

BANK EROSION HAZARD INDEX (BEHI) ANALYSIS

A. Purpose

The analysis is conducted to increase the understanding of the watershed's characteristics and the impact of changes on stream stability, to provide a basis for water quality recommendations, and to help determine critical areas. Upstream and downstream samples were collected to identify whether problems are localized or systemic, according to MDEQ's Standard Operating Procedure for Assessing Bank Erosion Potential using a modified Rosgen's Bank Erosion Hazard Index. The data collected is used to assist in the overall watershed assessment. The watershed assessment helps to determine locations where stream bank stabilization, channel realignment, changes to channel geometry, or changes impacting flow or sediment transport are recommended.

The analysis:

- Determined locations and context of erosion potential hot spots
- Provides data for calculation of pollution control requirements including the characterization of non-point source pollution loads
- Provides an accurate assessment of watershed problems and causes
- Locates stable reaches of the river

B. Procedure

The analysis was initiated with identification of preferred sample locations during the WARSSS Reconnaissance Level Assessment (RLA). All investigators attended a training session and other meetings held to discuss the observational approach. Investigators conducted sampling, measurements and data verification in compliance to the project Quality Assurance Project Plan (QAPP). A modified version of the Rosgen procedure was adopted as described in the QAPP. Data review and independent verifications were made to reconcile products with Data Quality Objectives (DQO).

Photography of the BEHI sites was provided to independent investigators for evaluation. A discussion of differences in scoring were discussed and reconciled. All original sampling products remain in the possession of the original investigators with copies to watershed assessment professionals.

C. Description of Sample Locations

The Black River watershed (HUC 0409001) encompasses 459,542 acres (718 square miles) of old glacial lake plain within Lapeer County, Sanilac County, and St. Clair County. The Black River begins in the northern end of Sanilac County and outlets into the St. Clair River at Port Huron.

The Black River watershed is commonly broken into three subwatersheds: Mill Creek (117,660 acres), the Lower Black (95,620 acres), and the Upper Black (246,260 acres). Overall, the major land use in the watershed is agriculture, with upland forest and wetlands being the second largest land use.

Band Erosion Hazard Index (BEHI) sampling was conducted in the late summer and early fall of 2008. Locations were chosen from a sample of identified problem areas, river access sites and representative reaches of the rivers, creeks and streams of the watershed. As observations were obtained these were plotted to mapping by State Plane Coordinates. The plotting was reviewed periodically for distribution around the watershed and used to plan subsequent sample sites. The overall objective was to provide a uniform and representative sample of scores usable for the characterization of erosion potential among the Black River and its major tributaries.

Upper Black: The Upper Black River subwatershed lies mostly in Sanilac County with very small portions in Lapeer and St. Clair Counties. The most tributaries of the Black River subject to the BEHI observations were located in the Upper Black River sub-watershed. Those were the Berry Drain, Elk Creek and Black Creek.

Lower Black: The Lower Black River subwatershed lies mostly in St. Clair County, with the northern third extending into Sanilac County. A relatively few number of observations (14) were required to characterize this area due to its relative size compared to the Upper Black. The main tributary of the Black River is Mill Creek, largest of the tributary watersheds of the Black River.

Mill Creek: The Mill Creek subwatershed spans both Lapeer and St. Clair Counties. A significant area of interest lies downstream of the City of Yale along Mill Creek. A significant portion (20) of the BEHI observations was obtained in the Mill Creek sub-watershed.

Table 1 below summarizes the number of samples taken directly in the Black River and the main tributaries mentioned above:

Table 1 – BEHI Observations

Name	County	Number of Direct BEHI Observations	Number of Total BEHI Observations in the sub-watershed
Black River	Lapeer, St. Clair, Sanilac	22	82
Mill Creek	St. Clair, Lapeer	11	20
Black Creek	Sanilac	4	6
Elk Creek	Sanilac	5	16
Berry Drain	Sanilac	2	2

D. Extrapolation Procedure

A satisfactory distribution of observations over the watershed allows for simple geometric averaging of conditions. Samples found at locations within the subject tributaries are considered valid for the reach from the linear midpoint between two sample points to that of the sample point and the next in the opposite direction. The characteristic upstream into a tributary stream was considered similar to the major stream. While a point located most upstream on a tributary was considered most influential among all adjacent observations not located on the tributary stream channel or the downstream channel. The influence of a sample location on the represented erosion potential of a reach of the major streams is determined by the following hierarchy:

1. Sample Location in the stream reach
2. Sample Location at confluence point
3. Sample Location in minor tributary closer than actual reach sample location

E. Results

Eighty-two sites were sampled and evaluated over the entire watershed. Forty-four sites (46.3%) were located in the Black River watershed and minor tributary sub-watersheds exclusive of the major sub-watersheds. Twenty sites (24.5%) were sampled in the Mill Creek sub-watershed. Six sites (7.3%) were sampled in the Black Creek sub-watershed. Sixteen sites (19.5%) were sampled in the Elk Creek sub-watershed. Two sites (2.4%) were sampled in the Berry Drain sub-watershed.

Five sites (6.1%) indicated high erosion potential. Fifteen (18.3%) indicated moderate erosion potential. Sixty sites (73.2%) indicated low erosion potential. Two sites (2.4%) indicated very low erosion potential.

Three of the five high potential erosion areas were located in the Lower Black River Watershed. Two were located in the Upper Black River Watershed. Two of the five high potential erosion areas are located directly on the Black River. One is located in northern St. Clair County, inside the Lower Black River Watershed. The other is located in Croswell, inside the Upper Black River Watershed. Two others are located in the Lower Black River watershed in small sub-watersheds west of Port Huron. Last, one other is located on Elk Creek, approximately two miles upstream of the Elk Creek, Black River Confluence.

Moderate erosion potential is concentrated along the Black River and Mill Creek at their lower reaches corresponding to locations of relatively unmanaged watercourses and gullied side tributaries. Very low erosion potential was indicated in the upper reaches of the Upper Black River Watershed adjacent to the Minden Bog region.

F. Conclusions

The Black River and its tributaries appear to be a relatively stable system. With the exception of a few particularly severe erosion "hot spots" sediment from stream processes, channel movement, evolution and other geomorphic instabilities do not appear to threaten the water quality of the Black River and its tributaries. The areas of high erosion potential appear to be response to specific activities adjacent to the river in combination with soil character and vegetation. Areas of moderate erosion potential appear to be a response to agricultural and commercial hill slope practices adjacent to the tributaries.

The agricultural practices have been common across the watershed over approximately a century with the intensity more or less constant in the Upper Black River Watershed and a reduction of the activities in the Lower Black River Watershed recently. The river response to these activities would be expected to continue as it has over the time scale. Commercial activities remain relatively small in scale and concentrated at the lower extent of the Lower Black River Watershed.

An emphasis on further understanding of the river response and improvements to agricultural practices within the watershed should be pursued in order to mitigate the river response to upland sediment supply and erosion processes in the Black River tributaries. Study and repair of specific areas of high and moderate erosion potential should be pursued.