

# Identification of Streambank Erosion Processes and Channel Changes in Northeastern Mississippi

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Identification of streambank erosion processes is important for determining suitable measurement techniques and for choosing appropriate stream remedial measures. Sediment loads from watersheds located in Northeastern Mississippi can have contributions from stream channel degradation as large as 90%. Town Creek watershed is an experimental watershed in the Southeastern Plain Ecoregion of Mississippi (Ecoregion 65). Northern headwaters in Town Creek located within the Black Prairie Subecoregion present incised streams with unstable active bank profiles. The most common gravitational failure mechanisms are slab failure, soil fall, and cantilever failure, accompanied by a basal clean out process when stormflow events occur. An active agricultural land use near streambanks with limited or reduced presence of riparian zones increases the streambank instability and favors gully erosion activity. This condition is predominant along the different headwater reaches. The middle 20 km of the principal channel system is located within the transitional zone between the Tombigbee Hills and the Black Prairie subecoregions. Wide stable channels showing evidence of streambank erosion induced by fluvial erosion, shallow slides, and rotational failures are mixed with natural, vegetated zones and regions with sediment deposition on bed and streambanks. Especially along this section of the principal channel, sediment bed deposition and erosion are significantly modified seasonally by flow conditions. Low flow velocities and sediment deposition occur on the inside of incipient meander bends in the sinuous reach, along the downstream most 10 km before the outlet at the Tombigbee River.

Key words: Surface water, nonpoint source pollution, geomorphological processes, streambank erosion.

## Introduction

Streambank erosion is a geomorphic process which occurs in all channels as adjustments of channel size and shape are made to convey the discharge and sediment supplied from the stream catchment. However, increases in sediment supply due to accelerated streambank erosion are often linked to land use change and contribute up to 90% of sediment yield in watersheds within northeastern Mississippi. Identification of streambank erosion processes is important for determining suitable measurement techniques and for choosing appropriate stream remedial measures.

## Study Area

The Town Creek watershed is a 1769 km<sup>2</sup> watershed near Tupelo, Mississippi, with the outlet at latitude 33° 38.78' and longitude 89° 33.88'. The watershed is located within the Tombigbee River Basin, representing 50% of the Upper Tombigbee River Basin at Aberdeen pool on the Tennessee Tombigbee Waterway and approximately 10% of the entire Basin. The Town Creek watershed and some of its tributaries group with the reference code HUC 03160102 within the Tombigbee River Basin, which comprises East-Central Mississippi. This group of water bodies was listed as evaluated wa-

ter bodies impaired due to sediments (MDEQ, 2006).

Preliminary reference of sediment transport rates have been developed for various Ecoregions in the USA including Southeastern Plains (Ecoregion 65) which contains Town Creek watershed. However, limited work monitoring the sediment concentrations has been developed. A water quality monitoring and watershed characterization has been conducted to quantify sediment in Town Creek tributaries as a reference to produce remedial measures for reducing water quality impairment within the entire watershed.

Town Creek watershed could be the primary source of sedimentation in Aberdeen pool, where annual sediment dredging is around 310,000 ton/yr. To produce remedial measures for reducing water quality impairment and sediment costs (expressed in terms of a percent reduction of sediment loads) and to address future BMP's in Town Creek watershed, is necessary to know the sedimentation sources and sediment loads currently transported within the watershed. Without actual (last 10 yr) sediment transport data for Town Creek, a combination of methods have been used in this project, including field reconnaissance, detailed data collection and surveying, and modeling of upland areas and channels. The study is performed to evaluate sediment processes in the Town Creek watershed and identify remedial measures to reduce water quality impairment and sediment costs.

Tributaries:

Yonaba Creek

Mud creek

Chiwapa Creek

Cooneewah Creek

Tallabinella Creek

### **Assessment**

Northern headwaters in Town Creek are located within the Black Prairie Subecoregion:

Incised streams with unstable active bank profiles.

Slab failure, soil fall, and cantilever failure, accompanied by a basal clean out process when stormflow events occur.

Agricultural land use near streambanks with limited or reduced presence of riparian zones increases streambank instability and favors gully erosion activity.

Middle 20 km of the principal channel system located within the transitional zone between the Tombigbee Hills and the Black Prairie Subecoregions.

Wide stable channels showing evidence of streambank erosion induced by fluvial erosion.

Shallow slides, and rotational failures are mixed with natural, vegetated zones and regions with sediment deposition on bed and streambanks.

Sediment bed deposition and erosion are significantly modified seasonally by flow conditions.

Low flow velocities and sediment deposition occur on the inside of incipient meander bends in the sinuous reach, along the downstream most 10 km before the outlet at the Tombigbee River.

### **Recommendation**

The development of a program and implementation plan for streambank and riparian buffer zone restoration and establishment of other BMPs, is necessary to reduce sediment and nutrient concentrations to attain water quality standards within Town Creek watershed.

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Figure 1. View of a creek at the headwaters of Town Creek, MS



Figure 3. Incised unstable channel at the Yonaba Creek, MS

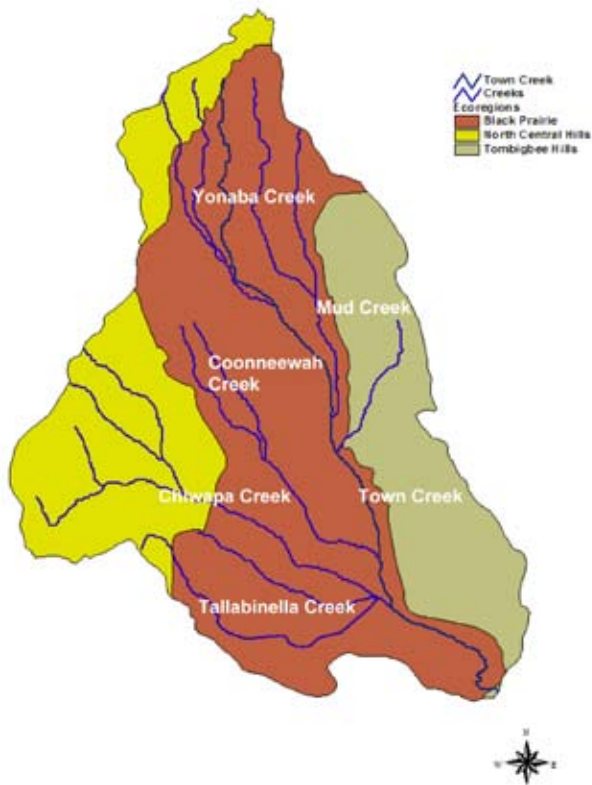


Figure 2. Principal tributaries for Town Creek, MS



Figure 4. Gully erosion formation in an agricultural field with reduced presence of riparian zones at the Town Creek headwaters.



Figure 5. Fluvial erosion at the Town Creek headwaters in MS.



Figure 6. Sand deposition on streambanks at the middle section of the Town Creek, MS



Figure 9. Meandering low flow velocities and streambank sediment deposition at the least 10 km of Town Creek, MS



Figure 7. Mobile ber at the middle section of the Town Creek, MS



Figure 10. View of agricultural fields with an established riparian zone



Figure 8. Meandering low flow velocities and bed sediment deposition at the least 10 km of Town Creek, MS