



## FRIENDS OF THE JORDAN RIVER WATERSHED, INC.

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### RATIONALE FOR CONDUCTING SOIL BORING STUDIES ON THE JORDAN RIVER

The City of East Jordan has recently announced plans to hydraulically dredge 50,000 cubic yards of almost pure sand from its harbor and boat launch area near the mouth of the Jordan River. These sediments, believed to have been transported to Lake Charlevoix from the Jordan River, fill what once was a relatively deep harbor. Moorings, once used to dock deep drafting lake steamers far up river, are now nearly buried in sand. River guides, who once used 10'-12' poles to push fishing boats up a rocky bottomed river channel, must now simply wade the sandy shallows. The river channel, once deep enough to accommodate these boats, can barely float a canoe in places today. A once vibrant grayling fishery has long gone extinct due to extreme alterations in riverine conditions.

These notations, and many others like them, are not just legends of the good old days. They are facts. And they are not unique to the Jordan River. They are testimony to the obvious, that the Jordan River contains and slowly transports a very heavy burden of sand. What is not obvious or clearly understood is where these sediments came from, how they were deposited throughout the river system and what impacts or changes have occurred as a result. Answers to these basic questions could provide valuable insights into modern river management decisions and possibly refocus remediation efforts. At the very least, a stronger scientific understanding of sediment loading of Northern Michigan streams would emerge.

In 1988, early founders of Friends of the Jordan, MDNR, and others excavated several sand traps in the Jordan River following techniques developed by Alexander and Hansen. The goals were to halt the delivery of sand sediments downstream from the traps and allow the river's natural hydrologic forces to transport remaining sediments to "reveal" the original streambed. If properly maintained it was estimated that the river would "revert" or "convert" approximately one-half mile of stream every five years. While it is generally agreed that downstream conditions from one of the traps have improved over the years and that the technique works, sound scientific analyses have never been performed to document these claims. Furthermore, due to funding constraints, proper maintenance has not been performed. What has been established is that one trap can collect over 1,000 cubic yards of sand annually and below the sand bedload lays an earlier streambed.

When the sand traps were originally excavated some striking observations were made. Below several feet of sand, stream cobble was discovered. Furthermore, woody debris, including “saw logs” was found. What was assumed but never proven was that these findings represented the original stream bottom prior to the logging era and the impacts of modern man. Similar observations have been made on other rivers where sand traps or excavations have occurred.

Prior to the 1880’s, Michigan experienced several thousand years of geologic calm. Lakes and streams stabilized after the retreat of the glaciers and the ice age. Forests matured and biologic communities reached equilibrium. Then, in a few short years, (1880’s- 1920’s) entire landscapes were clear-cut right to the waters edge and then burned. Hillsides and stream banks were left bare and scoured. Log drives and over harvesting radically altered the watershed ecosystem. Poor farming practices and community developments followed, further straining the environment’s capacity to heal and cleanse itself. The river’s capacity to transport sediments was simply overwhelmed and the sand bedload burden ensued.

Now, the forests have been allowed to regenerate. Stream banks and hillsides have largely been stabilized. The Jordan River is protected by Natural Rivers designation. The lessons of the past have mostly been learned and many good remediation efforts have been successful. Yet the massive erosive forces unleashed years ago manifest themselves today in the form of a self-perpetuating, slow steady transport of the sand bedload and impaired aquatic habitat. If this problem is to ever be solved, it first must be understood. Soil boring studies, like Aldo Leopold’s time travels while sawing through a log, could provide a road map for this geomorphologic journey. A prerequisite for this type of inquiry should include a morphologic assessment of current conditions utilizing existing inventories and data. These data could be enhanced and validated during soil boring study design and execution.

This proposal seeks to answer the following fundamental questions:

1. Did a natural or stable river ever exist? What is the operational or stream potential?
2. What did it look like? What were its geomorphic characteristics? Is that relevant or comparable to today’s conditions?
3. How big is the sand bedload? How much is “natural vs. manmade”?
4. What are the origins of these sediments? Hillsides, roads, braided channels?
5. How do these sediments move through the system? At what rate?
6. What can the sediments tell us about the past? Pollen, cobble, woody debris, flora, fauna, climate, discharge, productivity?
7. Can we paint a picture prior to the 1800’s? Was there a stable channel bottom or is this ever changing?
8. If the bedload is not natural, can it be reversed? Should it? How? What would be the expected results?
9. What is or could be the “proper functioning condition” or “desired future condition”?

