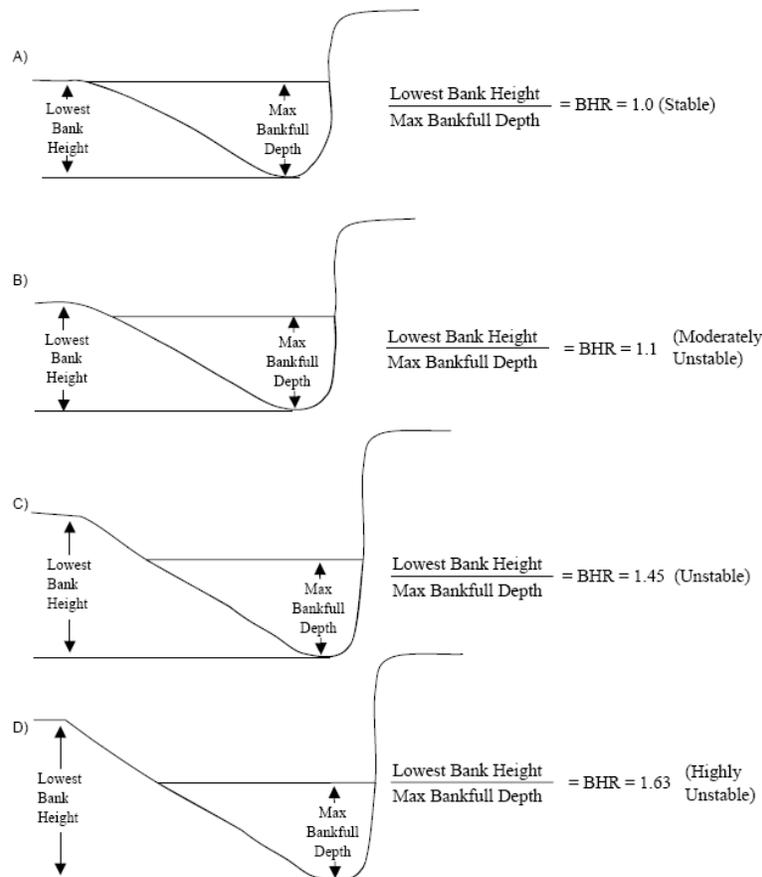


# Selected Key Terms - Stream Geomorphology

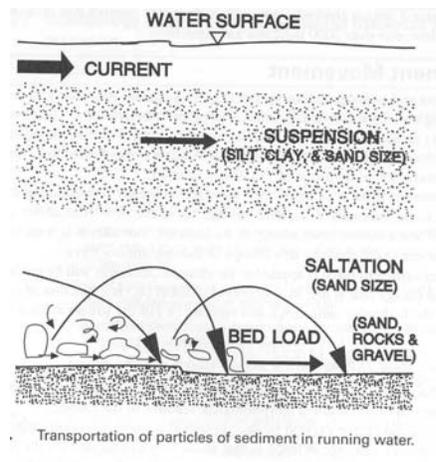
## by W. Barry Southerland – Fluvial Geomorphologist, Ph.D.

- Aggradation** A long-term, persistent rise in the elevation of a streambed caused by sediment deposition. A rise in the streambed relative to the floodplain.
- Anthropocentric** interpreting or regarding the world in terms of human values and experiences, considering human beings as the most significant entity of the universe.
- Anthropogenic** of, relating to, or resulting from the influence of human beings on nature.
- Bankfull Discharge** Sometimes referred to as the effective flow or ordinary high water flow. It is the channel-forming flow. It is an empirical fact that, for most streams, the bankfull discharge is the flow that has a recurrence interval of approximately 1.5 years in the annual flood series. Most bankfull discharges have a recurrence range between 1.1 and 1.8. In some areas it could be lower or higher than this range. It is the flow that transports the most sediment for the least amount of energy-over time. BFD often exceeds a 2.0 return interval in extreme arid conditions and may approach an annual high Q in humid areas.
- Bank Height Ratio** BHR: It is the height of the top of the bank divided by the bankfull discharge height. Typically measured from the toe. The BHR is a relative measure of the floodplain connectivity to the bankfull channel.



Bedload

The part of a stream's sediment load that is moved on or immediately above the stream bed, such as the larger or heavier particles (boulders, pebbles, gravels) rolled along the bottom; the part of the load that is not continuously in suspension or solution.



Belt Width

The width of the full lateral extent of the bankfull channel measured perpendicular to the fall of the valley.

Channel Confinement

Lateral constriction of a stream channel. Quantitatively measured by meander width ratio.

