Stream Physical Characteristics & Functions:

Stability & Restoration Approaches

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Stable Stream

transports the water and sediment produced by its watershed, such that over time it maintains its dimension, pattern, and profile, while neither degrading nor aggrading

Rosgen, 1994
Unstable Streams
Stream Corridor: 4 Dimensions

Stream Corridor Longitudinal Profile

Mountain headwater streams flow swiftly down steep slopes and cut a deep V-shaped valley. Rapids and waterfalls are common.

Low-elevation streams merge and flow down gentler slopes. The valley broadens and the river begins to meander.

At an even lower elevation a river wanders and meanders slowly across a broad, nearly flat valley. At its mouth it may divide into many separate channels as it flows across a delta built up of riverborne sediments and into the sea.


Stream Corridor Lateral Profile

“Fluvial Geomorphology”

“study of stream physical characteristics and factors affecting them”

- Dimension (cross-section)
- Pattern (plan form)
- Profile (bed form)
- Bed material (substrate size)
Channel Dimension

- Width
- Depth
- Cross-Section Area
- Floodplain Width

Figure 4. Example cross-section survey. The X's represent cross-section distances (widths) from the left pin. The Y's represent the location and reading of a bankfull depth. The dashed line (faint at left) equals the calculated mean depth for a section. The shaded rectangle shows an example of the sectional area. Add incremental areas across the entire cross section to get total cross-sectional area.
- Sinuosity
- Meander
- Wavelength
- Radius of Curvature
- Belt Width
Channel Pattern

Straight
- pool
- riffle

Sinuous
- pool
- riffle or cross over
- thalweg line
Channel Profile

- Slope
- Pool-Riffle Sequence
- Step-Pool Sequence
Bed Material
Sediment Transport

*Sediment Sources*

- Land disturbances
- Streambank & bed erosion
- Bedload transport
Causes of Instability

- Increase slope
- Increase runoff
- Change sediment load
- Loss of riparian buffer
- Instream modification
Increase Slope

- Channelization
- Lower Reservoir Water Surface
- Dam Break
- Geologic Uplift
Increase Runoff

- Urbanization
- Clear-cutting
- Climate Change
Changes in Sediment Load

- Development
- Agriculture
- Bank Erosion
- Impoundments
Simon Channel Evolution Model

Source:
Simon, 1989, USACE 1990
Class III. Degradation

$h < h_c$
Class IV. Degradation and Widening

$h > h_c$

terrace

slumped material

![River degradation image]
Case Study: Worley Creek
Watauga County, NC
Case Study: East Prong Roaring River
Stone Mountain State Park,
Wilkes County, NC
Case Study:
Little Garvin Creek, Clemson, SC