

Restoration Design Evaluation of the East Branch of the Beaver River, Silver Bay, Minnesota: A Student-led Investigation Comparing Two Designs

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In 2016, the city of Silver Bay, MN, put out a request for proposals (RFP) to restore an area on the East Branch of the Beaver River adjacent to the Silver Bay Municipal Golf Course that sustained damage from a 500-year flood event in June 2012. The goals of the RFP were to a) protect golf course infrastructure, b) restore river to a “stable state”, and c) use “natural channel design” methods to accomplish the above objectives. A stream restoration design class of advanced interdisciplinary STEM students at the University of Minnesota Duluth surveyed this site and evaluated two different design approaches with regards to the RFP. The first plan involved a re-meander of the lower half of the existing reach and the second plan involved creating a steeper, lower sinuosity step-pool channel through the current floodplain. Each plan was based on existing proposals from the consulting firm undertaking the restoration project. Site surveys performed by the class in fall 2016 determined grain size distributions, vegetation composition, macroinvertebrate presence, and long profile and channel planform topography. The following semester, two different restoration design plans were created and evaluated. The class analyzed hydraulics using HEC-RAS and CAD, executed a sediment analysis using BAGS and Monte Carlo simulations, created a re-vegetation plan, and proposed a post-construction monitoring plan. After both stream design plans were analyzed for suitability, the class concluded that the lower reach re-meander met the RFP goals in the least invasive manner and more effectively transported sediment within and just below the stream reach of interest. The class also concluded that the step-pool design was not ideal as it could create a net depositional environment below the study reach, inside the existing golf course channel. The project stakeholders approved the step-pool plan, and it is scheduled to be constructed in summer 2017.