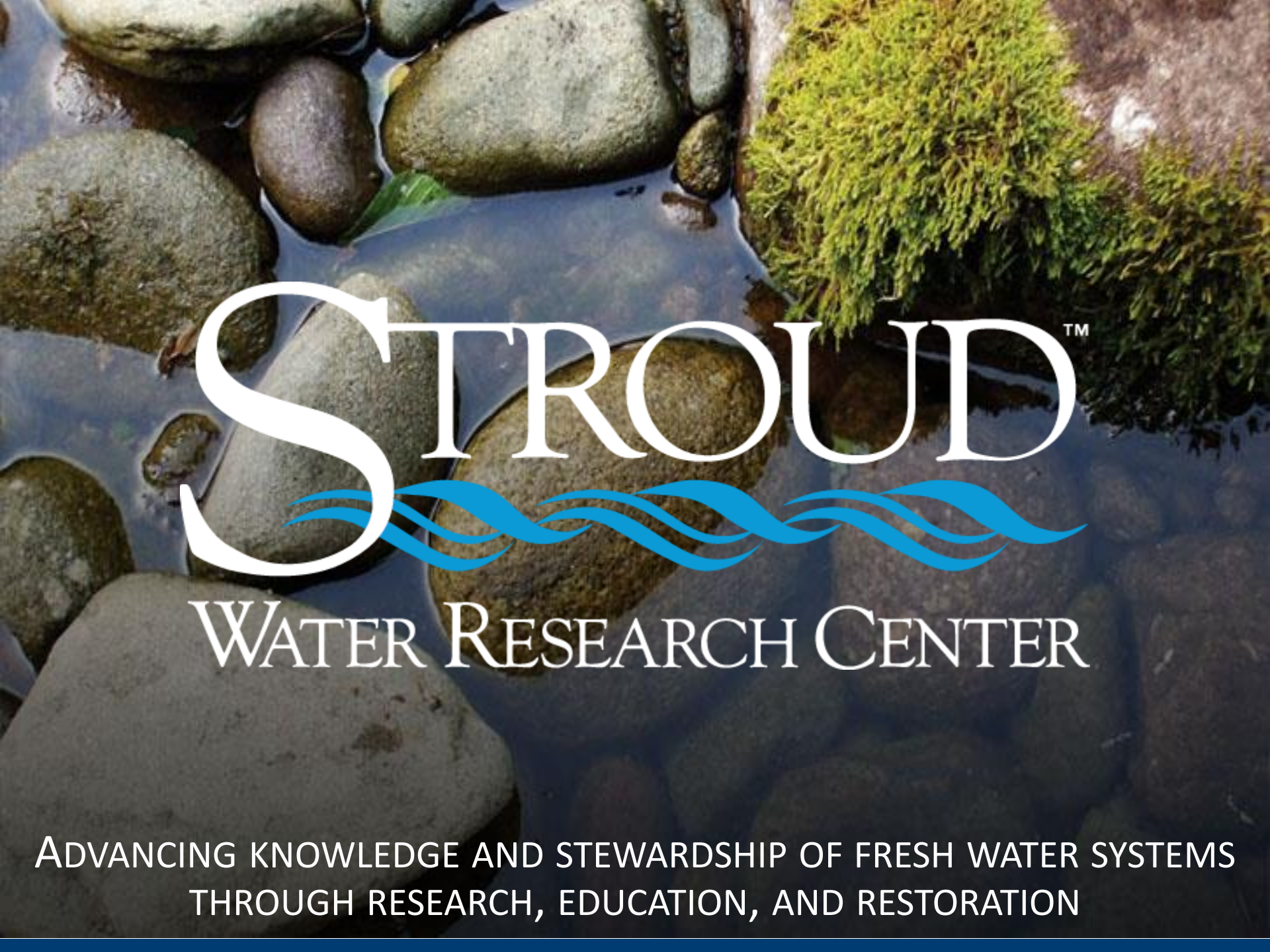

ADVANCING KNOWLEDGE AND STEWARDSHIP OF FRESH WATER SYSTEMS THROUGH RESEARCH, EDUCATION, AND RESTORATION

PHYSICAL MONITORING AND METRICS

Learning objective:

