

FY18 RSM IPR



Sediment Yield for Catchments of the Ohio River Basin

Jim Lewis, Ahmad Tavakoly, Travis Dahl, Kate Staebell, and Phu Luong
Coastal and Hydraulics Lab, Rivers and Estuaries Branch

Objective:

- Establish annual suspended sediment yields for each of over 170,000 catchments of the Ohio River Basin from 1980 to present.
- Use relationships between sediment and runoff
- Refine the approach by using available data sets such as land cover, slope, drainage area, and soil type.

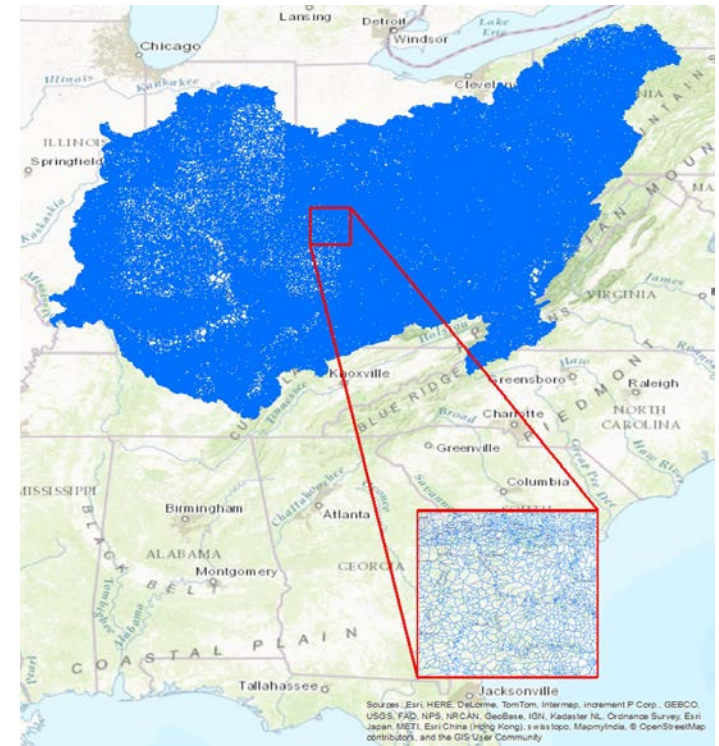
Partners:

- USACE Districts (Louisville, Huntington, Nashville, Pittsburgh, Detroit)
- USACE partners (EPA, USGS, ORSANCO)

Leveraging:

The primary leveraging for this project will be through the use of available data sets that have been made freely available.

Schedule: Dec. 2017 through Sep. 2018, \$75k



Map of the 170,000+ catchments of the Ohio River Basin

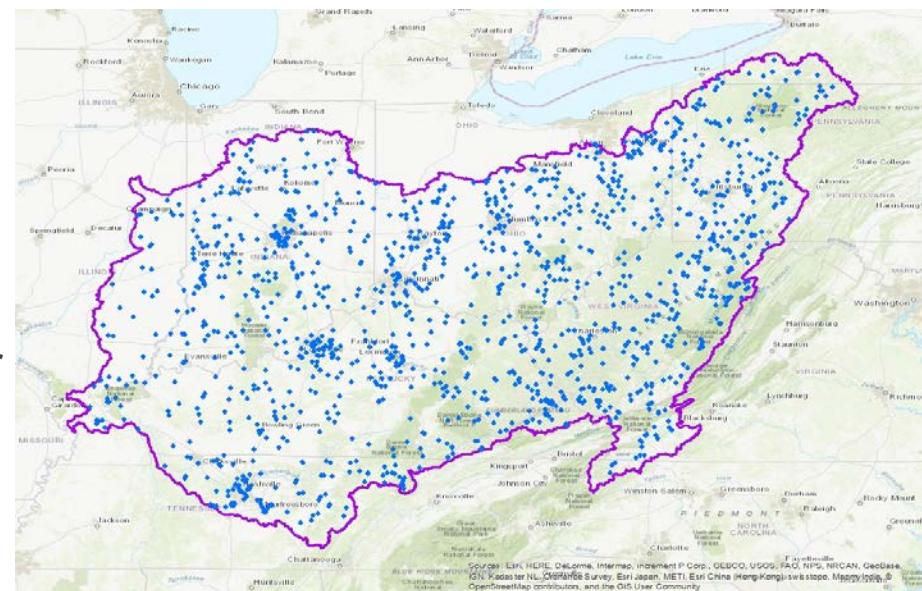
Objective	Data	Approach	Products & Value	Status & Accomplishments
------------------	------	----------	------------------	--------------------------

Sediment Yield for Catchments of the Ohio River Basin



Data sets available:

- National Hydrography Dataset Plus version 2 (NHDPlusV2) contains catchments and stream networks at very high spatial resolution. Many hydrologic and hydraulic properties are included in these data sets.
- US Geological Survey (USGS) has taken measurements at 1,400 gages (including both active and historic gages) throughout the Ohio River Basin.
- Gridded Soil Survey Geographic (gSSURGO) Database contains high resolution soil information.
- National Land Cover Database.
- North America Land Data Assimilation System (NLDAS): This data set will allow for the determination of runoff for each of the 170,000+ catchments.
- Sediment and dredging data records from USACE District offices and USACE partners.



