Vermont Stream Geomorphic Assessment

Appendix M

Delineation of Stream Bed Features

Vermont Agency of Natural Resources
April, 2004

Delineation of Stream Bed Features

Geomorphic Significance of Stream Bed Features

Classifying stream bed features is one of the more challenging tasks in a stream geomorphic assessment. Nearly all significant changes in bed gradient and depth may be important to survey, especially from a habitat perspective, but only certain bed features may be significant from a fluvial geomorphic perspective. While a small scour pool around a boulder in a riffle-pool stream may be significant fish habitat, that feature may not be a significant pool from a geomorphic perspective. Biologists are interested in the existence of pools and the habitat they provide. Geomorphologists are concerned with the fluvial processes that create pools and their longevity. While conducting a geomorphic survey, focus on how a feature was formed and whether it is biologically and/or geomorphically significant. For all features surveyed, take care to label those features that are significant geomorphically on both your field notes and on the DMS spreadsheet.

Generally speaking geomorphically significant features are those that are formed by the erosion and deposition of material at bankfull flows consistent with the current balance between the watershed inputs and the energy grade of the stream. As such, geomorphically significant features typically comprise the entire bankfull width of the channel and persist so long as the current equilibrium conditions of the bankfull channel persists. Geomorphically significant features can be thought of as those that play a formative role in the long-term average characteristics of the channel.

Identification of Bed Features

If a feature is determined to be geomorphically significant it will need to be specifically denoted. If it is not significant then it is part of the larger feature in which it lies. Classifying a feature begins with identifying the feature's beginning and end points, observing its characteristics and reconsidering its geomorphic significance. A list of bed feature types with defining characteristics found in riffle-pool streams is given below and represented diagrammatically in Figure 1.

- **Riffles**: the sections of the bed with the steepest slopes and shallowest depths at flows below bankfull. Riffles typically occur at the cross over locations and have a poorly defined thalweg.
- **Runs**: differ from riffles in that depth of flow is typically greater and slope of the bed is less than that of riffles. Runs will often have a well defined thalweg.
- **Pools**: are the deepest locations of the reach. Water surface slope of pools at below bankfull flows is near zero. Pools are often located at the outside of meander bends.
- **Glides**: are located immediately downstream of pools. The slope of the channel bed through a glide is negative while the slope of the water surface is positive. The head of the glide can be difficult to identify. Use the following characteristics to help you locate the head of the glide:
    - the location of increased flow velocity coming out of the pool,
    - the location at which the steeply sloped bed rising out of the pool decreases to a lesser gradient,
    - the location at which the thalweg coming out of the pool becomes less well defined and essentially fades completely.
    - the location which is approximately same elevation as the tail of the run.
- **Other**: This category is provided to accommodate the unstable short lived bed feature such as a zone of aggradation that you do not want to lump with stable features.

There is a typical but by no means absolutely predictable sequencing of bed features found on riffle-pool streams. Riffles will most often be followed by runs. Runs may transition back to riffles but more often are followed by pools. By definition glides begin at the downstream end of pools and end at the upstream end of a riffle or run. Use this expected sequence to help type individual features but do not let it override characteristics of slope and depth and the existence of a well defined thalweg.

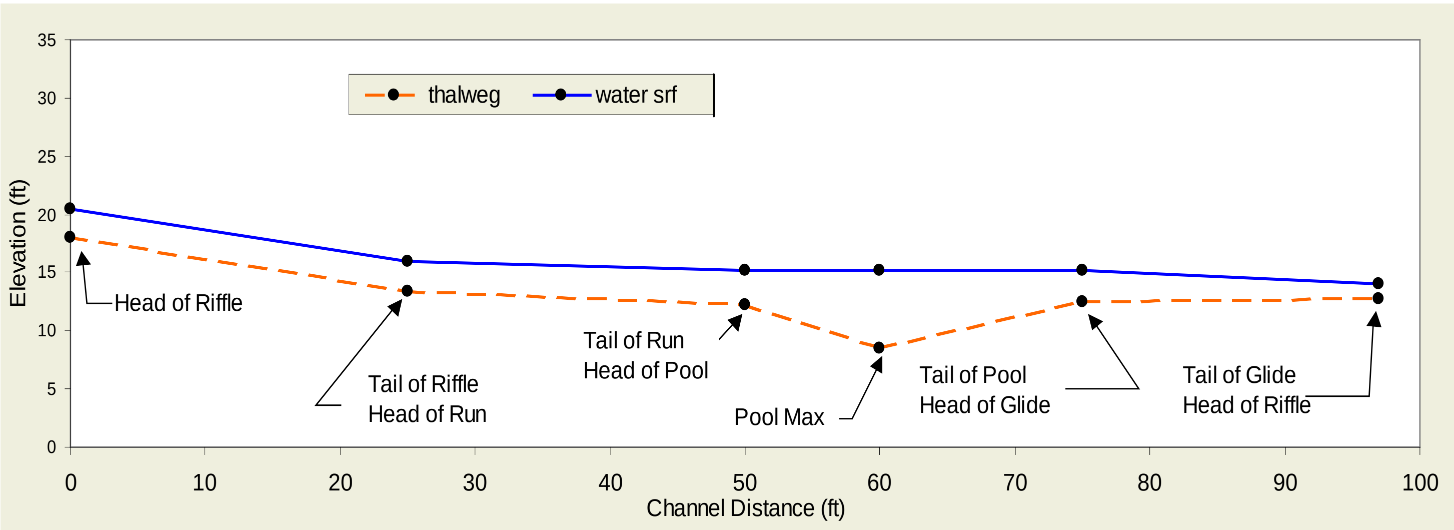

Figure 1 Typical slope and depth characteristics and sequencing of bed features in a riffle-pool stream.

