

# Developing a Comprehensive Flood Management Hydrologic Computer Model

Starting date: 7/01/01

Duration: 24 months

Completion date: 6/30/03

Funding: State

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## Problem

Louisiana has a low-gradient topography and complex fluvial systems and tidal channels. Additionally, many of Louisiana's watersheds contain wetlands. Therefore, making accurate hydrologic predictions for these systems is a challenging task because of the dominant role of hydraulics. Flood damage can result from expansion activities in the transportation infrastructure or in residential and commercial development in flood

prone areas. Therefore, developing a comprehensive computer model to evaluate the various flood management strategies could greatly reduce this potential damage.

Because of the reoccurring flood problems, Lafayette parish has been selected for a pilot project to develop a proposed hydrologic model. The Vermilion - Teche watershed in this parish contains over 2,400 river miles and 1,800 perennial river miles with a watershed area of approximately 1,700



Developing Hydrologic Model for Vermilion - Teche Watershed



LTRC



Louisiana Transportation  
Research Center

Sponsored jointly by the  
Louisiana Department of  
Transportation and Development  
and  
Louisiana State University

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square miles and a perimeter of 223 miles. Land use within the watershed is 3 percent urban, 37 percent forest, and 60 percent farmland.

In addition to the concerns of local government, the Louisiana Department of Environmental Quality has identified this basin as a high priority watershed for pollution abatement and mitigation. Therefore, this low-gradient watershed is in urgent need of improved flood management analyses and practices that provide an ideal situation for immediate implementation of the model. The USGS National Wetlands Research Center and the U.S. Army Corps of Engineers have also looked at flooding in this area and are recommending more on site water management through the use of detention systems.

## Objectives

The scope of this project is to develop a Vermilion - Teche watershed hydrologic model for use as a management tool for local, state, and federal officials who must make decisions that impact the watershed. The necessary criteria to adapt the model to other watersheds across the state will also be developed.

The objectives include:

1. Develop a comprehensive computer model to evaluate flood

management in Lafayette Parish.

2. Calibrate the model against field measurements at selected sites within the Vermilion - Teche Basin.
3. Demonstrate the model by developing GIS flood maps for selected areas within Lafayette Parish.
4. Develop a training manual and conduct training for LADOTD and federal (FHWA and FEMA) personnel. Make program available to other state (DEQ and DNR) and local (parish) personnel involved in flood management.
5. Evaluate the model's potential to design and locate detention basins for on-site flood management.

## Description

The historic records of hydrologic and hydraulic data (i.e., soil type, land use, water stage and discharge, etc.) will be compiled for the Vermilion - Teche watershed from federal, state, and local agencies as appropriate. Field sites will be identified and instrumented to provide the additional data (i.e., precipitation, water level, discharge rate and direction, etc.) as needed to ensure the accuracy and reliability of the model.

Research tasks include, but may not be limited to:

1. Conduct a comprehensive literature search.
2. Collect and compile historical data.
3. Develop a comprehensive GIS data base for the watershed that is compatible with LADOTD usage.
4. Collect and analyze field data.
5. Develop a computer model for the watershed that is compatible with LADOTD usage.
6. Validate the model at selected sites within the watershed using the field data collected.

## Implementation Potential

The model can be transferred to other watersheds and used to develop a flood management program for entire watersheds across Louisiana. It can be used to address the impact of any modification to the hydrologic system, i.e., adding a concrete-lined coulee or detention basin, or increasing run-off by development or roadway construction activities. This model will provide local, state, and federal agencies with an important tool to be used in flood management.