## **ORIGIN, GEOMORPHOLOGIC HISTORY AND IMPACTS OF THE SAND BEDLOAD OF THE JORDAN RIVER**

Eroded sand and its resulting bedload is considered the most significant nonpoint source pollutant in Northern Michigan rivers and streams according to MDNR, MDEQ, EPA and many others. Its cumulative effects include simplifying river channel morphology, filling of deep pools, covering and smothering benthic substrate needed for spawning fish and macroinvertebrates and scouring of the river bottom. Additional impacts include reduced aquatic productivity, increased water temperatures, impaired navigation, braiding of river channels and flooding.

Over the years numerous projects and millions of dollars have been invested to mitigate the negative effects of sand bedload. These projects include stream bank stabilizations, improved road/stream crossings, improved agricultural and forestry techniques, diversions for storm run-off, dredging and sand trap installations. Many of these projects have been successful and beneficial. Yet the sand bedload remains.

Most stakeholders can agree on the negative impacts of sand bedload on rivers and streams. Few, however, agree on its origin, geologic history, fluvial behavior, need for or benefit of removal, or methods by which to do so. Nowhere in the literature has it been determined whether this sand bedload is natural or man-made. Neither has the source been determined, rate of deposition, the manner by which these deposits move through a riverine system, or what an original stream bottom may have looked like prior to major human influences such as the logging era. Much is known about stream hydrology and morphology but the subject begs for a broader understanding of sand bedload relative to pre-modern conditions in order to apply this knowledge today. A comprehensive geomorphic assessment has never been conducted on Michigan's first designated Natural River.

Prior to the arrival of mechanized man, Michigan and the Great Lakes Region experienced several thousand years of relative geologic calm. After the retreat of the glaciers, rivers and streams reached equilibrium where natural down cutting of glacial deposits was matched by hydrologic transport. Stable aquatic and terrestrial communities evolved providing natural checks and balances. Variations of climate occurred gradually and natural ecosystems adapted and flourished. Soil boring studies could document this period, assess fluvial conditions and then be used to predict, preclude or guide future influences.

Historical accounts strongly suggest that the Jordan River was a very stable and highly productive stream. The Jordan River would make an excellent experimental model given its relatively short length (less than 33 miles), protected status (Natural Rivers Designation and large amount of public ownership), sparsely developed watershed (reduced variables), stable hydrology (constants), recently completed inventory and assessment (MDNR), and historical prestige.

**TITLE:**

**Soil Boring Analysis Along the Jordan River Stream Bottom.  
An Assessment of Current and Pre-Modern River Morphology.**

**PURPOSE:**

**Measure current and historical stream bottom composition to determine geomorphologic characteristics and impacts of sand bedload relative to a stable channel balance.**

**METHODS:**

- 1. Conduct multiple soil borings along various transects of the Jordan River corridor to a depth predating the effects of mechanized man.**
- 2. Analyze the substrate by: a) Composition, b) Depth, c) Origin, d) Historical and geologic relevance, e) Integration with topography, geology, hydrology and watershed dynamics.**
- 3. Design and conduct soil borings and analyses consistent with the principles of modern fluvial geomorphology whereby results would substantiate geometric relationships needed for river assessment. (i.e.: slope, stream channel dimensions, discharge, meander wavelength, sinuosity, riffle/pool sequence, bankfull width, etc.)**

**ASSUMPTIONS: PROVE or DISPROVE**

- 1. A considerable sand bedload lies atop an original stable stream bottom.**
- 2. The sand bedload is the result of human influence.**
- 3. The sand bedload is not a natural phenomenon.**
- 4. The sand bedload negatively impacts the river's potential.**
- 5. A profile of a stable stream channel (pre-mechanized man) will emerge from boring data.**
- 6. A stable stream bottom discovery and substrate analysis will provide a broader understanding of a truly natural river.**
- 7. Comparative analysis of modern and historical stream bottom strata will provide useful insights into future watershed management decisions.**
- 8. Results here could be applied to many Northern Michigan rivers and streams.**
- 9. A qualitative and quantitative assessment of modern and historical morphology will provide a necessary template for future remediation efforts.**

**NOTE : Project could be performed in a tiered fashion.**