Active and historic USGS sites in the basin

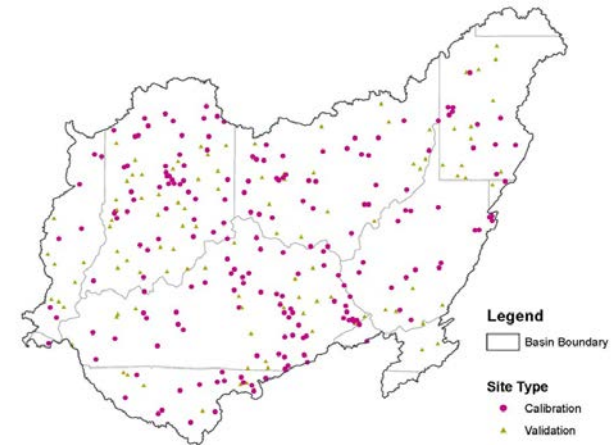
Objective	Data	Approach	Products & Value	Status & Accomplishments
-----------	-------------	----------	------------------	--------------------------

Sediment Yield for Catchments of the Ohio River Basin

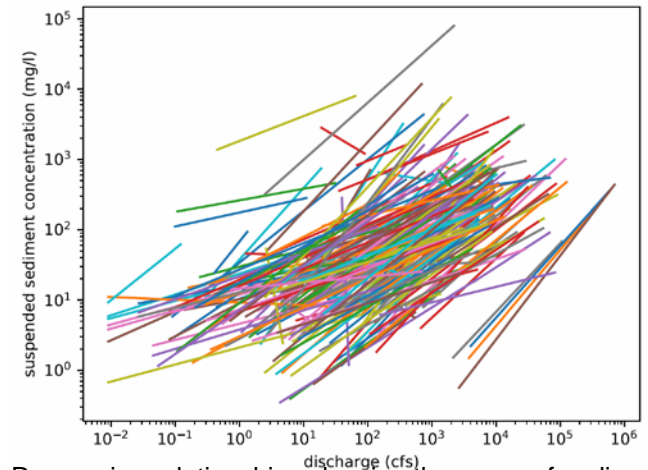


Approach:

- Use python to process geospatial and sediment data
- Empirical regressions (sediment / discharge rating curves) using USGS suspended sediment measurements and other useful data.
- Of the 300 sites, 200 were randomly chosen to be used for calibration, with the remaining 100 reserved for validation.
- Initial result of performing regression power laws through each of the 200 calibration sites.
- NLDAS runoff data set will be used to calculate sediment yield based on the empirical regression for each catchment.



The 300 USGS sediment measurement sites available, which were randomly chosen for calibration and validation.



Regression relationships showing the range of sediment conditions for each of the 200 USGS calibration sites

Objective

Data

Approach

Products & Value

Status & Accomplishments

Sediment Yield for Catchments of the Ohio River Basin



Products:

- Data set of high resolution sediment yields for all 170,000+ catchments (NHDPlus v2) of the Ohio River Basin.
- Uncertainty of the sediment yield estimates, as demonstrated by the validation of the empirical approach to measured data.
- Journal Technical Paper (draft within FY18).
- Automated scripts and many intermediate data sets or relationships.

Value Added:

- These estimates will include uncertainty information and will be useful to obtain quick answers in early phases of projects or for questions where a lower degree of accuracy is acceptable.
- Used as boundary condition inputs for any missing tributaries of a sediment transport model.
- This framework (large area, high resolution) could serve as a foundation for future work to improve uncertainty and make data available quickly.
- It will be a very good data set for comparisons with other models or data sets.

Sediment Yield for Catchments of the Ohio River Basin



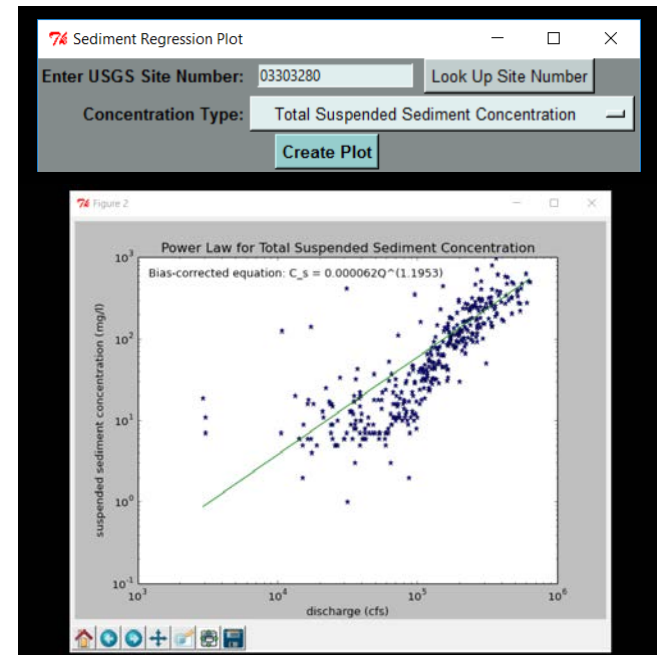
Status / Accomplishments: (on track)

- To this point, the python scripts are able to harvest data, perform regressions, calculate errors, and even perform some initial groupings.
- Remaining work includes: polishing up a presentation of uncertainty; perform categorical groupings of data sets (soil type, land cover, etc.) to test for improvement; comparisons with other available data; and project documentation.

Additional product: Created a python interface which can calculate a sediment discharge rating curve for any USGS site number. This is shareable and works on ACE-IT machines.

Welcome any feedback: (How should we make the data available? Is there a preference for sediment yield by catchment or by river reach? What temporal resolution would be most useful?)

[james.w.lewis@usace.army.mil]



Interface tool to create sediment discharge rating curves