- Understand effective means of monitoring watershed hydrology, sediment loads, and physical habitat quality

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Turbidity

- Fine sediment transport (suspended load)
- Cloudiness or haziness of a fluid caused by large numbers of individual particles that are generally invisible to the naked eye, similar to smoke in air

Mississippi River at its confluence with the St. Croix

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Turbidity

- Measured by shining a light through the water and is reported in nephelometric turbidity units (NTU)

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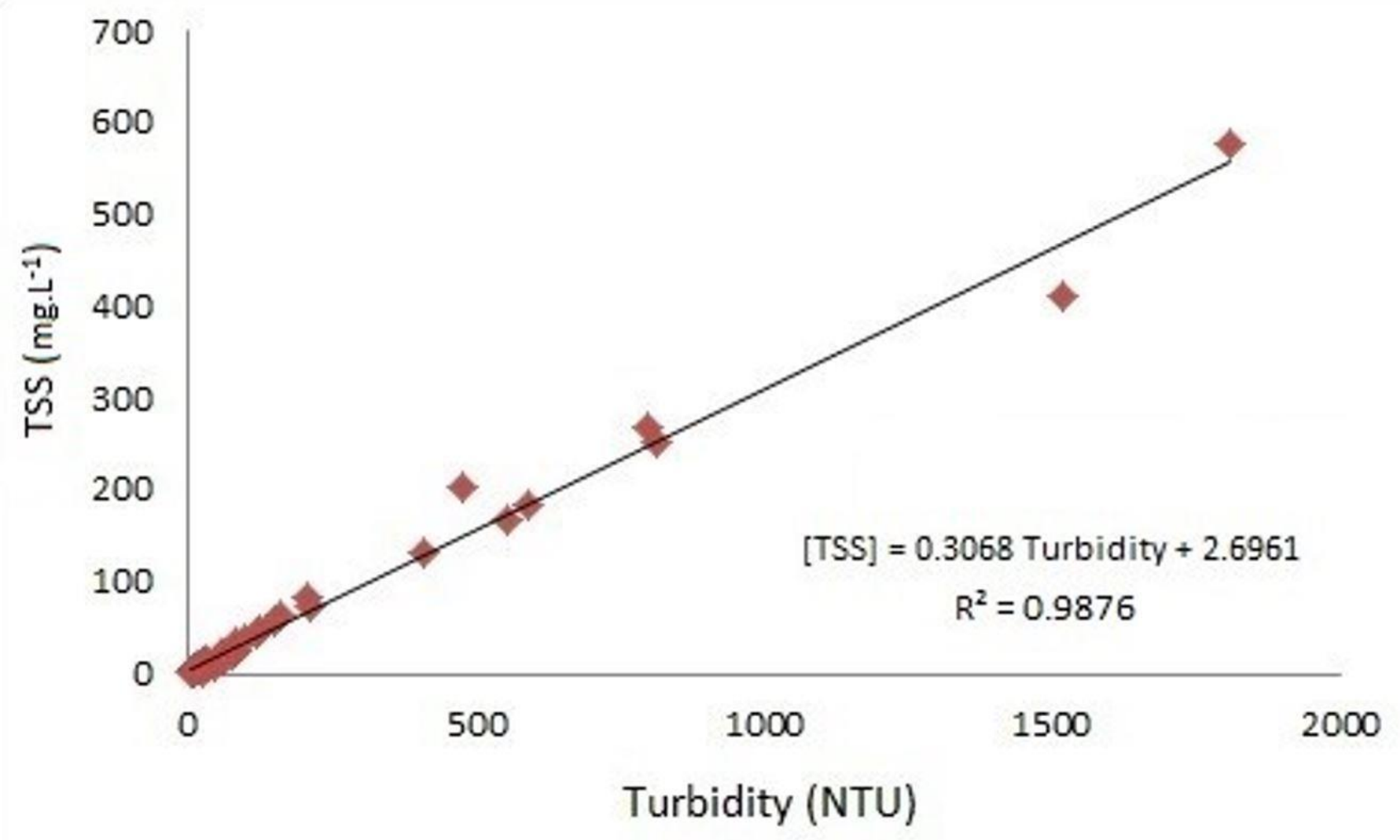

http://dx.doi.org/10.1590/2318-0331.011615099

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Turbidity

- Affects light penetration and productivity, recreational values, and habitat quality, and cause lakes to fill in faster.

