Although the process of creating riffles and pools is highly variable, the riffles and pools occur at predictable intervals. The spacing of these riffles or pools along the thalweg relates closely to the width of the stream at the elevation of dominant discharge. **Figure 3.1.7** illustrates riffle geometry in plan form. Further, the spacing of the pools, which are near the outside bend and slightly downstream of the maximum curvature of the meander, have essentially the same relationship to channel width as the riffles.

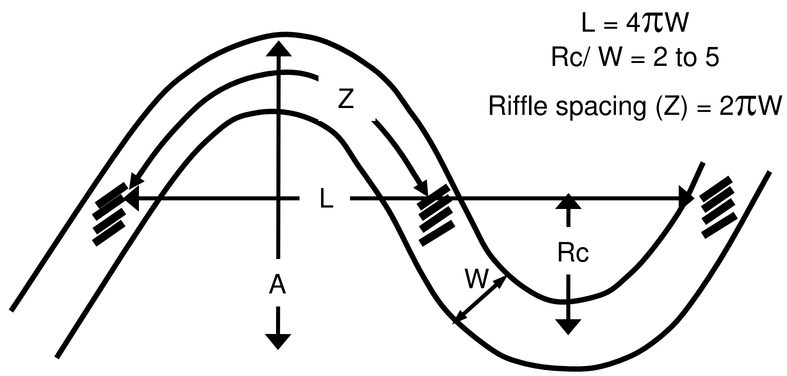

Figure 3.1.7. Meander Geometry

In alluvial streams of homogeneous material such as sand, meanders take the form of sine-generated curves. Leopold and Langbein (1969) demonstrated that this shape is the most hydraulically efficient form for turning water. These relationships between stream width, riffle spacing, meander wavelength and radius of curvature are remarkably consistent for streams and rivers throughout the world.

Most stable relationships in channel geometry include the channel width at the elevation corresponding to the dominant discharge. Riffle spacing (Z) generally occurs every 6.3 bank widths (W) where W is the width at the dominant discharge. This spacing is essentially $2\pi W$. Meander wavelength is approximately 12 bank widths, which approaches $4\pi W$.

The radius of curvature is also related to the channel width at dominant discharge elevation. The ratio of meander radius of curvature (Rc) to channel width (W) generally ranges between 2 and 7. Bagnold's (from Thorne et al. 1997) investigation of energy losses at bends confirmed the empirical observations by determining that flow energy losses are minimized through this shape. A tighter radius causes a flow separation and severe energy losses, a hydraulic inefficiency that is not persistent. In natural rivers, channel bends erode to an Rc/W ratio from 2 to 5 and then maintain that form, which indicates that the hydraulic efficiency is optimized by this form.