(Capacity) –  
Bedload

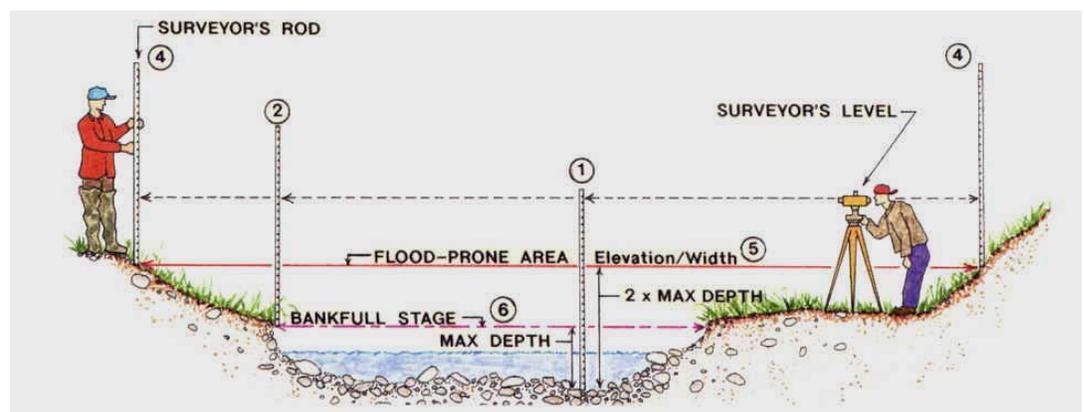
Total load – bedload and suspended components moving through a channel  
Aggradation occurs when the shear stress associated with the existing hydraulic geometry is incapable of transporting the total load. Incision occurs when the shear stress of the hydraulic geometry is considerably greater than what is necessary to transport the total load

(Competence)-  
(Bedload)

The ability of the stream to entrain the largest particle typically transported in the system at bankfull Q. Typically  $D_{max}$  on the lower 1/3 bar of a pool:riffle morphology.

Cross-section

A line across a stream perpendicular to the flow along which measurements are taken, so that *morphological* and flow characteristics of that section are described from bank to bank.



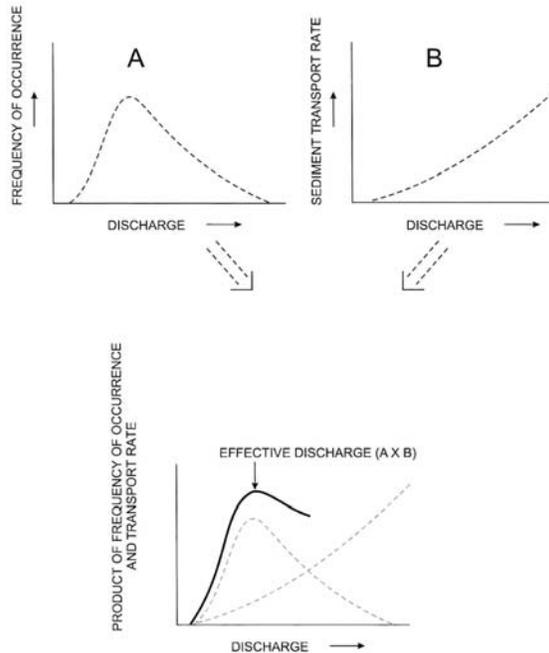
Depositional Features

features built and typically maintained within the bankfull channel such as point bars, central bars and riffles.

$D^{50}$

Median size particle measured in the alluvial channel. 50% of the material is greater and 50% is smaller in size.

Effective Discharge



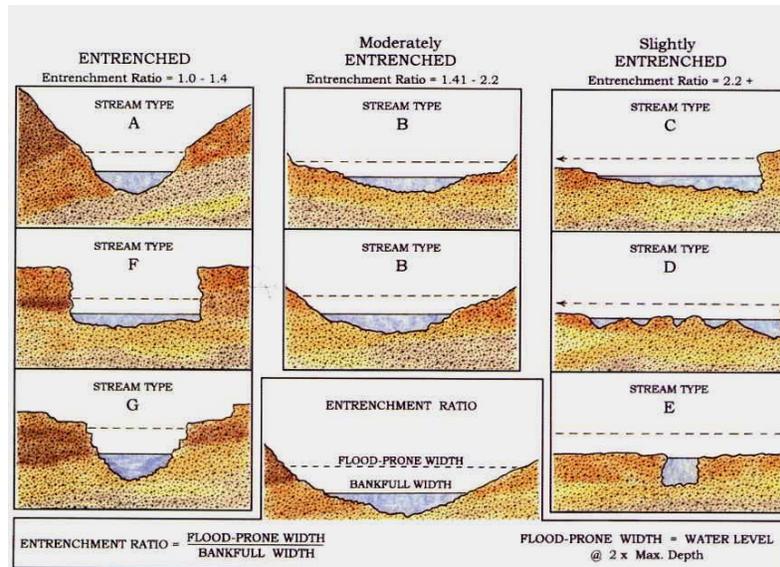
The Q that transports the most bedload over time. often the same as bankfull discharge.

