APPENDIX F - Stream Classification Procedure

The procedure derives from the "Stream Stability Validation" approach that is described by Rosgen (1996). Stream stability over time may be assessed by monitoring the stream channel for five factors: 1) aggradation; 2) degradation; 3) shifting of particle sizes of stream bed materials; 4) changing the rate of lateral extension through accelerated bank erosion; and 5) morphological changes following the CEM (Simon et al., 1992). If any hydrological changes or disturbance occurs in the watershed, the five elements defined above are critical to analyze the channel response to the implementation of HMP mitigation measures.

One reference stream station will be used for comparison purposes and should coincide with the station selected for the bioassessment. The reference station should be located in a stream that shows the same lithology, sediment regime, and morphometric parameters as the study stream stations. Annual comparisons of channel stability will be carried out at the same time of the year, at the end of the spring season, thus maximizing the chances to monitor similar weather patterns.

Channel stability will be evaluated on an annual basis at selected cross-sections in the San Juan hydrologic unit. Evaluation of the vertical or bed stability will serve as the reference method to understand the geomorphological changes of a channel stream over time. Vertical or bed stability will be evaluated at each of the identified cross-sections; this field method will identify a potential aggradation or degradation, if any, of the stream. Rate, magnitude, and direction of vertical change, if any, will be quantified.

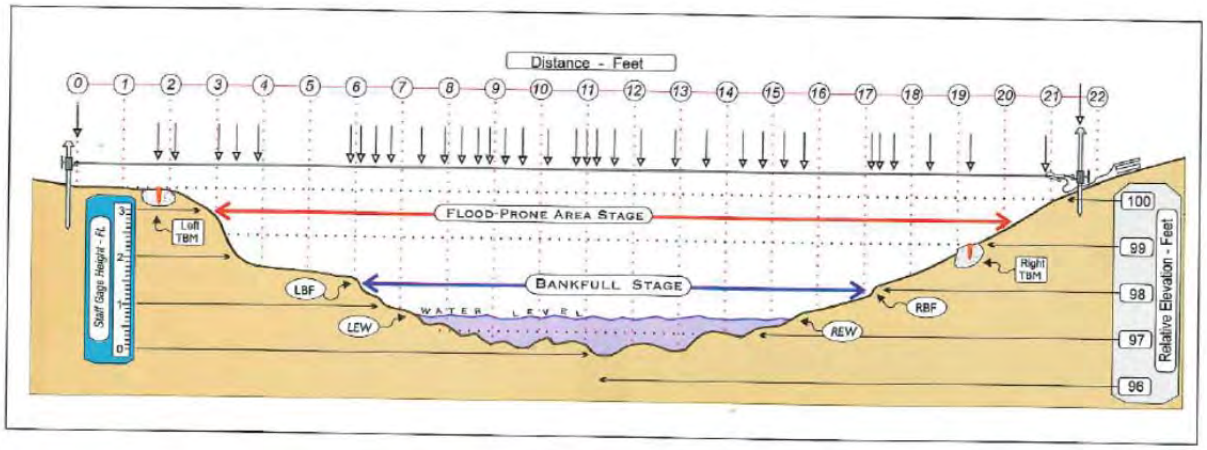
Vertical or bed stability

Rosgen (1996) has documented a couple methods including one, known as the "Monumented Cross-sections Method". At each selected site, the method consists of setting permanently monumented cross-sections that are located on a riffle and pool segment (or step/pool segment), i.e., two monumented cross-sections per site. Annual measurements at the two monumented cross-sections per site will be compared to the reference elevations taken during the initial survey.

Initially, one permanent benchmark should be installed on each bank of the stream: a left temporary benchmark and a right temporary benchmark. These should be made permanent by digging a hole in which a 10-inch stove bolt will be set up by a pad of concrete. The intent is to avoid vandalism damage. These two benchmarks will be located at the cross-section on a stable site above and away from the bankfull channel. Additionally, an elevation cross-section is often needed if the left or right side of the cross-section is located on an unstable slope. An elevation benchmark is established and often does not represent a true representation, but rather a relative elevation set at 100 feet.

During each cross-section survey, a leveled tape line is set above the stream channel. Measurements originate from the intercept of the rod with the leveled tape line (**Figure 17**).

