FLORIDA COOPERATIVE FISH AND WILDLIFE RESEARCH UNIT

PROJECT STATUS REPORT

1. TITLE: Geomorphic Assessment of Channel Changes along a Modified Floodplain: Pascagoula Basin, Mississippi

2. PROJECT OFFICER: Jim Williams (USGS-BRD), Steven Hrabovsky (USACE)

3. PRINCIPAL INVESTIGATOR: Joann Mossa

4. CO-PRINCIPAL INVESTIGATOR: None

5. RESEARCH WORK ORDER #: 219

6. FUNDING AGENCY: U.S. Geological Survey/ U.S.Army Corps of Engineers (will contribute and coordinate funding from several agencies including the Pat Harrison Waterway District and the Nature Conservancy)

7. START DATE: 6 /16 / 2002 END DATE: 6 / 15 / 2005

8. REPORTING PERIOD FOR DELIVERABLES:

Progress	August 30, 2002
Progress	December 31, 2002
Progress	April 30, 2003
Interim (Year 1)	June 15, 2003
Progress	August 30, 2003
Progress	December 31, 2003
Progress	April 30, 2004
Interim (Year 2)	June 15, 2004
Progress	August 30, 2004
Progress	December 31, 2004
Progress	April 30, 2005
Final	June 15, 2005

9. ABSTRACT OF PROJECT (maximum 4000 characters)**:** The ramifications of channel changes associated with floodplain disturbances are numerous. This study proposes to examine connections between mining and other major disturbances on floodplains to channel changes in portions of the Pascagoula Basin, Mississippi. Geomorphic changes will be evaluated from a cross-sectional and planform perspective using historic USGS data, historic maps and GIS, and field comparisons of cross sections in both disturbed and undisturbed portions of the floodplain. Cross sections at about 20 locations throughout the basin will be assessed and normalized for comparability and a subset of about 12 stations will be evaluated for aggradation and degradation using gage data. Planform changes will be examined in portions of the Leaf River, Chickasawhay River, Bowie River, Thompson Creek, and Pascagoula River and possibly other tributaries, with reaches selected to assess how channel instability varies with different land uses such as mining, urbanization, agriculture, commercial forestry and natural forests. Spatial patterns and temporal relationships of floodplain changes and channel instability will be used to evaluate which locations are most unstable, whether modified portions are experiencing more instability than less modified portions, and evaluate cause and effect interactions. Such research is important because channel instability has numerous ramifications to the environment and private and public properties. Elucidating and quantifying these relationships is important in defining and refining state regulations regarding floodplain activities, including those associated with deforestation, agriculture, mining and development.

10. OBJECTIVES OF PROJECT (maximum 4000 characters):

OBJECTIVES FOR YEAR 1: Evaluate spatial and temporal character of floodplain disturbances, evaluate the character and significant events in the basin, analyze historic changes in cross sections, compare spatial variations and timing of long-term changes in channel cross-sections to disturbances

TASKS
Literature review (southeastern rivers, Pascagoula River basin, channel change literature)
Data collection
-download, compile and edit existing hydrologic data off the Internet and CD-ROMs,
-collect and photcopy historic cross sections and discharge summary data from the USGS in MS
-compile statistics on historic mining in Pascagoula River basin
-compile maps and aerial photographs to evaluate floodplain disturbances
Data input and analysis
-plot and analyze long-term hydrographs
-plot comparison flood cross-sections early and late in the period of record
-analyze aggradation and degradation using various methods
-produce graphs of temporal variations in extraction from mining statistics
Field observation in study area
-examination of bridges with cross-sectional measurements
Data interpretation and analysis
-compare spatial variation and timing of long-term changes in channel cross-sections to disturbances

OBJECTIVES FOR YEAR 2: Evaluate spatial and temporal character of floodplain disturbances and channel planform changes in a GIS, and compare spatial variations and timing of long-term changes in channel planform character to floodplain disturbances and significant hydrogeomorphic events

TASKS
Data input and analysis
-digitize channel positions of selected portions of the Pascagoula River floodplain as areal features
-digitize channel centerlines of this area as line features
-digitize floodplain mining and other disturbance features as either areal and point coverages or both
-transform data to common projection to analyze changes in areas and lengths of target features
Preliminary field observation
-canoe length of river to be digitized to obtain ground knowledge of study area
Data interpretation and analysis
-transfer and integrate data into spreadsheets to compile variables by reach blocks of various sizes
-relate various measures of channel instability (areal and linear changes between time periods) to various floodplain disturbances (measured quantitatively) using appropriate statistics

OBJECTIVES FOR YEAR 3: Measure and analyze cross-sectional data in the field, comparing disturbed and undisturbed portions of the Pascagoula River floodplain. Also, synthesize findings of historic cross-sections, GIS analysis, and field measurements.

