

Stream Assessment

A Stream Assessment Protocol integrates river metrics, assessment methods, and assessment products, to create a tool that addresses specific needs.



Analysis of river behaviors affecting public safety and aquatic ecosystems requires accurate characterization of fluvial geomorphology (FGM) **metrics** across a watershed. FGM metrics, such as bankfull dimensions and pebble size distribution, are calculated through the measurement of FGM **features**, such as bankfull channel edges and bed materials. There are many **methods** for performing these measurements, including personal observation, physical surveys, terrestrial laser surveys, and the use of remote sensing tools. Measurements of FGM features and metrics can lead to a variety of assessment **products**, including priority ratings, stream quality scores, engineering equation variable values, and mapped hazard zones.

Assessment **protocols** incorporate a selection of FGM metrics and products. They can vary in ease-of-application, spatial-scale of interest, level of objectivity, philosophical approach, product type, and more. One major variant is the **topic of interest** each is designed to address. The following table summarizes common topics:

Topic	Description	Features of Interest	Example Protocols
Habitat	The river's ability to sustain permanent and diverse wildlife populations	<ul style="list-style-type: none"> • food sources • access to spawning areas • migratory connectivity • shelter availability • water quality 	RHS (2003) BURP (IDEQ, 2007) AIP (Moore et al 2008) RBP (Barbour et al 1999) SRMG (KDOW, 2007)
Water Quality	The suitability of the river as a water source for human consumption. The prevention of high sediment yields	<ul style="list-style-type: none"> • water chemistry • microorganism populations • turbidity • sediment sources 	PSSW (ADEQ, 2012) SIH (USFS, 2009) USM (USACE, 2007)
Fluvial Hazards	Delineation of areas where erosion or inundation may threaten life, property, or economy	<ul style="list-style-type: none"> • slope, profile • channel dimensions • planform shape • bed and bank materials • vegetation 	WARSSS (Rosgen, 2007) VTSGA (Kline et al 2003) SEDG (MEI, 2008) GEEHZ (COAWPD, 2013)
Project Design	Definition of hydraulic and sediment transport properties relevant to specific engineering plans	<ul style="list-style-type: none"> • hydrography • lithology • debris sources 	WARSSS (Rosgen, 2007) SEDG (MEI, 2008)



Assessment Protocols

The following table provides a list of stream assessment protocols used around the United States and the world. While each is unique, all rely on observation of physical features, and differ only in their methods of data collection, physical attributes of interest, and interpretation of the data after collection.

Protocol	Source	Summary
WARSSS	Rosgen, D. 2007. Watershed Assessment of River Stability and Sediment Supply (WARSSS)	Four-phases classify streams, measure features for channel evolution and sediment models. Guides "natural channel design."
VTSGA	Kline, M., et al. Various Dates (2003, rev. 2004). Stream Geomorphic Assessment Protocol Handbooks .	Three-phase protocol for watershed planning, hazard mapping. Emphasizes river corridor, is incorporated into state legislation.
PSWQS	ADEQ Surface Water Section. 2012. Standard Operating Procedures for Surface Water Quality Sampling, Arizona .	Manual of assessment methods, based on Rosgen. Focus is water quality. Part of statewide surface water monitoring program.
BURP	IDEQ. 2007. Beneficial Use Reconnaissance Program Field Manual for Streams .	Guidance for assessment planning, preparation, fieldwork, and reporting. Focus is biological condition and habitat availability.
AIP	Moore, K., et al. 2008. Aquatic Inventories Project: Methods for Stream Habitat Surveys, Version 17.1 .	Quantifies habitat condition by assigning numeric values to stream, riparian, and valley geomorphic features.
SIH	USFS. 2009. Stream Inventory Handbook: Level I & II, Version 2.9 .	Set of inventory protocols geared towards various watershed management activities. Focus and level of detail are flexible.
CMA	USACE and USEPA, 2008. Compensatory Mitigation for Losses of Aquatic Resources; Final Rule	Determine requirements to offset impacts. Available for New England, VA, NC, SC, GA, AL, MS, IA, IL, WI, MN, OK, TX, KY.
SEDG	Mussetter Engineering, Inc. 2008. Sediment and Erosion Design Guide .	Delineates Lateral Erosion Envelope (LEE) using bank retreat equations based on bank material and incision depths.
GEEHZ	City of Austin Watershed Protection Department, 2013. Guidance on Establishing an Erosion Hazard Zone	Estimates surface and subsurface erosion hazard zones based on future incision and channel migration. Has legislative force.
Mont-Buff	Montgomery, D. R. and J. M. Buffington. 1998. Channel Processes, Classification, and Response	Energy and mass-balance equations are used to classify reaches, assess condition and predict disturbance response.
RSF	Brierley, G., & Fryirs, K. 2005. Geomorphology and River Management: Applications of the River Styles Framework	Divides river into Geomorphic Process Zones based on sediment dynamics, remediation aims for best-possible "sustainable river."
RHS	The RHS Team, 2003. River Habitat Survey in Britain and Ireland: Field Survey Guidance Manual, 2003 version	Applied rapidly by non-experts, scores habitat based on physical stream structure. Conforms to EU Water Framework Directive.
MQI	Rinaldi, M., et al. 2012. A method for the assessment and analysis of the hydromorphological condition of Italian streams: The Morphological Quality Index (MQI) .	Grades habitat from continuity, morphology, vegetation quality. Uses remote sensing. Conforms to EU WFD.