Step-pool systems may contain all of the bed features listed above although typically riffles are replaced by steps which most commonly transition directly into pools. Riffles and runs may exist in lower gradient segments of step-pool reaches. Due to the abundance of boulders, step-pool streams often contain a high number of scour pools. Generally speaking, it is the pools that are associated with step features and not scour pools around randomly located boulders that are significant.

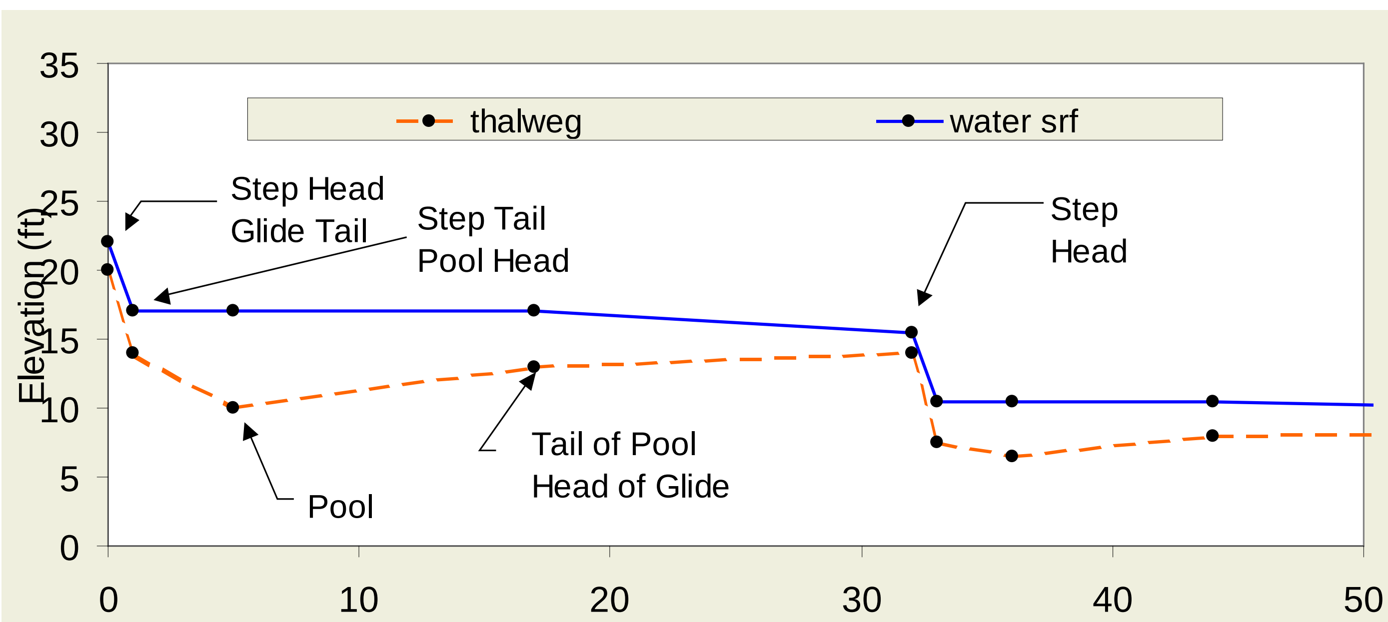

Figure 2 Typical slope and depth characteristics and sequencing of bed features in a step pool stream.

Plane bed streams by definition are featureless and do not have a distinct sequence of bed features such as riffles and pools. When surveying the longitudinal profile of plane bed streams, take elevations at stations spaced at a distance equivalent to one bankfull width. Be sure to code the profile stations as plane bed (PB). To take advantage of the weighted pebble count and roughness coefficient calculations of the DMS spreadsheet, place plane bed pebble count data into the riffle pebble count section of the materials worksheet.

In vertically adjusting systems, bed forms may be encountered that look like that of a plane bed stream, but are not formed by the same fluvial processes that create a plane bed system. For instance, in degraded streams, bed features may be scoured away; while in aggraded streams, bed features may be "drowned out" by the deposition of fine sediment. In other situations, bed features may be formed by an anomalous scour or deposition process (e.g., those found at confluences or bank slumps). For these cases, a category labeled "other" has been created on the profile, cross-section, and pebble count field forms and DMS worksheets. By placing pebble count data in the "other" data entry table, these materials will not included in the weighted pebble count and roughness coefficient calculations. The advantage of the "other" category is being able to compare data from anomalous or unstable sites with those of reference bed features and cross-sections.