Entrenchment

Qualitatively defined as the vertical containment of a stream and the degree in which it is incised in the valley floor. A stream may also be entrenched by the use of dikes or other structures.

Entrenchment Ratio

Measurement of entrenchment. It is the floodprone width, divided by the surface bankfull discharge width. The lower the entrenchment ratio, the more vertical containment of flood flows exists. Higher entrenchment ratios depict more floodplain development.



Floodplain The flat area adjoining a river channel constructed by the river in the present climate and overflows during moderate flow events.

Floodprone Area Generally includes the active floodplain and the low terrace. The elevation of the floodprone is qualitatively defined as 2 times the max. bankfull depth.

Headcut The identifiable point of active incision where a break in grade occurs from a lower to a higher elevation. An active headcut point migrates in an upstream direction.

Hydraulic Geometry A quantitative way of describing the channel changes in width, depth, and velocity relative to discharge.

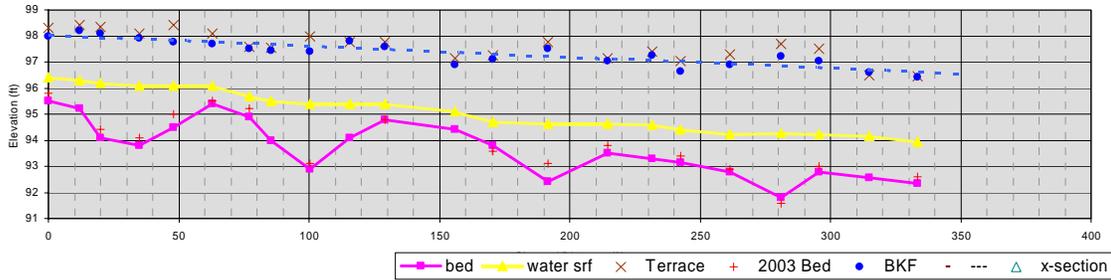
Hydrophysiographic Region (Area) is a drainage basin where the combination of the mean annual precipitation, lithology, and landuse(s) produces similar discharge for a given drainage basin.

Incised Channel A stream channel in which the bed has dropped and as a result, the stream is disconnected from its *floodplain*. Incised channels are often referred to as degraded channels. Stage II, III, and IV in Schumm's CEM.

Longitudinal Profile A profile of a stream or valley, drawn along its length between two given points. It is a straightened out section that follows the meandering of a stream. The elevations along a streambed go from a higher to a lower point. Long. Profiles measures most accurately describes the bedforms, such as: Step:pool, riffle:pool, plane bed, cascade, hollow and so forth.

