Jeff Osborn
Chelan PuD #1
1(509) 667-4223

APPLIED RIVER MORPHOLOGY

DAVE ROSGEN
Wildland Hydrology
Pagosa Springs, Colorado

Illustrations
HILTON LEE SILVEY
Western Hydrology
Lakewood, Colorado

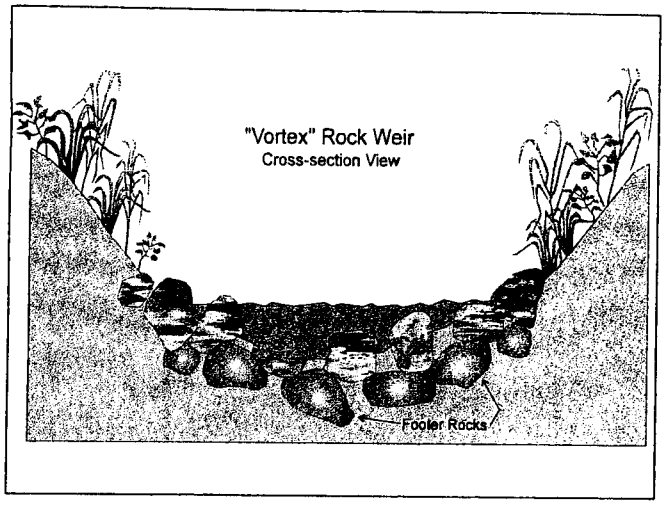

FIGURE 8-22. Vortex rock weir. (*Rosgen, 1993a*)

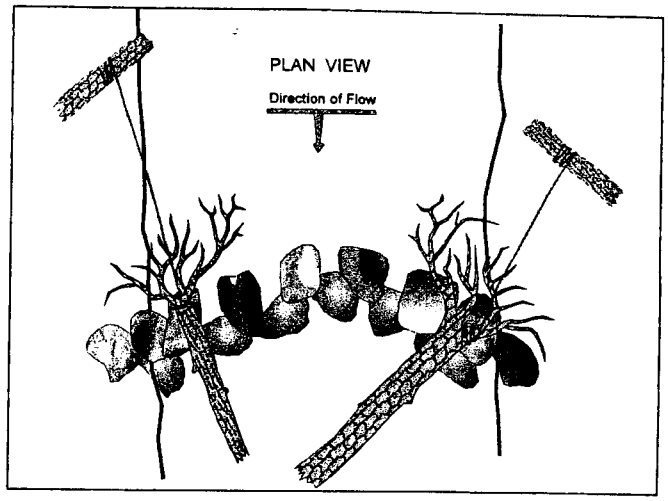

FIGURE 8-23. Modification of vortex rock weir to include "floating" log covers w/bank anchors. (*Rosgen, 1993a*)

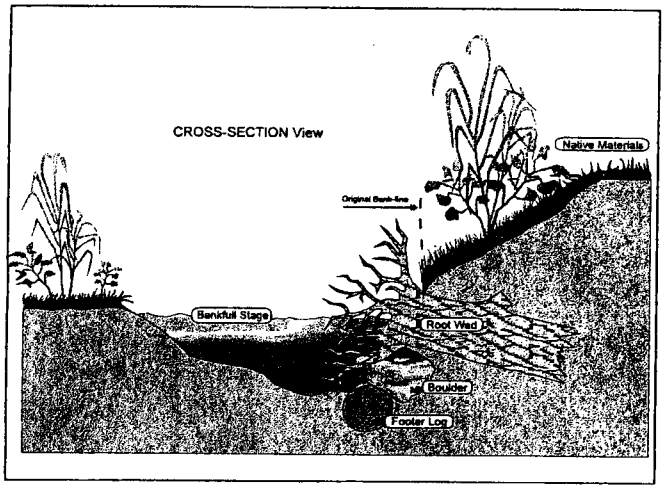

FIGURE 8-24. Native material bank revetment. (*Rosgen, 1993a*)