Figure 17 - Typical permanent channel cross-section with benchmark locations and points of measurement – Rosgen (1996)



Simple measurements are made with the measuring tape and elevation rod method as described by Rosgen (1996):

- Locate the permanent benchmark on both sides of the stream (or, if on one side, a bearing for the transect is needed)
- Stretch the tape very tight with spring clamp and tape level
- Locate tape at same elevation as reference bolt on benchmark
- Read distance and elevation reading of rod intercept with tape
- Measure major features, such as:
    - Left benchmark (LBM)
    - Left terrace/floodplain (LT, LFP)
    - Left bankfull (LBF)
    - Left bank (LB)
    - Left edge of water (LEW)
    - Various bed features, bars, etc.
    - Thalweg (TW)
    - Inner berm features (IB)
    - Right edge of water (REW)
    - Right bank (RB)
    - Right bankfull (RBF)
    - Right terrace/floodplain (RT, RFP)
    - Right benchmark (RBM)

Measurements must include the floodplain, terraces, and stream adjacent slopes. Other surveying procedures such as auto or laser levels and total station surveys may be adapted from the described "measuring tape and elevation rod" method. If technically feasible, any exceptional event associated with a level higher than the bankfull level needs to be marked and indicated on the cross-section. The cross-section needs to be plotted for each measurement and compared to previous cross-sections to evaluate bed stability.

Finally, the longitudinal slope will be assessed based on measurements taken at two consecutive cross-sections. Rosgen (1996) also recommends developing a vicinity map and

detailed site map indicating the locations of monumented cross-sections, as well as upstream and downstream photographs for site documentation. Channel dimensions for stream classification need to be correlated in order to document morphological comparisons for extrapolation.

Each stream segment being surveyed will be classified on an annual basis per the simplified Rosgen system of channel classification (Rosgen, 1996). Classification will be possible upon identification of the following parameters: floodprone width, bankfull width, bankfull depth, and longitudinal slope. **Figure 18** shows the different types of channels per Rosgen channel classification (Rosgen, 1996).

Figure 18 - Simplified Rosgen Channel Classification (Rosgen, 1996)

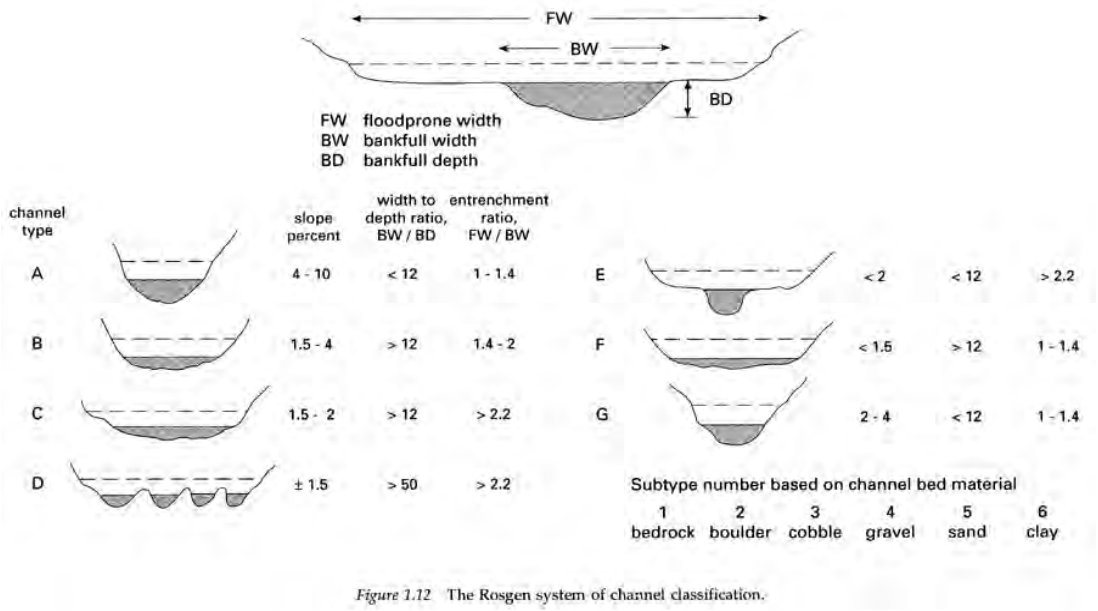


Figure 1.12 The Rosgen system of channel classification.