TASKS
Measurement and analysis of field cross sections
-Measure several cross sections, comparing disturbed and undisturbed portions of the floodplain
-Input, plot and analyze field cross sections in spreadsheets
-Extract various numerical measures from these plots
-Evaluate similarities and differences of cross-sectional measurements of disturbed and undisturbed portions of

the floodplain statistically
Synthesis of various project elements

11. PROGRESS STATEMENT (maximum 4000 characters):

We have begun work on two phases of the project concurrently, the historic changes in channel cross sections and literature review (deliverables due end of year 1) and the GIS/channel planform changes (deliverables due end of year 2). The work for year 2 requires acquisition of historic maps and possibly photography, and will take a lot of computer and student time (with educational conflicts), and will require searches and long waits to get data from agencies. For these reasons, it is important to get jump on later tasks, especially since they require early guidance from the PI.

Towards Year 1 objectives, the cross-sectional measurement variables associated with periodic discharge measurements were obtained from the USGS web site and imported into Excel spreadsheets. The data included daily streamflow data (to produce hydrographs) and summary data from cross-sectional discharge measurements, which are collected 6-12 times per year at most stations. The variables listed included date, width, area, velocity, gage height, discharge, and measurement type (e.g. wading, boat, bridge crane). Dates were converted to a decimal format, mean depth was computed by dividing the area by the width, and mean bed elevation was computed by adjusting the gage elevation to the datum and adding stage height to computed adjusted gage height and subtracting the mean depth. Width-depth ratio was computed by dividing the width by the mean depth. Metric and date conversions were made and available data were plotted and reviewed so that appropriate questions regarding the status and quality of the data could be asked during the office visit to the USGS. Preliminary plots were made and the data were checked for unusual outliers. All of the gaging stations had definite or possible data errors, some major and others minor in nature, which were corrected during the visit. For some gaging stations, in particular the two on the Chickasawhay River, data were missing for most of the period of record. In these cases, hand-written forms were copied so that data could be typed into spreadsheets after returning to Florida. Some of this typing has begun. Because I had entered the latter half of a twin pregnancy by the time the project began, I took my husband with me as project volunteer. He assisted me with copying, visiting field sites, and his companionship helped reduce project costs by providing free labor and requiring use of only one hotel room. I spent some time talking with USGS hydrologists (in particular Phil Turnipseed and Van Johnson) during the office visit and obtained copies of their reports focusing on specific sites in the Pascagoula Basin relevant to this study. In addition, we copied several individual cross sections, so that the distance and depth measurements could eventually be input onto spreadsheets and used to evaluate changes in cross section. They had nearly all of their historic data in-house rather than in archives, which was beneficial from a research

standpoint, but created more work from the standpoint of copying and may later create more work for inputting data. Maximum depth data for bridge measurements were extracted from individual cross sections at some sites. This data will need to be input into Excel spreadsheets such that thalweg elevations can later be computed by subtracting maximum depth from adjusted gage height. Another potential source of hydrological data including historical and real-time discharge data is NOAA and we will later asses whether they have additional information of benefit to the project.

For the literature review component of the project, we obtained one report from Paul Hartfield of USFWS in Jackson. We visited the PHWD in late June after four days at the USGS office in Pearl. We obtained copies of recent relevant papers from Chris Bowen and discussed the project in a brief meeting with him. We borrowed six larger reports, copied and returned them to Stuart Smith several weeks later. We scanned in some of the graphics from these reports, in particular the color land use maps. During the visit, we also discussed field and imaging supplies with him, as compatibility in some cases between UF and sponsoring agencies is a project and obtained a copy of a CD showing some digital images and videos. At UF, we are currently searching government documents to learn of drainage modification projects authorized by Congress in the Pascagoula River watershed. We have found several such documents and have begun to photocopy them. We have also obtained a historical narrative of the region, which includes some descriptions of the study area that dates back to 1794. We have obtained a list of the titles of the papers in the conference proceedings of the Mississippi Water Resources Research Institute and are planning to obtain copies of certain papers through Interlibrary Loan. Other publications may be obtained from the Mississippi Department of Environmental Quality, Office of Geology in Jackson.