Stroud Water Research Center

Turbidity

- Increases sedimentation and siltation, resulting in harm to habitat areas for fish and other aquatic life
- Particles also provide attachment places for other pollutants and pathogens (e.g. metals and bacteria)

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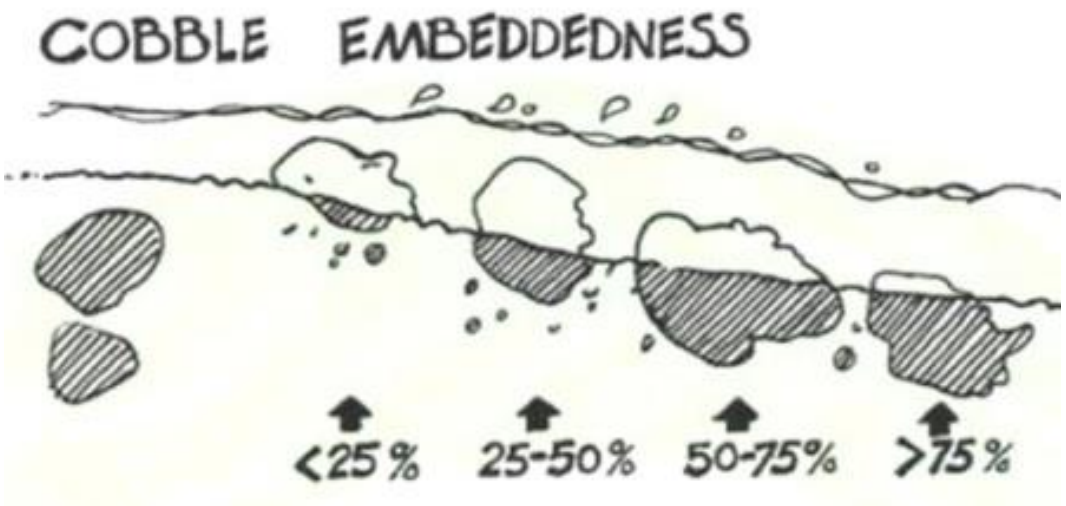
Turbidity

- Substrate Embeddedness
  - Smothers gravels
  - Eliminates invert and fish habitats



http://www.dep.wv.gov/WWE/getinvolved/sos/Pages/SOPhabitat.aspx

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Low fine sediment

Inter-gravel spaces free

High fine sediment

Inter-gravel spaces clogged with fine sediments

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Turbidity

- Pool infilling (V* metric)

