1 - METHOD BACKGROUND			
NAME OR CODE			**LAWA-FS - Stream Habitat Survey (Field Survey)**
COUNTRY			Germany
KEY REFERENCE			LAWA (2000, 2002a)
WEBPAGE			
CATEGORY			The method aims to measure the naturalness of a river or stream based on the current hydromorphoological features and historical data
2 - METHOD CHARACTERISTICS			
A - SOURCE OF INFORMATION / DATA COLLECTION		Maps/Remote sensing	NOT APPLICABLE
		Field survey	A time consuming, well-structured field method, field survey is done by walking along the river and recording relevant features. 3 ways to record features: dominant feature (e.g. valley form); multiple choice (e.g. flow types); estimation of percentage (e.g. land use)
		Rapid field assessment	NOT APPLICABLE
		Existing database	NOT APPLICABLE
		Modelling	NOT APPLICABLE
B - SPATIAL SCALE	HIERACHICAL SPATIAL SCALE	River catchment/Water body/ Reach/Cross Section	The method surveys the overall water body but the survey focuses on reach scale. It uses a hierarchical approach at the reach scale: main parameters (6) → functional units → single parameters
	LONGITUDINAL SPATIAL SCALE	Fixed length	100 m is the standard length, but also its multiples are used (depending on channel width), but not exceeding 1 km (for largest rivers)
		Scaled to channel width	NOT APPLICABLE
		Variable length	NOT APPLICABLE
	LATERAL SPATIAL SCALE	Channel	3 main parameters analyzed at channel scale: pattern, longitudinal profile and channel bed features
		Banks/Riparian zones	3 main parameters analyzed at bank scale: cross section and channel bank features (including riparian vegetation); banks are recorded separately
		Floodplain	1 main parameter analyzed at floodplain scale (including also riparian zones): floodplain, assessed within a width of 100 m for each river side
C - TEMPORAL SCALE		Physical and morphological assessment	The method assesses the current state and compare it to a past/reference state
		Hydrological assessment	NOT APPLICABLE
D - TYPE OF METHOD		Characterization/classification	The method makes a characterization (e.g. presence/absence, extension) of physical river features
		Assessment by index	Mapped features/parameters are scored: a scale of seven points (1 best, 7 worst) is used. Scores are averaged and assigned to 6 main parameters and then averaged to obtain the final score. The method also uses a functional-unit score system, where scores are assigned following a hierarchical approach
		Deviation from reference	The method assesses the status of the river in comparison to the potential reference conditions
		General assessment / Design framework	NOT APPLICABLE
		Modelling status / Scenario	NOT APPLICABLE
		Final expert judgment	There is an 'expert opinion' entry, which acts as quality assurance: deviations between the computed scores from the individual attributes and expert opinion are cross-checked (Raven et al., 2002)
		Links with other systems	It could be used in conjunction to the Overview survey to get large spatial scale information
E - REFERENCE CONDITIONS			Reference conditions ('Leitbild') are defined empirically or modelled, and correspond to the potentially state to which the stream would develop without further human influence
F - GENERAL INFORMATION	RIVER TYPOLOGY		Germany uses system A to define river typologies: 24 river typologies are identified, but the method only differentiates between six major geomorphologically based river types with valley shape and slope as relevant factors
	TYPOLOGY LIMITATIONS		The method is not adapted to be applied to large rivers, braided reaches, and seasonal watercourses
	TYPE-SPECIFIC (Protocol / Assessment method)		The method was initially developed for small to medium sized streams, but later extended to large rivers: two distinct and specific field survey protocols exist for "small to medium" and for "medium to large" rivers. The method uses a type-specific score system for the main parameters
	BASIS FOR STANDARDS / THRESHOLDS		All parameters have similar ecological potential (no weighting), but 6 main parameters are scored differently in relation to stream type. Evaluation is computed and checked by calibration against a natural or near-natural river reach (reference). 7 classes are used: 1=Unchanged, 2=Slightly changed, 3=Moderately changed, 4=Distinctly changed, 5=Obviously changed, 6=Strongly changed, 7=Completely changed
	REACH SCALE SURVEY STRATEGY		No reach scale survey strategy, features are recorded by walking along the stream/river; all the river has to be assessed in continuum
	TIMING AND FREQUENCY		The field survey method is time consuming; the recommended monitoring frequency is 6 years, with respect to morphology and continuity (Weiss et al., 2008)
	DATA PRESENTATION (OUTPUT/LAYOUT)		Final index, colour-coded maps and entered in a GIS server
	METHOD SUPPORT / APPLICATION TOOLS		A manual; paper or palm pilot protocols; identification sheet (to record general characteristics)
	SPATIAL COMPARISON		Comparison between water bodies is possible and to some extend used to determine the 'naturalness' of the water body