We visited a few gaging stations/bridge sites on the way to Jackson and on during the return trip to Hattiesburg and then on the return trip back to Gainesville by private vehicle. We took photographs with a 35 mm SLR camera because we did not have a digital camera at this time, but we had digital copies made onto CD to allow sponsoring agencies to have access to copies if requested later and to use more readily in reports and computer presentations. I have done some research on digital cameras, and plan to purchase one (probably a Sony Mavica) sometime during the course of the project based on internet reviews and discussions with camera salesmen. This camera uses mini CDs to record, which will ultimately save on project costs. It is the same make (but not model) as the equipment used by the USACE-MD and PHWD.

We have contacted a number of agencies and individuals as part of our background effort at obtaining historic and recent data. The soil survey office of every county in the Pascagoula basin was contacted and copies of published soil surveys were obtained

where available. Dr. J. Michael Harrison of the University of Richmond (VA), who was formerly an Assistant Professor in physical geography and remote sensing at USM, provided us copies of LANDSAT digital images on CD-ROM of the southern part of the basin between 1984 and 1999, which might prove useful in our research.

We contacted a number of individuals in an attempt to get historic data and statistics regarding sand and gravel mining, but have not had good luck so far. We will continue to try to ascertain how much information regarding historic mining exists and to get all data pertinent to this project.

We contacted several agencies with regards to potential historic maps and photographs. The USDA seems to have the most comprehensive set of aerial photographs at a scale appropriate to the project, dating back to the early 1940s. The USACE contact in Mobile is Linda Lillycrop. They have aerial photographs from 1969-2001 in B/W, color, CIR. We have obtained a listing of the dates and locations of aerial photographs in the basin from both sources. Carrie Goeringer of the National Archives and Records Administration maintains historical aerial photographs, maps, and drawings from 1800s, but vendors from their listing must be hired to perform research in their archives. We are uncertain as to whether we will use theses services. Some local contacts and sources of historical aerial photos and maps in Mississippi Elsy Martin at Jackson-George County, the Mississippi Department of Archives and History, Historical Jefferson College in Washington, Mississippi and the Mississippi Department of Archives and History, in Jackson, Mississippi. We suspect that their maps are probably not better than other federal sources. Discerning the quality of these sources and using them in the study would require additional travel and research hours (all research must be done in person at the library) that we do not have in our current budget.

A considerable amount of time was spent downloading data from the State of Mississippi, Internet site www.maris.state.ms.us. The coverages that were downloaded include all the DOQQs (mostly from mid-1990s) and DRGs (mostly from early 1980s) and a variety of other coverages. All index vector data listed below have been acquired from MARIS, projected (where necessary or the projection defined), and clipped to match the same geographic extent of the Pascagoula River Drainage Basin as defined by the USGS HUC.

Additional locational and index vector data:
Roads
County boundaries
Watershed boundaries
Drainage basin boundaries (USGS HUC)
USGS quadrangle index

PLSS township and range index
Major streams
Perennial streams
Lakes and reservoirs
Dam Locations
General and detailed soils coverages
Generalized surface geology
USGS Anderson Level II landuse data

Metadata on all MARIS data has been acquired, and includes the metadata on the MSTM (Mississippi Transverse Mercator) projection parameters.

Craig Remington of the University of Alabama, Department of Geography was contacted because his web site http://alabamamaps.ua.edu has images of out-of-print 15-minute U.S.G.S. maps of Mississippi and Alabama. Most of these cover only the southern part of the basin (portions of Harrison, Jackson, Stone, George, Forrest, Perry and Greene counties) and a 30-minute square of Lauderdale and Clarke counties in the north. Although not downloadable from the web site, he provided copies of the data shown on-line in Mr. Sid format. We are planning to rectify these to the existing DOQQs from the mid 1990s and the DRGs, which are largely from the 1980s. Although this site has saved us considerable effort in obtaining maps and time in scanning maps, it still takes about several hours of student labor per map to register the township and range coordinates with control points to the more recent digital maps. Ultimately, there will be areas without early coverage because no mapping was conducted during that period in some areas of low population 21 historical 15-minute USGS map series have been acquired and exported to Tiff format for registration. Six historical 15-minute series maps have been georeferenced (map registration performed) to match all existing data, currently in MSTM projection.

