Hydrology & Geology: Surge Flow

Figure 1

Figure 2

Figure 3

Observant boaters have noticed an interesting and unusual flow pattern occurring on the river, especially in winter. The Niobrara is not characteristic of most Great Plains Rivers, simply flowing over and around obstacles. Instead it exhibits a pattern called “surge flow” (Fig. 1 & 2) where periodic surges (or bores) move along the water surface, eventually forming a cresting or surf-like breaking wave (Fig. 3) before receding again. At times these waves can reach heights of three feet or more!

These waves, sometimes known as pulsating periodic bores, are most evident during higher water levels (winter flows) when large amounts of sediments are suspended and transported within the stream. Besides a sand source, a steep gradient, relatively shallow waters and swift current are necessary for surge flows to occur. Surge flows have been noted in streams in the Southwest, Rocky Mountains and Northwest, but the sediment-dependent pulsating flow found in the Niobrara is generally regarded by scientists as an uncommon geologic feature. Be cautious when canoeing or kayaking through these waves -- if your boat turns broadside to these waves you may easily capsize.