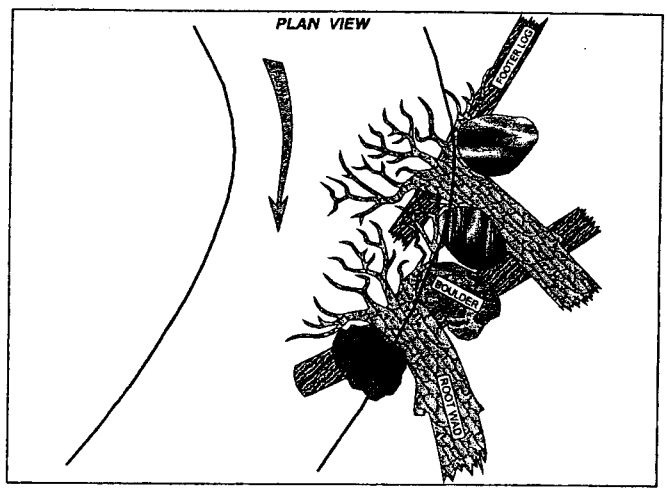

FIGURE 8-25. Native material bank revetment. (*Rosgen, 1993a*)

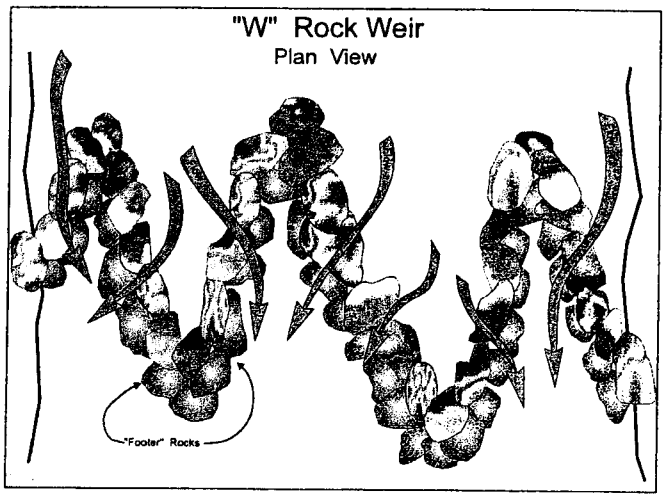

FIGURE 8-26. "W" rock weir. (*Rosgen, 1993a*)

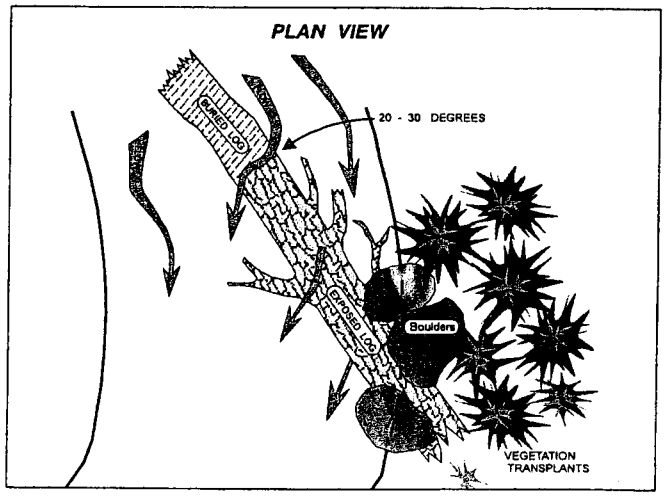

FIGURE 8-27. Log-spur bank feature. (*Rosgen, 1993a*)

Before designing restoration methods for an unstable river, it is essential to determine the causes of the disequilibrium conditions. These causes can be complex and interrelated with many watershed variables. Often an attack on the symptom, does not effect the cure! Many restoration attempts have failed, as the processes driving the cause of the problem were not identified, nor understood. As a minimum, it is important to know the bankfull discharge, sediment regime, drainage area, and stream hydrograph characteristics of the watershed.

Changes in the watershed that affect the quantity or timing of stream flows are activities such as vegetation removal, roads, soil compaction, impoundments or diversions, urban development, and drainage alteration. Changes in the nature, size, amounts, and source areas of sediment, influence channel stability. Previous discussions in this book and prediction methods are currently available to quantify these relations.