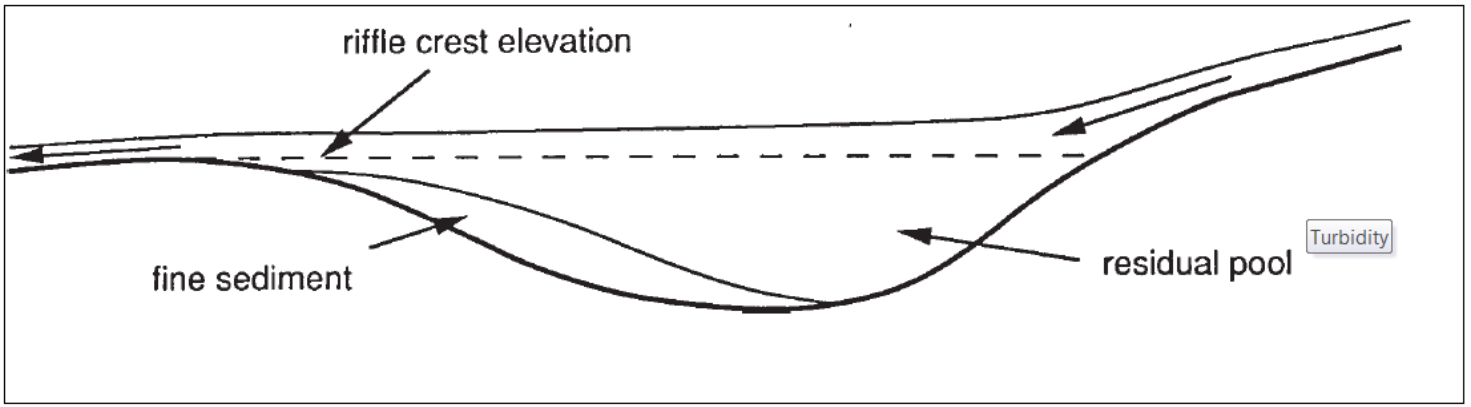

Figure 1. Representative pool in Three Creeks, a tributary to Willow Creek in Six Rivers National Forest

Lisle, T.E. 1989. http://www.fs.fed.us/psw/publications/lisle/currents06.pdf

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Velocity/flow/depth/stage

- Many streams have USGS gages to measure stage and flow
- This information is sometimes needed on at a specific location on a stream and/or on streams without a USGS gage.
- Monitoring the velocity/stage/flow in a stream can give us information about variations in inputs to streams

Method Selection based on Physical Setting

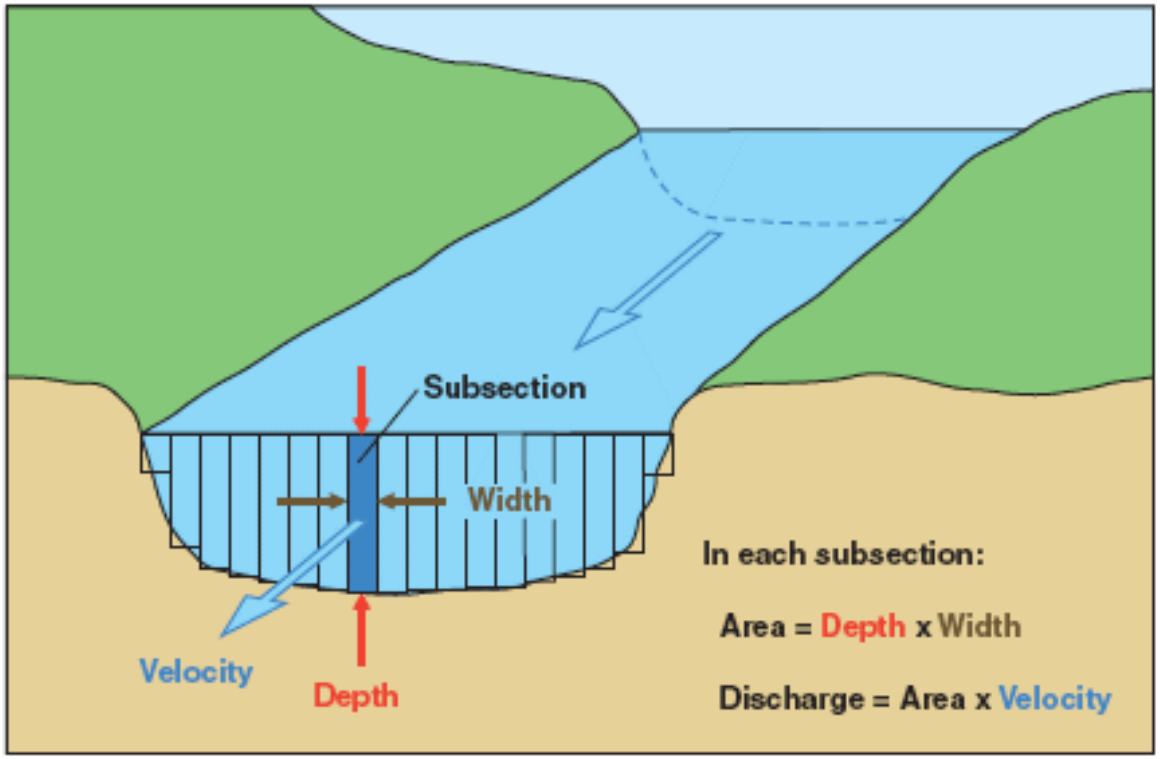
- 3 factors to consider: physical setting, velocity, water depth
- Small channel – flume/v-notch weir or salt dilution method
- Medium – velocity profile via wading rod/current meter
- Large – velocity profile from bridge or tethered profiler (ADCP)

Figure 10-2.—Equipment for making wading measurements with a current meter. Note tag line for marking stations.