	CONNECTION TO ECOLOGY		It links hydromorphological features to the ecological functioning of the channel and floodplain; It is able to detect local variations in features contributing to habitat character (because of small reach scale approach)
	USERS		Resulting maps present and interpret the survey results in a manner understandable by non-expert users and a wide range of stakeholders
	SCALE INFORMATION		Only reach scale information is processed (large scale info collected to determine river type and reference conditions)
	NUMBER OF END PARAMETERS		6 main parameters/indicators for both protocols: 29 end parameters for small to medium size rivers and 31 end parameters for medium to large size rivers (organised into 14 functional units)

3. RECORDED FEATURES			
A - CATCHMENT / VALLEY	LARGE SCALE CHARACTERISTICS		NOT APPLICABLE
	HYDROLOGICAL REGIME	Hydrological conditions	Flow diversity
		Metrics of hydrological regime	NOT APPLICABLE
		Hydro-peaking	NOT APPLICABLE
	VALLEY FORM / FEATURES		River valley type
B - CHANNEL	CHANNEL PATTERN / PLANFORM		Constrained, sinuate, meandering, anastomosing (the last recorded as specific structures/features indicators of channel dynamics)
	CHANNEL FORMS		Side bars, point bars or mid-channel bars; islands are recorded as specific structures/features (indicators of channel dynamics)
	BED CONFIGURATION		Indicated as special bed features (into "Channel bed features/morphology")
	CHANNEL DIMENSIONS		Depth diversity; banktop height; diversity in channel width
	FLOW-TYPE		Flow types are assessed
	PHYSICAL / HYDRAULIC VARIABLES		NOT APPLICABLE
	SUBSTRATE		Dominant substrate (mud, sand, gravel, stones, bedrock); substrate diversity
	IN-CHANNEL VEGETATION		Recoded as "Channel bed features/morphology"
	WOODY DEBRIS		Fallen trees, debris dams (assessed as special features of "Channel pattern"); woody debris are recorded also along the banks
	ARTIFICIAL FEATURES AND STRUCTURES		Some features indicated under the main parameter "Longitudinal profile" (artificial structures, culverting, impoundment); other under "Channel bed features/morphology" (bed fixation/modifications); pollution effect (erosion, sewage)
C - RIVER BANKS/ RIPARIAN ZONE	BANK PROFILE / SHAPE		Cross section form (e.g. natural, near natural, different artificial stages) and depth
	BANK MATERIAL		NOT APPLICABLE
	RIPARIAN VEGETATION STRUCTURE		Woody and herbaceous vegetation
	LONGITUDINAL CONTINUITY OF RIPARIAN VEGETATION		NOT APPLICABLE
	RIPARIAN VEGETATION WIDTH		NOT APPLICABLE
	VEGETATION COMPOSITION, COVERAGE AND OTHER RIPARIAN VEGETATION CHARACTERISTICS		Special features at banks (e.g. side channel around a tree, fallen tree parallel to bank, woody debris)
	ARTIFICIAL FEATURES AND STRUCTURES		Bank fixation/modification (e.g. concrete, gabion, stones, etc.); obvious pollution effects (sewage, litter, sewage overflows, poaching)
	LAND USE		Riparian buffer strip (native deciduous forest, coniferous forest, grassland, urban area, agricultural use, typical standing water bodies), recorded as floodplain parameter
D - FLOODPLAIN	FLUVIAL FORMS		Special floodplain features/structures (backwaters, side arms, oxbows, springs, natural lakes, natural terraces, etc.)
	INFO ON FLOODPLAIN FEATURES		NOT APPLICABLE
	LAND USE		Land use (native deciduous forest, coniferous forest, grassland, urban area, agricultural use, typical standing water bodies); infrastructure works / impacts (e.g. fishpond, roads, impoundments, dumps, purification plants, etc.)
4. RIVER PROCESSES			
A - LONGITUDINAL CONTINUITY		Sediment and wood	Presence of natural and anthropogenic migration barriers
		Water flow	
B - LATERAL CONTINUITY		Lateral hydraulic continuity	Assessed through the mapping of artificial features
		Sediment (and wood) lateral continuity	NOT APPLICABLE
C - BANK EROSION / STABILITY			Erosion of bend (assessed as parameter of "Channel pattern"); bank erosion
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)			It represents the most commonly used method in Germany for the implementation of the WFD (most of the 16 federal states), but not (yet) the formally selected method; it is possible to convert the 7 quality classes into 5 required by WFD
APPLICATION TO ALL WATER BODIES			It applies to all river types identified in Germany comparable to the water quality
USED IN THE CLASSIFICATION OF HIGH-STATUS / OTHER STATUS CLASSES			It could be used in the classification of any river status
USED TO PREDICT RISK OF DETERIORATION			Potentially able to detect risk of deterioration
USED TO IDENTIFY IMPROVEMENT TARGETS			It could be used for local to regional river maintenance plans and river development plans; the method also aims to assess the impact of river engineering or rehabilitation
USED TO HELP IDENTIFY CAUSE OF ECOLOGICAL IMPACTS			The method is type-specific and refers to a specific/potential reference state, and the classification systems with 7 classes is comparable to the hydro-biological and physical-chemical features commonly used in Germany
KEY STRENGTHS FOR RIVER MANAGEMENT			It is able to distinguish local variations in features contributing to habitat character (because of small reach-scale approach); features are surveyed in continuum