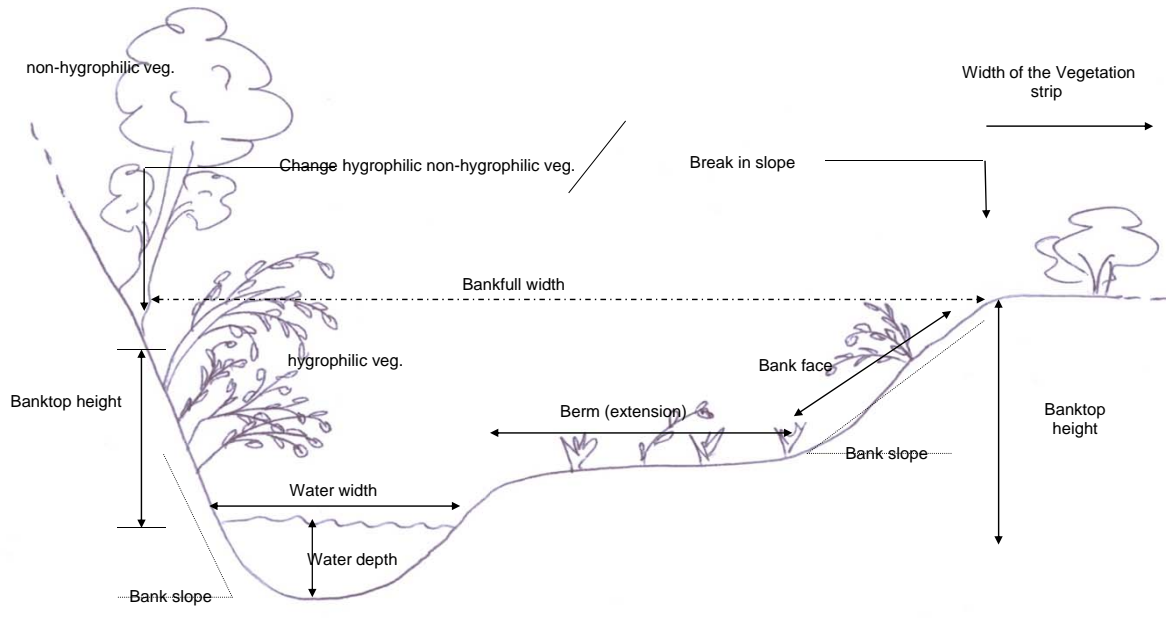
- NV** = not visible
  - FF** = free fall
  - CH** = chute flow
  - BW** = broken standing waves
  - UW** = unbroken standing waves
  - CF** = chaotic flow
  - RP** = rippled
  - UP** = upwelling
  - SM** = smooth
  - NP** = no perceptible flow
  - DR** = no flow (dry)
- clearly separates from back-wall of vertical feature - associated with waterfalls  
 low curving fall in contact with substrate - often associated with cascades  
 white-water tumbling waves must be present - mostly associated with rapids  
 upstream facing wavelets which are not broken - mostly associated with riffles  
 a chaotic mixture of three or more of the four fast flow-types with no predominant one obvious  
 no waves, but general flow direction is downstream with disturbed rippled surface - mostly associated with runs  
 heaving water as upwellings break at the surface - associated with boils  
 perceptible downstream movement is smooth ( no eddies) - mostly associated with glides  
 no net downstream flow - associated with pools, ponded reaches and marginal deadwater  
 dry river bed



