

Proposal for Geomorphic Evaluation of the Woonasquatucket River,
Providence, RI

Developed by: ERDC-Waterways Experiment Station

Submitted to: USEPA

29 July 2002

Work Description:

A geomorphic investigation is proposed for the Woonasquatucket River to provide information for the feasibility study and to support additional investigations, such as the vertical core-sampling plan. The investigation will involve identifying geomorphic landforms (i.e. floodplain, terrace, abandoned channel) and associated active and passive geomorphic processes. Identification of landforms and processes will enable efficient planning of future sampling operations by delineating those areas most likely to enhance contaminant concentration and migration.

Task 1. Definition and Description of Features and Processes

1. Conduct literature and data collection of existing material for the Woonasquatucket River and surrounding area.
 - a. Review pertinent literature.
 - b. Review web sites and other key information sources (universities, state and federal agencies).
 - c. Obtain aerial photography of different vintages for identification and comparison of geomorphic features and processes over time.
 - d. Synthesize pertinent existing knowledge.

2. Define system landscape, boundaries, landforms, geology, and hydrology.
 - a. Aerial photography and historical maps will be used to characterize the landscape and to identify present and past geomorphic features.
 - b. Geologic maps obtained from the United States Geological Survey, state geology office, and local universities will be used to interpret and describe the geology of the area.
 - c. Historical evolution of the river system will be described.
 - d. Conduct field investigation to ground-truth information described in this task.

Note: This task is the defining part for the geomorphic project.

Task 2. Support vertical core sampling program

1. Produce a sampling plan using information gained from Task 1 to identify areas of investigation for vertical cores.
2. Provide on-site geologic support to describe the cores, interpret depositional environments, and to modify the sampling program, if needed.
3. Sample cores for ^{210}Pb and dioxin laboratory analysis.
4. Provide interpretation of laboratory analysis.

Task 3. Prescription of Conceptual Solutions

1. Produce report to describe geomorphology and geochemical interpretation.
 - a. Suggest actions to minimize or optimize the impacts of mitigation actions on sediments.
 - b. Include digital maps of geomorphology for input into geographic information system.
 - c. Meet with other members of the Woonasquatucket River project to discuss results of the report and options for contaminant management.

Details of geomorphic analysis for the Woonsquatucket River described in *Task 1. Definition and Description of Features and Processes* of the proposal Geomorphic Evaluation of the Woonsquatucket River submitted 29 July 2002

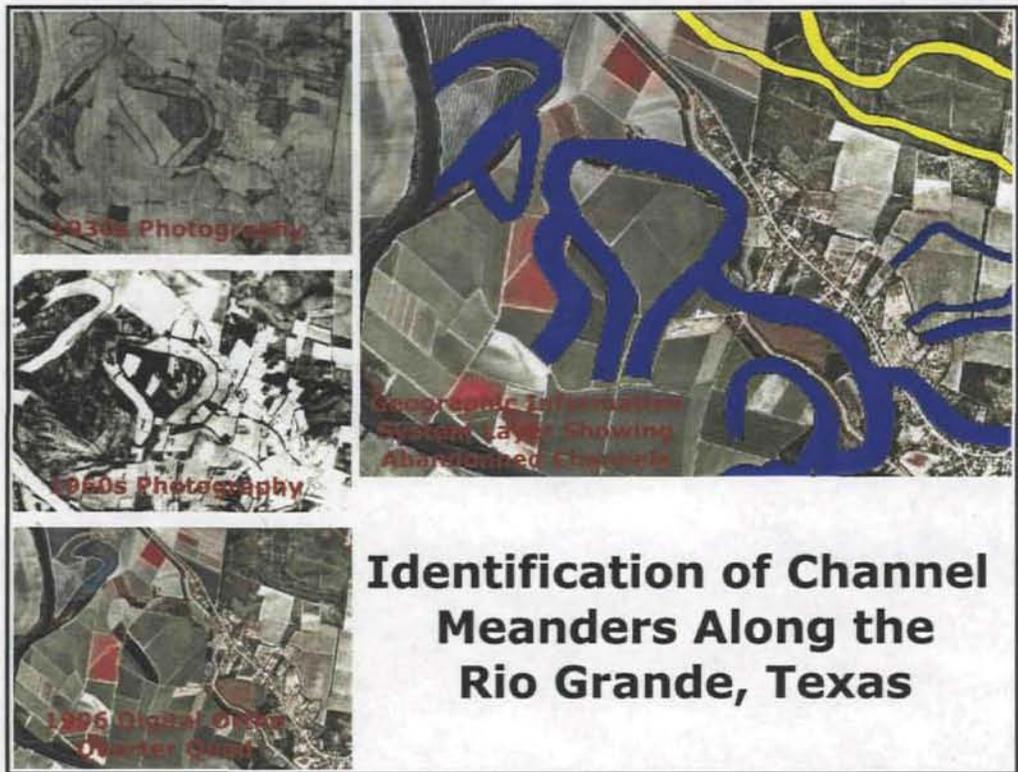
Submitted to: Ms. Laureen Borochnan and Mr. David Mark
COE New England District
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Task 1. Definition and Description of Features and Processes

The purpose of conducting a geomorphic investigation on the Woonsquatucket River is to provide a solid foundation for future studies. A geomorphic assessment addresses the past and present river dynamics and, therefore, establishes evolutionary trends of the river.

Historical and recent aerial photography and topographic maps are used to recognize landforms, such as point bars, natural levees, and abandoned channels. The maps and images are scanned to produce a digital file and a geographic information system is used to outline the various landforms.

An example of this procedure is given below. The aerial photography in this example was used to determine channel migration of the Rio Grande River in Texas. Specific landforms exhibit the same stratigraphy and lithology. For example, if a core is taken in a point bar along the Mississippi River, it will have the same characteristics of a fining-upwards sequence (i.e. the grain size is smaller at the highest vertical position in a point bar) as that of a core taken in a point bar along the Woonsquatucket River.



A geomorphic evaluation of the landscape serves as the basis for a more effective core sampling program. Identification of landforms provides insight into the subsurface lithology and, therefore, a core sampling program in a contaminated site can target fine-grained sediment (silt and clay) and organic-rich material, which usually contain the chemicals of concern.

Isotopic analysis (usually using ^{210}Pb) of the cores is conducted to determine the average sedimentation rate of the river. The importance of this process is to find the depth at which contamination should not longer exist. For example, if a factory dumps waste and by-products of manufacturing into or near the river in the 1970s, then an average sedimentation rate can be used to "back" calculate how much sediment has been deposited since the contamination began.

The maps used for this part of the geomorphic assessment are obtained from various sources such as the United States Geological Survey, state geology survey, and local universities. For the study on the Woonsquatucket River, the Environmental Protection Agency (EPA) and The U. S Army Corps of Engineers (USACE), New England District, will provide, if available, aerial photography (digital or hard copy), publications that pertain to this site that may not be available from other sources, and results from previous coring program along with locations of each core. It is essential that the geomorphic evaluation be delivered in the same format (i.e. coordinate system and geographic information system) used in the existing database maintained by the EPA and the USACE.

The deliverables for this task include a report describing the geomorphology associated with the Woonsquatucket River and the aerial photography/topographic maps in digital format. After discussion with other members of the Woonsquatucket River team, a core sampling program will be outlined to produce the optimal results for determining geomorphology and contamination concentration. Ms. Maureen K. Corcoran will be on-site during the sampling program to describe cores and sample intervals needed for isotope analysis.

For questions concerning this proposal, please contact:

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