

## FLOOD MITIGATION STUDY ZUMBRO RIVER WATERSHED, MINNESOTA

ANNUAL PROGRESS REPORT  
December 31, 2012

### BACKGROUND INFORMATION

During the 2010-2011 academic year, Dr. Steve Druschel and his students completed a capstone project that evaluated a portion of the Zumbro River Watershed devastated by a massive fall flood in 2010. Dr. Druschel's group worked closely with local partners, and given the quality of work provided, those partners (now known as Zumbro and Friends) contacted Dr. Shannon Fisher in December 2011 to discuss a collaboration of efforts.

As a result of ongoing discussions, the Zumbro and Friends coalition hosted a public informational session on March 18, 2012 to discuss Zumbro River flood mitigation and revitalization. The meeting was well attended and included several area legislators, local elected officials, civic leaders, flood-impacted property owners, clergy, and other concerned citizens. The session generated a terrific discussion about the need to model flood behaviors in the Zumbro Watershed - with the intended outcome to provide a deliverable that will help assess the strategies to ameliorate flood damages. As a result of this meeting, an LCCMR grant proposal was submitted by the local collaborators. The proposal requested significant funding and was ultimately rejected. During the following months a team of local leaders and university staff maintained communication with legislators. As a result, the funding for this grant agreement (\$50,000) was provided to complete some of the initial modeling and assessment.

A grant agreement was executed on September 24, 2012, between the State of Minnesota and the Minnesota State University, Mankato (Water Resources Center). Subcontractors on the grant include the Department of Mechanical and Civil Engineering, Zumbro and Friends, and the Zumbro Watershed Partnership.

### PROGRESS SUMMARY

- ***Task 1: Elicit Stakeholder Concerns and Gather Available Data***

Local leaders involved in the Zumbro and Friends organization were instrumental in coordinating a town hall public meeting. These partners met with Dr. Fisher and Dr. Druschel on several occasions to develop an approach and agenda for collecting the data needed to formulate the watershed models. As a result of these planning efforts, a town hall meeting was held in Pine Island on October 25, 2012.

The meeting brought together representative land owners who were impacted by the flood, along with citizens identified from each of the groups that also attended the March informational meeting. Dr. Druschel led the discussion and interviewed flood-impacted citizens about their experiences and observations before, during, and after the flood. The interviews were recorded and documented by students from Dr. Druschel's lab and will become a critical component of the model development. Additional survey data were being collected from land owners in the flood-impacted areas. Attached are meeting minutes as well as a write-up in the local newspaper.

- **Task 2 : Website Development and Hosting**

A subcontract between Minnesota State University, Mankato and the Zumbro Watershed Partnership was executed on December 4, 2012. The Zumbro and Friends collaborators met several times with the Zumbro Watershed Partnership (Partnership) to discuss website parameters and to gather all the information to be uploaded to the web site. The Partnership completed the website framework by the end of December. As a mutual collaboration, the website is hosted on the Zumbro Watershed Partnership website. The Partnership has been paid for their labor and services; however, the Partnership is providing in-kind hosting of the website and posting information and materials indefinitely for Zumbro and Friends. The website has the capacity to provide access to project-related update, meeting notifications, document access, contacts, and comment board. The comment board allows interested parties to provide their suggestions, concerns, etc. about the project. Project partners can respond transparently for others to review the discussion, and this provides an ongoing civic engagement component to the project. An email list has also been developed from which partners can send announcements and requests. The website address is <http://www.zumbrowatershed.org/Default.aspx?pagelid=1474872>, and information can be found under the 'PROJECTS' tab- Zumbro and Friends. This annual report will also be posted on that website.

- **Task 3: Construction of Topographic Base**

The primary task is to complete the construction of a topographic base that will serve as the foundation of the model. The construction of these base maps is tedious and there are significant amounts of data to be reviewed, incorporated, and verified. Dr. Druschel and his students are progressing toward completion of these base layers for the following sub-watersheds:

- North Fork Zumbro River
- Middle Fork Zumbro River
- South Fork Zumbro River
- Main Zumbro River

With the transition from one school year to another, upper grade level students teach and support incoming students. The incoming students learned, with assistance from the upper grade level students, how to utilize ESRI's ArcGIS program to complete the tasks needed for this project. Once acclimated to the program, the students brought LiDAR data files from the four counties in the Zumbro River Watershed (Dodge, Goodhue, Olmsted, and Wabasha) into ArcMap. The LiDAR data files from these four counties were clipped to the specific area (Zumbro River and sub-watersheds) and then merged to create one continuous topographic base. This topographic base will be used to do the modeling and to create secondary datasets. The data analysis is being completed by three groups of interns (two students in each group), with each group focusing on a certain river/branch.

The next step in the process of creating base layers is to map the center lines of the Zumbro River and the sub-watershed streams (North Fork Zumbro River; Middle Fork Zumbro River; South Fork Zumbro River; and the North, Middle and South Branches of the Main Zumbro River). The center lines and topographic data will be used in another engineering program to determine data that will assist in the analysis of the watersheds. The center line construction is a step-by-step process that is done by hand and is therefore tedious, involving more time in the creation of base layers.

All this data will be imported into a program created by the US Army Corps of Engineers. HEC-GeoRAS is a set of procedures, tools, and utilities for processing geospatial data in ArcGIS using a graphical user interface (GUI). The interface allows the preparation of geometric data for import into HEC-RAS and processes simulation results exported from HEC-RAS. To create the import file, the user must have an existing digital terrain model (DTM) of the river system in the ArcInfo TIN format. This is the information we are creating from the LiDAR data. The user then creates a series of line themes pertinent to developing geometric data for HEC-RAS, of which the Stream Centerline is the main component.

Water surface profile data and velocity data exported from HEC-RAS simulations may be processed by HEC-GeoRAS for GIS analysis for floodplain mapping, flood damage computations, ecosystem restoration, and flood warning response and preparedness.

### Upcoming Work

- Task 1: Elicit Stakeholder Concerns and Gather Available Data
  - Preparation of task memorandum summary report.
- Task 2 : Website Development and Hosting
  - Website is completed but hosting/updating continues.
- Task 3: Construction of Topographic Base
  - Identification and measurement of bridges crossing the channel of the Zumbro River throughout the four main sub-watersheds.
  - Manual delineation of flood plain and hydrological unit boundaries.
  - Estimation of channel bottom shape throughout four main sub-watersheds.
  - Completion of base map development.
  - Preparation of task memorandum summary report.
- Task 4: Define Rainfall Events and Probabilities
  - NOAA data to be assembled and assessed for the region.
  - Rainfall event spatial and chronological definition.
- Task 5: Build River Model and Calibrate
  - Begin construction of river model through cross section definition.

### Potential Issues/Problems

- Quality of LiDAR obtained from Goodhue County: missing demarcation of waterway limits.

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