**Primary flow type**  
 The flow type occupying the greatest percentage of the cross section

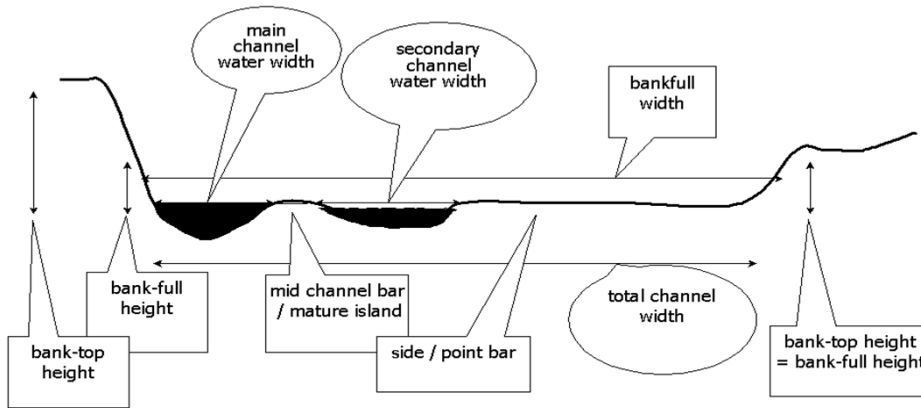
**Secondary flow type**  
 The second-most dominant flow-type of the cross section. This should be recorded even when relatively inferior to the primary flow type (small areas can be relevant for macroinvertebrates, fish or other biota). As a rough guide flow types occupying < 10% of the transect should be ignored

Channel Dimension Guidance (Sections A, B & E)



Definition of river features

- River bank** Permanent side to river
- Total channel width** Measured from the base of one bank to the base of the other, i.e. the width of the river bed
- River bed** The entire area between the base of the right bank and the left bank. Includes wetted area and dry bed (such as mid/side/point bars)
- Base of bank** The break in slope between the river bed and the river bank
- Number of wetted channels** The total number of distinct, flowing channels in the cross-section at the time of survey
- Water width primary/ secondary channels** To be measured/estimated for each transect



PHYSICAL ATTRIBUTES OF BANKS AND CHANNEL (Sections E/F)

EROSION/DEPOSITION FEATURES (Section E)

Banks	
Erosion/Habitat	Deposition
NV = Non Visible NO = No erosion feature EC = Eroding Cliff ( <i>ring</i> if sandy substrates) SC = Stable Cliff ( <i>ring</i> if sandy substrates) EB = Eroding Bank ET = Eroding bank, Top only EE = Eroding bank, base only TO = TOe LE = Local Erosion of the bank	NV = Non Visible NO = No deposition feature PB (b) = unvegetated Point bar VP (b) = Vegetated Point bar SB (b) = unvegetated Side Bar VS (b) = Vegetated Side bar AB = Alternate Bars CB = Concave Bar BB = Big Block SD = Sand Deposit SP = Sparse deposit (b) indicates the presence of a backwater area Possible causes of deposition /BB = Big Block /AR = Artificial

Channel	
Deposition	Channel position
NV = not visible NO = none RO = exposed boulders EB = exposed bedrock VR = vegetated rock BB = Big Block MB = unvegetated mid-channel bar VB = vegetated mid-channel bar MI = mature island MU = Multiple bars Possible causes of deposition /BB = Big Block / Emergent rocks /AR = Artificial	

CHANNEL HABITAT AND MODIFICATION (Section F)

Channel substrate	Primary substrate type	Secondary substrate type
NV = not visible BE = bedrock BO = boulder CO = cobble GP = gravel/pebble ( <i>ring</i> G or P if predominant) SA = sand SI = silt CL = clay PE = peat RR = rip rap CC = concrete AR = artificial	The substrate type occupying the greatest percentage of the cross section	The second-most dominant substrate-type of the cross section. Substrate types may be recorded as secondary <i>either</i> if they form discrete patches of differently sized material <i>or</i> if they are mixed with the primary substrate type.
	Primary substrate type = BO Secondary substrate type = GP	Primary substrate type = BO Secondary substrate type = GP

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CNR-IRSA, Italy

**FIELD KEY**

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**CHANNEL HABITAT AND MODIFICATION (Section F) - continues**