Long Profile  
Continued

South Fork Asotin B4 Pool-Riffle Morphology

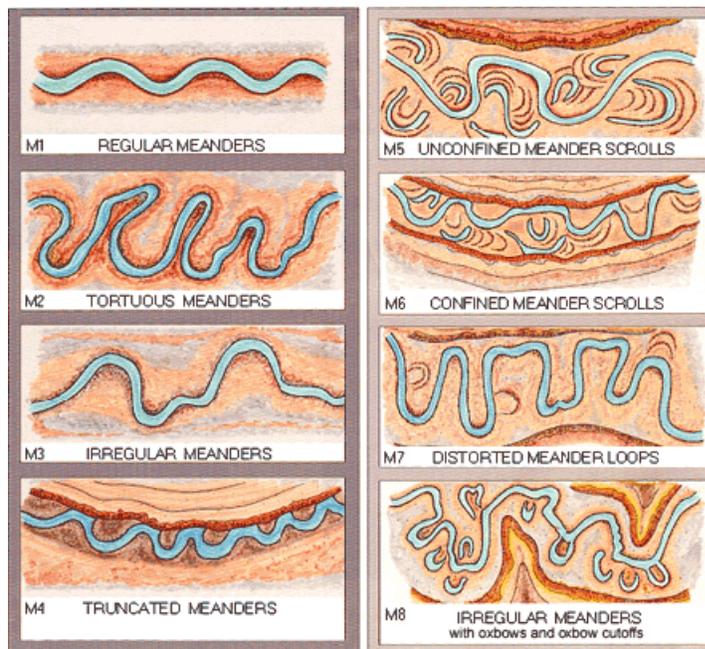


Manning's  
roughness  
coefficient

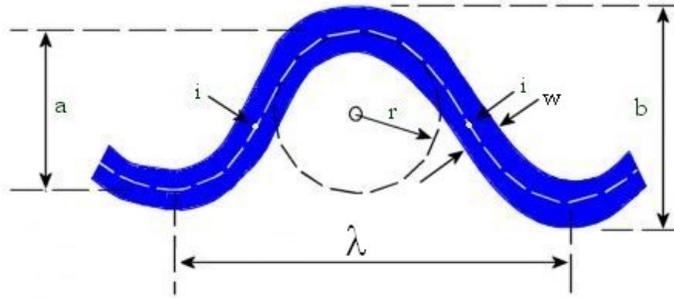
$$v = 1.486 \frac{r^{2/3} \times s^{1/2}}{n} \quad n = \frac{1.486}{Q} (A) R^{2/3} S^{1/2}$$

A series of sinuous curves or loops in the course of a stream that are produced as a stream swings from side to side in flowing across its floodplain. Measured as planform.

Meander Pattern



Meander Geometry



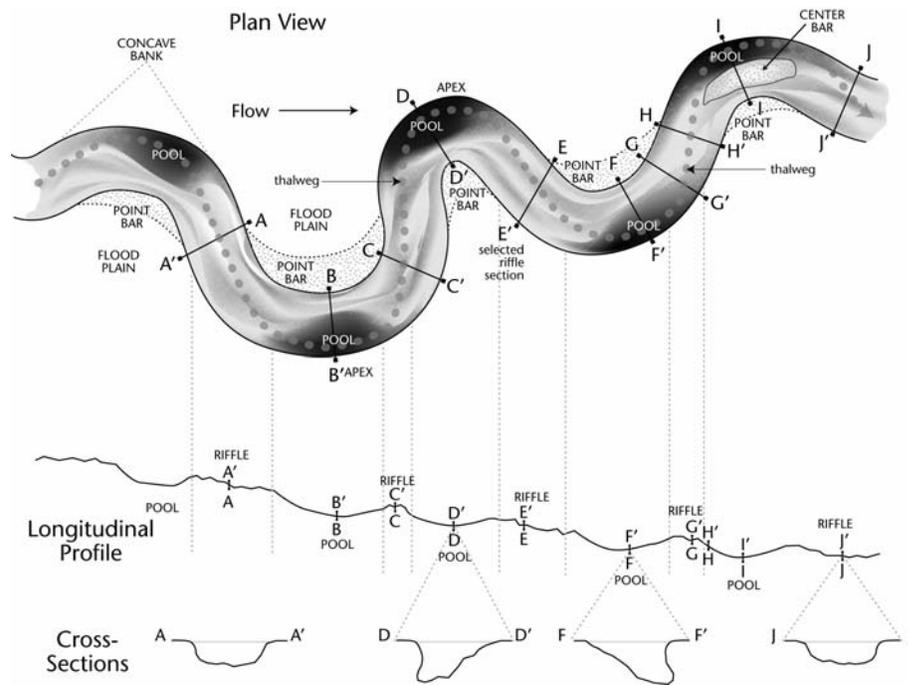
$a$  = amplitude  
 $\lambda$  = wavelength  
 $b$  = beltwidth  
 $r$  = radius of curvature  
 $w$  = bankfull width at inflection point  
 $z$  = arc length (stream length between successive inflection points,  $i$ )

Meander Width Ratio

MWR – The quantitative expression of confinement. It is determined by the ratio of the belt width/bankfull width.

Morphometry

Measurement of external form such as cross-section, profile, and planform.

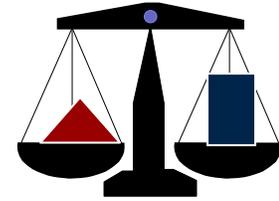


Reference Site  
(Stream Geomorphology Context)

The reference site is the stable morphological stream type in the system. This type may, or may not, be in a pristine state, usually not. The majority of time it is not pristine; however, the important geomorphologic, and most likely vegetative components, are there to sustain a long-term stable stream type. The reference site would fall within the range of natural variability for

geomorphic type and bedload transport. Historic analogs (rare) are reference reaches that exist in areas that have not been anthropogenically altered. Current Stable Analog are reference reaches that have been anthropogenically altered but stable in the current hydrophysiographic and runoff conditions.

