Dynamic River Dikes: A Study of the Effect of Channel Grade on Agricultural Dikes

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Pembina County, North Dakota has several examples of dikes protecting farmsteads and agricultural lands. What effect does the grade of the natural watercourse have on the dike's ability to reduce flood damages? Do agricultural dikes provide equal benefits regardless of differing channel grades? I hypothesize that natural watercourses with greater grades will have higher stream velocities resulting in more breakout flooding. Further, I hypothesize that agricultural dikes will provide beneficial flood control regardless of the channel grade. I loaded the streamtable with sand, created a meandering stream and ran a uniform flow to establish the channel. The channel was stabilized with rubber roofing material and grid system installed for easier observations. I discovered that flatter grade channels had minimal flooding with natural conditions and nearly non-existent flooding with dikes in place. Watercourses with steeper grades had higher stream velocities which related to increased breakout flows. I rejected my hypothesis regarding equal benefits regardless of channel grade as steeper channels did not experience a significant benefit from agricultural dike systems and transferred higher flooding downstream.

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