Figure 10-4.—Type A crane and current-meter assembly in position on bridge.

Measurement of Discharge

- Velocity profiling method



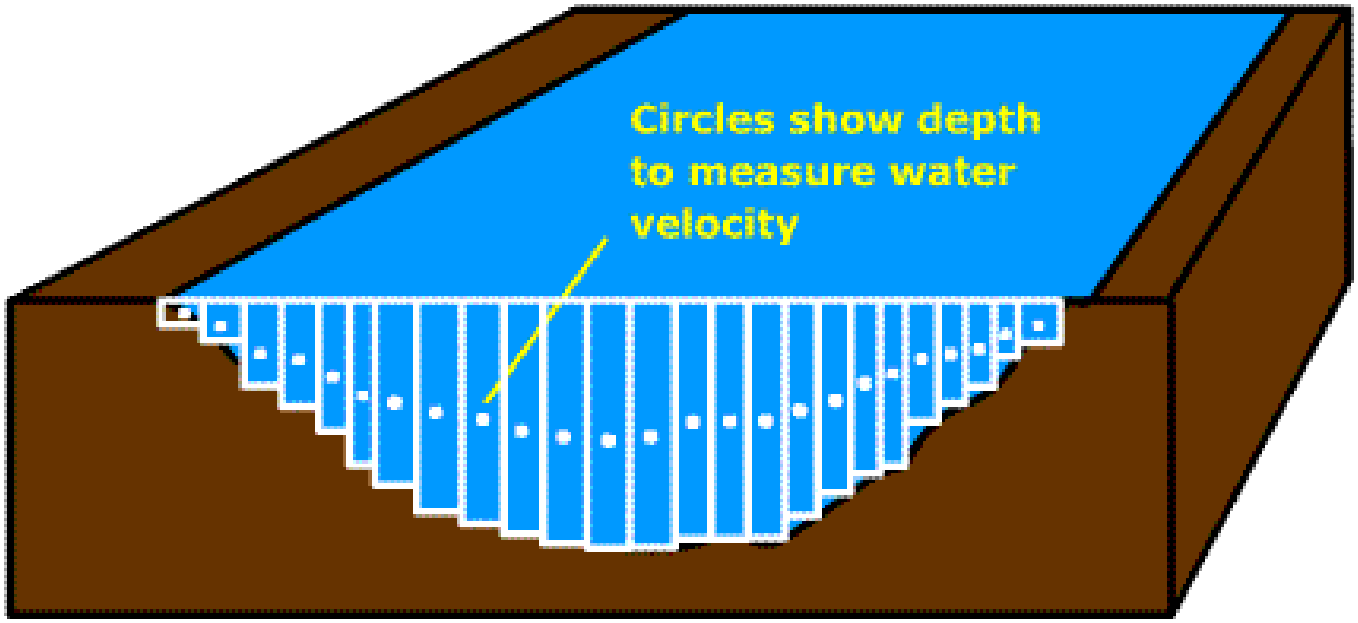
Current-meter discharge measurements are made by determining the discharge in each subsection of a channel cross section and summing the subsection discharges to obtain a total discharge.

https://water.usgs.gov/edu/streamflow2.html

Velocity Measurements

- 0.6 method (60% below surface)
- Also, need average of velocity (20-40s)

