MarTREC UTC Project Information Form
USDOT Tier 1 University Transportation Center
Agency ID or Contract Number 69A3551747130

Project Title: Utilizing Graceful Failure As An Opportunity for Flood Mitigation Downstream to Protect Communities and Infrastructure
Project Abstract (Brief Description): In 2011, we observed how "graceful failure" through planned damages to the Birds Point Levee by the US Army Corps of Engineers was enacted to alleviate extreme flooding on the Mississippi River. This action, while flooding croplands as planned in the past, actually reduced flooding and damage to waterway infrastructure and communities downstream. Recent trends and future climatic projections indicate that we will have more of these "extreme" flooding situations in our future. Therefore, this project will focus on identifying locations beyond Birds Point on the inland waterway system and associated tributaries where "graceful failure" or planned breach of levee infrastructure can be used as a means of flood protection for downstream communities and infrastructure. Advanced spatial analysis techniques will be used along with a set of criteria to be developed to identify probable locations for such mitigative approaches. Each location that is identified as a viable candidate will then be analyzed in terms of capacity for flood water detention, potential impacts to local infrastructure, and population potentially affected by the new floodway. This project will provide alternatives for flood mitigation not typically employed to reduce the need for disaster response and assist in transportation planning during extreme flood conditions.
Describe Implementation of Research Outcomes (or why not implemented) - Place any photos here *To be determined upon conclusion of the project*: Initial screening based upon location along the Mississippi River Basin, levee proximity, and land cover classification resulted in 20 potential sites that could be used for flood water detention and graceful failure option. Additional screening and analysis were conducted to determine preliminary feasibility of the sites to store enough flood waters to potentially be beneficial. From this evaluation, 17 potential sites were identified. For each of the 17 resulting sites, the volume of flood waters that could be contained at each of three elevations (flood stage, top of levee, and mid-way between flood stage and top of levee) were calculated.
Impacts/Benefits of Implementation (actual, not anticipated) *To be determined upon conclusion of the project:* The intent of this research project was to develop an approach to screen and identify potential areas where graceful failure through intentional levee breach could be used as a flood hazard mitigation effort along the Mississippi River Basin area. Publicly available data sets were utilized along with ESRI's ArcGIS software tools to perform a high-level screening analysis employing spatial analysis techniques in the approach. Criteria was identified and applied along the Mississippi River and tributaries to identify potential flood detention areas as those clustered areas (as identified by hot spot analysis) within 5 miles of the waterway center line, behind levees, and with low developed land cover types. The initial screening resulted in 20 potential sites. Three of these were removed due to basic feasibility considerations leaving 17 potential sites.
Web Links: martrec.uark.edu

Budget (Funding) Amounts & Source(s) (US DOT +Match(s) =Total Costs): $92.5 K USDOT + $47 K matching = $139.5 K total
Project Start and End Dates: May 2018 – March 2020 project complete
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Principal Investigator Institution (University): Vanderbilt University