

CENTRAL REGION INTEGRATED SCIENCE PARTNERSHIP FUNDS
FY 03 Project/Activity Outcome Report
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Project/Activity Title: Science to Support Adaptive Ecosystem Management in Rehabilitation Projects, Lower Missouri River

Account Number: 8795 AW700

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Total Funding Approved: FY03 – \$39,558.78

Total Expenditures: FY03 – \$39,558.78; FY04 – \$72,000; FY05 – \$38,400

Objective of Project/Activity:

Two general questions are addressed in this study:

1. Will alterations intended to achieve one limited ecological goal have unintended negative consequences for another part of the ecosystem? For example, will side-channel chute construction intended to increase off-channel aquatic habitat have significant negative effects on hydroperiod and vegetation communities in adjacent wetlands?
2. Given the great spatial variability in large river corridors, are there optimal approaches to classifying the river corridor according to rehabilitation potential? For example, can the best places to achieve particular ecological objectives be identified to aid in land acquisition and management?

The study objectives are:

1. Quantify ecological responses to engineered manipulations intended to rehabilitate parts of the Lower Missouri River corridor, with emphasis on
 - a. Exploring tradeoffs among terrestrial and aquatic ecosystem responses
 - b. Exploring the value of contextual earth sciences information – geologic, hydrologic, topographic, biologic -- in rehabilitation design and management.
2. Demonstrate the concept, structure, and utility of scientific performance evaluation to the adaptive management process.

Study products include:

Because many of the products of this study are in map form and due to the limited amount of funds available to this study, the final report for this project will be a peer-reviewed online report, served through the USGS-CERC Missouri River InfoLINK. If possible, the report will be in the USGS Bulletin Series. Also, a web page and fact sheet may be prepared for a lay audience. In addition to reports and maps, presentations of this material will be made to the USFWS, USACE, and state agencies either through existing formal conferences such as the annual Missouri River Conference or a special presentation arranged just for them.

Project/Activity Accomplishments:

The primary approach for this study includes the integration of morphostratigraphic, hydrogeologic, vegetative, and remotely sensed data to achieve the listed objectives. This project began in the summer of 2003 and accomplished the following in FY03:

The Missouri River alluvial deposits (containing all of Overton Bottoms North and South, across the entire Rocheport Missouri Quadrangle) have been mapped in preliminary form on aerial photos and a topographic base. Mapping was supported by remotely-sensed data, observations in the newly excavated chute, and over 40 shallow boreholes. Dr. John Holbrook and students from Southeast Missouri State University have completed this work using protocols and stratigraphic divisions established in their ongoing EDMAP surficial geologic mapping project upstream near Grand Pass, Missouri. Allostratigraphic mapping units include individual channel fills, splays, and point-bars, which are clustered into larger units called "domains." These allounits delineate foundational materials from which all surficial habitats must develop, and within which all near-surface groundwater must flow. Channel-fill deposits are generally thick and fine-grained strata that usually have low permeability and perch water on the surface. The point-bar units are coarser with thinner capping fine sediments, and tend to be better drained. The splays are thin loamy to sandy units that veneer either channel fills or point bars. Domains are larger map units depicting areas where channel-fills and point bars follow concordant surficial trends. Domains record episodes of channel migration and point-bar construction. Initial results show good promise for using allostratigraphic units to define landscape habitat capabilities.

Landsat Thematic Mapper multi-spectral satellite imagery will be used to determine the spatial and temporal distribution of the vegetation communities that have evolved on Overton Bottoms since the flood of 1993. Five images were purchased to accomplish this task. Each of the images has an early September acquisition date. Four images (1994, 1996, 1998 and 2002) are Landsat 5 data. One image (2000) is Landsat 7, because acceptable Landsat 5 data acquired in early September 2000 were not available.

Two wells were installed and a complete set of water levels were collected from 6 monitoring wells just before the chute was deepened and when both ground-water and river levels were near their low point for the year. Later in FY03, two more monitoring wells were installed and continuous water level recorders were installed on 8 monitoring wells and one existing surface water gage at a large scour. Monthly water levels are manually measured at all monitoring wells and on the Missouri River adjacent to the Overton Bottoms area. These monthly river-stage measurements are correlated with continuous stage data collected on the Missouri River at Boonville to synthesize continuous river stage near Overton Bottoms.

The project has been entered into Basis+ with each of the 4 tasks broken out for budgeting purposes. Each discipline has been given the lead for a task and is responsible for the budget of that task.

FY03 Results: *(Describe how funds awarded relate to the Director's goals of integrated science)*

Data collection and acquisition activities for the Overton Bottoms study in FY03 contributed toward almost every one of the Director's goals of integrated science:

Understanding Large River Systems: Data collected in FY03 will be used to understand relations between water levels in the Missouri River, constructed floodplain chutes, ground-water levels in the alluvial aquifer, and floodplain wetlands.

Restoration and Recovery of Impaired Ecosystems: Overton Bottoms was acquired by the USACE and is managed by the USFWS to restore native vegetation, systems, and functions to a Missouri River floodplain where agriculture had crowded out almost all remnants of native ecosystems. Therefore, the site provides a natural experiment to characterize processes such as floral and faunal succession, hydrologic influences on vegetation, effects of reconnecting the river with the floodplain, and effects of a constructed chute on hydrology and vegetation.

Forecasting Landscape Change/Monitoring and Remote Sensing/Water for Ecological Use/DOI Science on the Landscape: Historical remotely sensed data acquired in FY03 will be used to establish landscape/vegetation trajectories for rehabilitated floodplains on the lower Missouri River in relation to ground-water levels, flood frequency and duration, alluvial morphostratigraphy, and moisture stress on the lower Missouri River floodplain. Establishment of these relationships will allow the USFWS, the USACE, and state fish and game agencies to predict the rehabilitation potential of many other newly acquired lands along the Missouri River and maximize the ecological benefits of these acquisitions.

Priority Ecosystem Science: Overton Bottoms has been established as a long-term, multidivisional study site for USGS investigations into the ecologic, hydrologic, and geomorphic responses of various rehabilitation activities. Historical data provide detailed understandings of site characteristics that allow more comprehensive interpretations of the data collected in the CRISP study.

In addition data collected in this study in FY03 will contribute to at least two of the Central Region Science Priorities:

Water Availability (ground water/surface water relations/In-stream Flows): Concurrently collected data on river stage, wetland stage, and ground-water levels will be used to understand relations between water levels in the Missouri River, constructed floodplain chutes, the alluvial aquifer, and floodplain water bodies. These data will also help the USFWS understand in-stream flow characteristics of the newly constructed floodplain chute.

Invasives: Data collected in FY03 will assist the USFWS and other land managers in assessing the use of rehabilitated sites, such as Overton Bottoms, by the aggressively invasive Asian Carp.