Channel modification(s)	Channel modification indicators
<b>NO</b> = none <b>CV</b> = culverted <b>RS</b> = resectioned <b>RI</b> = reinforced <b>DA</b> = dam/weir/sluiice <b>FO</b> = ford (man made) <b>TR</b> = trash (urban debris)	1. Uniform bank profile 2. Straightened planform 3. Uniform / low energy flows 4. No trees / uniform-aged trees along the bank 5. Intensive / urban land use



\_INHABIT feb11

**ARTIFICIAL FEATURES\* (Sections F & G)**

Level of modification: major: m; intermediate: i; minor: s

**Cross-sectional structure**

**B - Bridges**

Major = with one or more in-channel supports and/or a very evident narrowing of the channel and /or massive presence of artificial structures in the channel

Intermediate = with supports on the lower banks and/or artificial narrowing of channel width

Minor = without in-channel supports, with no bank abutments (e.g viaducts); usually, resectioning is present

**W - Weirs/Dams**

Major = with one or more in-channel supports and/or a very evident narrowing of the channel and /or massive presence of artificial structures in the channel

Intermediate = semi-permanent structure extending across the entire width of the channel but permeable and not causing too high impediment to flow

Minor = small permeable and usually temporary structure

**F - Fords**

Major = crossing place with artificial bank and channel material

Intermediate = with supports on the lower banks and/or artificial narrowing of channel width

Minor = crossing place with no artificial bank or channel material

**C - Culverts/Tunnels**

Major = They determine an important narrowing of river channel ( $\geq 30\%$ ) and/or there is not continuity of water and/or sediment from upstream to downstream. The length of the culvert is  $>4$  times the width of the river.

Intermediate = They determine a small narrowing of river channel ( $< 30\%$ ), there is continuity of water and sediment from upstream to downstream. The length of the culvert is higher than river width.

Minor = They do not determine a narrowing of river channel. There is continuity of water and sediment from upstream to downstream. The length of the culvert is smaller than river width.

**Lateral structures**

**D - Deflectors/groyne/croy**

Major = extend  $\geq 30\%$  of channel width and/or it causes intensive erosion and deposition phenomena

Intermediate = extends 10-30% of channel width. If causes some erosion and deposition phenomena

Minor = extends  $\leq 10\%$  of channel width. It does not causes particular erosion and deposition phenomena

**O - Outfalls / I - Intakes (including pipes)**

Major = extent along the bank  $\geq 100\%$  channel width and/or  $\geq 25$  m and/or diameter of the outfall  $\geq 1$  m

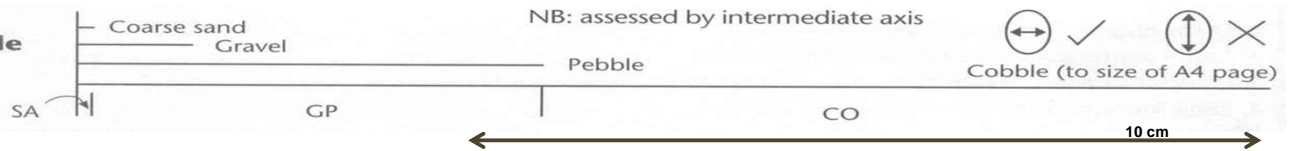
Intermediate = extent along the bank  $\geq 50\%$  channel width and/or 10-25 m long and/or diameter of the outfall  $\geq 0.5$  m

Minor = extent along the bank  $< 50\%$  channel width,  $< 10$  m long and diameter of the outfall  $< 0.5$  m

Indicate here the position of the feature recorded in Section G (Artificial features) an



**Scale**



NB: assessed by intermediate axis

Cobble (to size of A4 page)

10 cm

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The CARAVAGGIO method was developed with the collaboration of CNR-ISE (Pallanza, VB, I), APPA Bolzano (Italy), INAG (Lisbon, P) and University of Evora (P)