### **Current Stable Analog – Reference Reach - Entiat**



#### Sinuosity

The ratio of stream channel length (measured in the thalweg) to the down-valley distance, or is also the ratio of the valley slope to the channel slope. When measured accurately from aerial photos, channel sinuosity may also be used to estimate channel slope (valley slope/stream slope). Sometimes sinuosity is referred to as the meanderiness of a stream.

#### Step:pool

A category of steeper stream types that have a narrow width of transition between the step and the head of the pool. These stream types are often associated with rapids. Typical geomorphic stream types that are identified as step:pool are: A, Aa+, G, and some B types

#### Stream Stability

The ability of a stream to transport the water and sediment of its watershed in such a manner to maintain its dimension, pattern, and profile, **over time**, without either aggrading or degrading.

#### Suspended Load

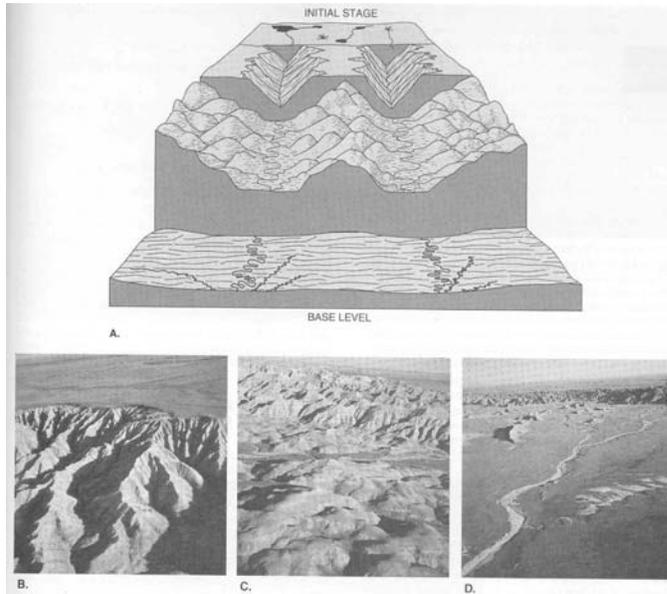
Is the portion of the total load component of streams, such as clay, silts, and fine sands and some sands that is carried in the water column. Load, minus bedload.

#### Thalweg

The line connecting the lowest points along a streambed; the *longitudinal profile*. Often referred to as the low flow channel within the bankfull channel.

Valley Type & Davis

Youthful to mature



(Don J. Easterbrook, 1999)

Water surface slope

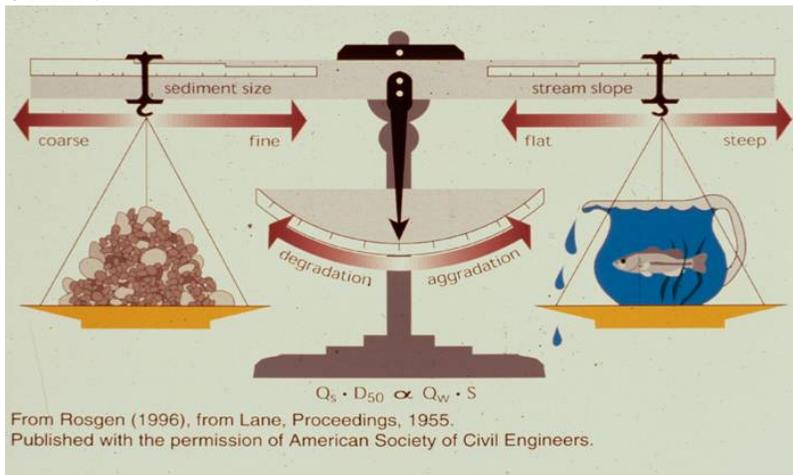
The slope of the stream as measured at the water surface rather than the bed surface. It is often used as the average energy grade of the stream. Slope values will vary somewhat for riffles and pools for the low flow stage compared to the bankfull stage. However, the slope throughout both features taken over a meander wavelength will be approximately the same overall slope as the bankfull Q slope.

Width-to-Depth Ratio

The bankfull width divided by the average bankfull depth. This measurement is taken after determining the bankfull discharge height and choosing a representative cross-section.

WBS – 2000

OTHER:



Lane's Equation

# Channel Evolution and Stream Classification – Wildland Hydrology WARSS