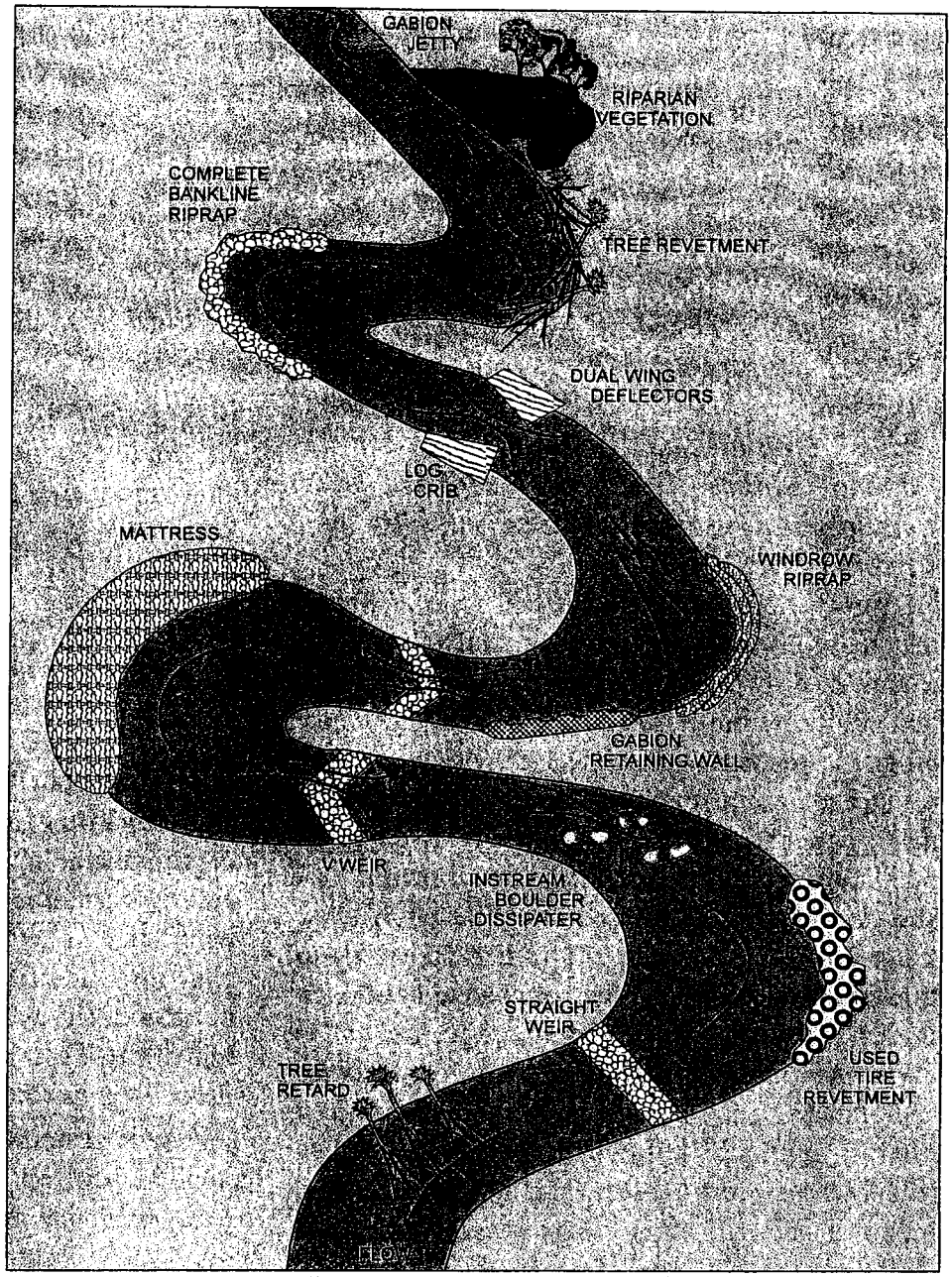

FIGURE 8-30. Non-point source pollution option for stream "improvement."

It is important, however, to understand the interrelations between channel stability and watershed changes. For example, if watershed changes produce an increase in streamflow, alluvial stream channel dimensions will change to accommodate the increases. That is, the channel enlarges and its bankfull dimension grows wider through bank erosion and lateral extension. Since meander geometry is related to bankfull width, other channel dimensions such as meander length, radius of curvature, and meander width ratio will also change. The overall result is channel instability with a corresponding loss of land, increased sediment supply, and the loss of aquatic habitat.

Watershed impacts leading to increased sediment supply can overload the river beyond its carrying capacity. There are many projects which have attempted to restore the river, when the cause was due to excessive sediment introduction from roads and surface disturbance activities. Often, mass wasting is accelerated due to roads and/or sat-