There are a few additional historic maps not on the Alabama site that we think we can obtain through USGS archives. We have contacted Bruce Wallace, Historical Archivist, who has done a search of which additional quadrangle maps are available and will help us in ordering sometime in the near future. The UF Geography department plans to obtain a scanner, likely sometime late in the Fall 2002 semester, capable of scanning large maps and possibly aerial photographs.

As part of the digitizing efforts, it is important to set guidelines for methods. We have defined coverage parameters as follows:
Naming convention for coverage's: strms_decade (i.e. strms_90s).
Precision: Double: This refers to the number of decimal places in which the (x, y) pairs of

nodes and vertices are stored. Double precision caries to 14 decimal places.
Coverage tolerances are as follows:
Weed (i.e. arc vertice resolution) min: .5 meter, max: ½ channel width.
Fuzzy .5 meter (controls line resolution during a clean or build).
Dangle 5 (will not allow a node dangle within 5 meters of an arc).
Edit 30 (concerns a snap coverage)
Nodesnap 5 (snaps nodes to one another within 5 meters).

Given the vast size of the drainage basin, we are proceeding by making an inventory of channel changes on major rivers of interest on a quadrangle-by-quadrangle basis to help us select target reaches for detailed study later in the project. So far, we have created an aml that will globally set these tolerances before creating a new stream coverage, determined the proper zoom extent to digitize stream coverage's and determined what attributes should be included in each stream coverage as listed below:
River Name
Source Year
Impacted by a landuse change, yes or no.
Current landuse
Soil type
Geology
Centroid: defined as the (x, y or lon\lat, in mstm coordinates) of the central reach digitized.
USGS Quad name that a particular stream reach is located.
MARIS Quad code: a code-naming convention, determined by MARIS
Channel width change, as a percentage of a previous decades channel width
Sinuosity change
Meander migration
Lateral migration
Other changes not included above: cutoff meanders, chaotic shifting, avulsing channels, etc.
Comments: any comments that further qualify or quantify change over time.

So far, we have created and digitized two preliminary channel polygon coverages for our inventory: Channel reaches over the Leaf, and Bowie Rivers in the Hattiesburg quad for the 1980's and 1990's, over Thompson's Creek, 1980's and 1990's, and Red Creek for the 1990s.

We regularly invest several hours to back up data, in case of possible computer problems. This takes a considerable amount of time given the large data sets. Although it means several hours of the project not moving forwards, it is insurance for the project not

moving backwards.

In sum, we have had a very productive first quarter of this project, having made good progress on Year 1 objectives, but also having made considerable inroads towards the deliverables and project tasks for Year 2.

12. PROJECT SUMMARY STATEMENT (one or two hardhitting sentences that capture project merits)**:**

This study will examine and quantify relationships between floodplain disturbance and channel changes in the Pascagoula River basin. It is important because channel instability has numerous ramifications to the environment and private and public properties, thus results can be used for defining and refining state regulations regarding floodplain activities, including those of the mining industry.

13. KEYWORDS (at least 1; up to 8): fluvial geomorphology, river instability, channel changes, land use, mining, floodplains, Pascagoula River, Mississippi

14. PUBLICATIONS (Cite all publications resulting from project including proceedings and technical reports. Use Journal of Wildlife Management style. Also, submit 5 reprints): None

15. PRESENTATION CITATIONS (Use Journal of Wildlife Management style, to include Name, Year, Title, Meeting/Conference Name, City and State: None

16. THESES/DISSERTATIONS CITATIONS (Use Journal of Wildlife Management style. Also, submit 2 copies): None

17. EMPLOYMENT STATUS OF GRADUATED STUDENTS (Provide Position Title, Agency/Company Name, City and State of employment of any graduated MS or PhD students who graduated)**:** None graduated

18. HONORS/AWARDS: None

19. PERSONNEL:

NAME	POSITION*	GENDER	MINORITY**	SUBJECT AREA OF DEGREE PROGRAM***
Joann Mossa	Assoc. Professor	F	No	Geography/Integrated
David Coley	MS Grad Student	M	No	Geography/Integrated
Glenn Hermansen	MS Grad Student	M	No	Geography/Integrated
Justin Ahern	Undergrad Student	M	No	Geography/Integrated

X MS Grad student; PhD grad student; Post-doc; Biologist; Technician;....

** B=Black; H=Hispanic; I=American Indian; O=Other; A=Alien

*** Aquatic, Terrestrial, or Integrated

20. NEWS MEDIA INVOLVEMENT:

None