

MultiMoRPh10 Indices (revised January 2020)

There are 16 MultiMoRPh10 indices:

CHANNEL CHARACTERISTICS

- INDEX 1: Number of present/extensive flow types**
- INDEX 2: Highest energy present/extensive flow type**
- INDEX 3: Number of present/extensive bed material types**
- INDEX 4: Coarsest present/extensive mineral bed material type**
- INDEX 5: Average alluvial bed material size (phi units)**
- INDEX 6: Average alluvial bed material size class**
- INDEX 7: Extent of superficial bed siltation**
- INDEX 8: Channel physical habitat complexity**
- INDEX 9: Number of aquatic vegetation morphotypes**

RIPARIAN CHARACTERISTICS (BANK FACE AND BANK TOP)

- INDEX 10: Average riparian physical habitat complexity**
- INDEX 11: Maximum riparian physical habitat complexity**
- INDEX 12: Riparian vegetation structural complexity**

HUMAN PRESSURES AND IMPACTS

- INDEX 13: Degree of human pressure imposed by bank top land cover**
- INDEX 14: Channel reinforcement**
- INDEX 15: Non-native invasive plant species extent**
- INDEX 16: Number of non-native invasive plant species**

The indices are calculated as follows:

INDEX 1: Number of present/extensive flow types

The number of flow types (from section 4.2) that have been recorded as P or E in any of the 10 MoRPhs (maximum possible value is 9)

INDEX 2: Highest energy present/extensive flow type

The highest energy flow type (from section 4.2: in the order Freefall > Chute > Broken standing wave > Unbroken standing wave > Upwelling > Rippled > Smooth > No perceptible flow > Dry) recorded as P/E in any of the 10 MoRPhs

INDEX 3: Number of present/extensive bed material types

Number of channel bed natural material types (from section 4.1: (Bedrock, Boulder, Cobble, Gravel-pebble, Sand, Silt, Clay, Organic, Peat) that have been recorded as P or E in any of the 10 MoRPhs (potential maximum 9, likely maximum 6).

INDEX 4: Coarsest present/extensive mineral bed material type

Excluding organic and peat (i.e. from section 4.1: one of the following in the order Bedrock > Boulder > Cobble > Gravel-pebble > Sand > Silt > Clay) the coarsest bed material recorded as P/E in any of the 10 MoRPhs

INDEX 5: Average alluvial bed material particle size (phi units)

Average value of this MoRPh index across the 10 MoRPh modules

INDEX 6: Average alluvial bed material particle size class

Index 5 is translated into an approximate particle size class as follows:

Particle size description	Minimum value (phi units)	Maximum value (phi units)
Boulder		-8
Cobble	>-8	-6
Gravel-pebble	>-6	-1
Sand	>-1	+4
Silt	>+4	+9
Clay	>+9	

INDEX 7: Extent of superficial bed siltation

This is the average of the ten MoRPh values.

INDEX 8: Channel physical habitat complexity

The index value ranges from 1 (minimal complexity) to 10 (extremely high complexity) and is calculated as a weighted average of 4 sub-indices as follows (round down to nearest integer value):

NumBedMat (i.e. Index 3): Number of natural channel bed material types that have been recorded as P or E in any of the 10 MoRPhs – maximum possible 9, likely maximum 6)

NumFlow (i.e. index 1): Number of water surface flow types that have been recorded as P or E in any of the 10 MoRPhs – maximum possible 9, likely maximum 6)

NumBedFeat: Number of types of natural bed features (from section 4.3, subsection 'Channel bed - Natural physical features': score 1 for each that is observed as P or E or count>0 in any of the 10 MoRPhs – maximum possible 11, likely maximum 6)

NumVegInteraction: Number of ways in which vegetation is interacting with wetted channel (from section 4.4, subsection 'Vegetation interacting with the wetted channel': across the 10 MoRPhs score 1 for each interaction type that is observed as P or E in any of the 10 MoRPhs apart from large wood dams and fallen trees which score 2 if count>0 – maximum 8, likely maximum 6)

The probably maximum value for the total of the above four indicators is 24, suggesting a denominator of 2.4.

Channel physical habitat complexity = ((NumBedMat + NumFlow + NumBedFeat + NumVegInteraction)/2.4)

INDEX 9: Number of aquatic vegetation morphotypes

Score 1 for every plant morphotype that is recorded P or E (maximum 10 types, ranging from liverworts/mosses/lichens to filamentous algae) based on observations (i) on the channel bed sheet (section 4.4, subsection 'Vegetation within wetted channel') and (ii) the bank face sheet (section 3.4, subsection 'Aquatic vegetation at the bank-water margin', where 5 of the types can also be recorded). Only score each morphotype once (maximum possible is 10).

INDEX 10: Average riparian physical habitat complexity

This index is the average of the values of riparian physical habitat complexity calculated for the 10 MoRPh modules.

INDEX 11: Maximum riparian physical habitat complexity

This index is the maximum of the values of riparian physical habitat complexity calculated for the 10 MoRPh modules.

INDEX 12: Riparian vegetation structural complexity

This index represents the number of riparian vegetation morphotypes found with an abundance of P or E on the bank tops and bank faces within the survey site. Count each of five vegetation structural components (i.e. mosses/lichens, short/creeping herbs/grasses, tall herbs/grasses, scrub or shrubs, saplings or trees) that is recorded as P or E on each bank top and also on each bank face across all 10 MoRPh surveys. Add the four scores (two for each bank). The maximum possible score is 20 so the total is divided by 2.

INDEX 13: Degree of human pressure imposed by bank top land cover

The average of the 10 indices from the MoRPh surveys

INDEX 14: Channel reinforcement

The average of the 10 indices for the MoRPh surveys

INDEX 15: Non-native invasive plant species extent

The average of the 10 indices for the MoRPh surveys

INDEX 16: Number of non-native invasive plant species

Count of NNIPS (Himalayan balsam, Japanese knotweed, Giant hogweed, Floating penny wort, Other Species 1, Other Species 2) observed in sections 2.3, 3.4 or 4.4 of the MoRPh survey. Count each species once if it is recorded T, P or E in any of these three sections of the 10 MoRPh module surveys. The maximum achievable score is 6