



Sediment Yield for NHDPlusV2 River Reaches of the Mississippi River Basin

Description

This project established sediment yields for all river reaches of the Mississippi River Basin. The river network and catchment shapefiles of the Mississippi River Basin are based on the GIS-based National Hydrography Dataset Plus version 2 (NHDPlusV2) geospatial dataset. The project team performed Phase 1 of this analysis for the Ohio River Basin in Fiscal Year 2018 with promising results for many locations. Phase 1 used empirical regressions with available GIS, discharge, and sediment data to calculate sediment yields and quantify uncertainties. In Phase 2, the method was extended to cover the entire Mississippi River Basin (MRB) within the United States. Annual sediment yield for entire MRB in 2013 is shown in figure 1. The project will provide a valuable data set of approximate sediment yields which can fill spatial, or resource-limited, gaps. In this year, the accuracy of the resulting data set will be evaluated and modeling results will be published in public forum.

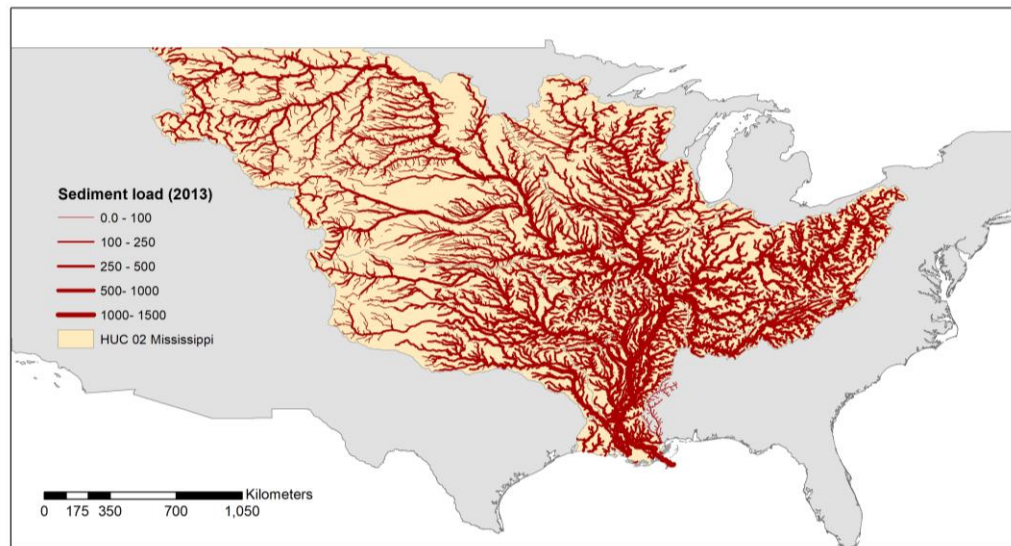


Figure 1. Map of annual sediment yield for NHDPlus river reaches of the Mississippi River Network. Only river reaches with Strahler stream order higher than three are shown in this figure for clarity.

Issue/Challenge To Address

Estimation of watershed sediment at the continental scale of Mississippi River Basin is an important step to better understand the overall sediment behavior in a waterway. Distributed hydrologic and sediment models (such as HEC-HMS, GSSHA, SWAT, etc.) require large amounts of data for sophisticated calibration processes. Furthermore, uncertainty in model parameters and computational demands pose challenges for modeling continental-scale river networks. Under these conditions, a simple regression approach can provide quick and practical information over a wide range of spatial scales.

To drive the regression equation, sediment and streamflow data for more than 21,000 USGS gages were refined. The suspended sediment yields for each of river reaches in the MRB are calculated based on the derived regression equations. Several models and national datasets are integrated for this project including: NHDPlusV2; North America Land Data Assimilation System (NLDAS); USGS sediment and streamflow gages; and

river routing component of the Streamflow Prediction Tool (SPT), the RAPID model. Python scripts were developed to process all steps and estimate sediment loads. Running these codes is computationally expensive, due to the scale of the project.

The use of this data set will be beneficial for all three of the U.S. Army Corps of Engineers primary missions: Navigation, Flood Risk Management, and Environmental Restoration.

**Successes
Lessons Learned
Expected Products**

Lessons learned will be compiled during the duration of this study.

- SedHyd 2019 peer reviewed conference paper is published, entitled: “Suspended Sediment yield estimates for 170,000+ NHDPlusV2 catchments in the Ohio River Basin using the NASA-NLDAS runoff dataset”
- Journal Technical Paper (under preparation)
- Data set of estimated annual sediment yield for all Mississippi River Basin catchments
- Automated scripts and intermediate data sets or relationships
- Publish results in the web access portal such as Navigation portal

Stakeholders/Users

Any regional USACE District needing approximate sediment yield information will be able to use this data set quickly. The data set will also be useful for other federal agencies, such as the USGS or EPA, National Water Center, state agencies, or regional water management personnel.

**Projected Benefits
Value Added**

This data set will be used to answer any questions which may not require a complete hydrologic and sediment model (development of each model can easily be upwards of \$100,000). This data set will fill gaps, both in available resources and spatial coverage, by providing very high spatial resolution sediment yield information to entire 2-digit hydrologic units, the Mississippi River Basin (HUC 05, 06, 07, 08, 10U, 10L, and 11).

This framework can be used to study effect of climate changes on the estimation and management of sediment load in the terrestrial systems.

**Leveraging
Opportunities**

This effort also leverages currently available data sets through the combining of NHDPlusV2 catchments, USGS sediment measurements, national GIS data sets (land cover, soil type, etc.), and the NLDAS runoff estimates to create a final product of sediment yield by high-resolution catchment.

Points of Contact

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Participating Partners

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