Measurement depth = 0.4 * depth



See rectangular subsections

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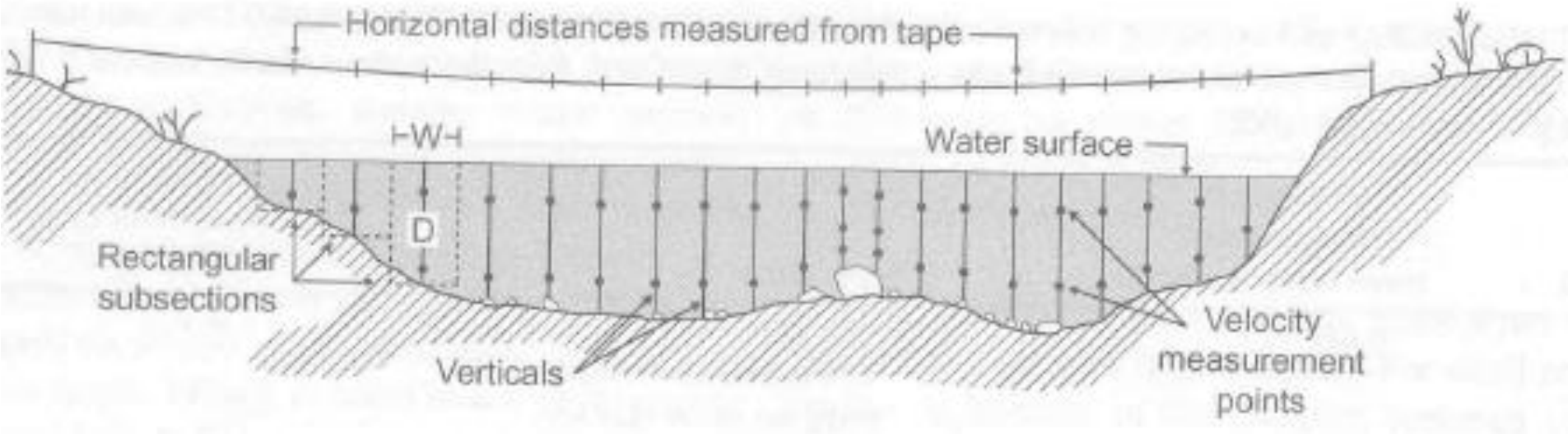
Current meter set-up showing position of the tape and depth/velocity stations

Shows the 0.8 and 0.2 method



Gordon et al., 2004

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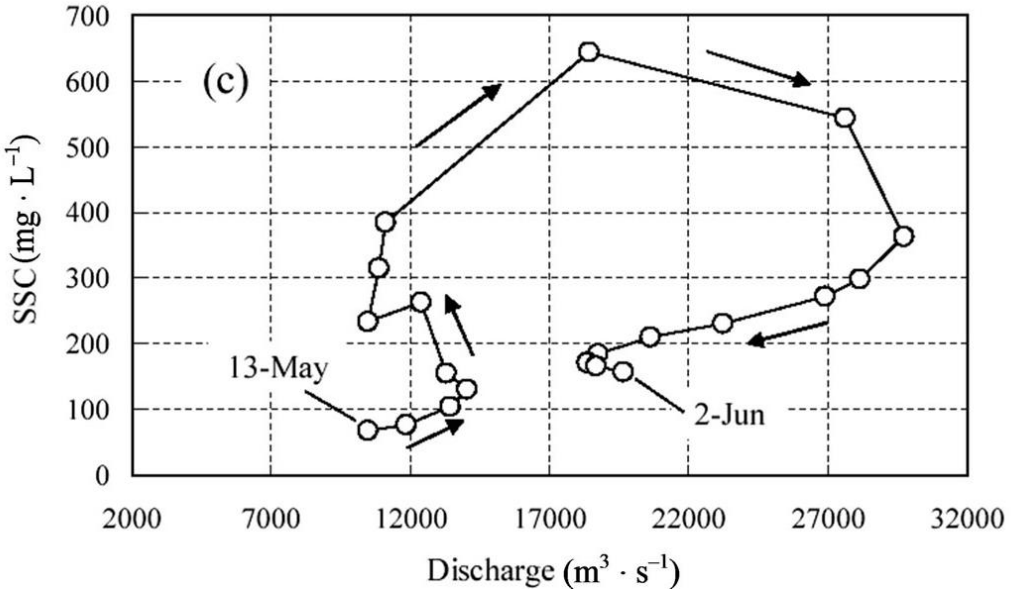
Advantages of Continuous Data Collection

- Can adjust for seasonal impacts on sediment transport



Journal of Water Resource and Protection
Vol.4 No.4(2012), Article ID:18418,7
DOI:10.4236/jwarp.2012.44020

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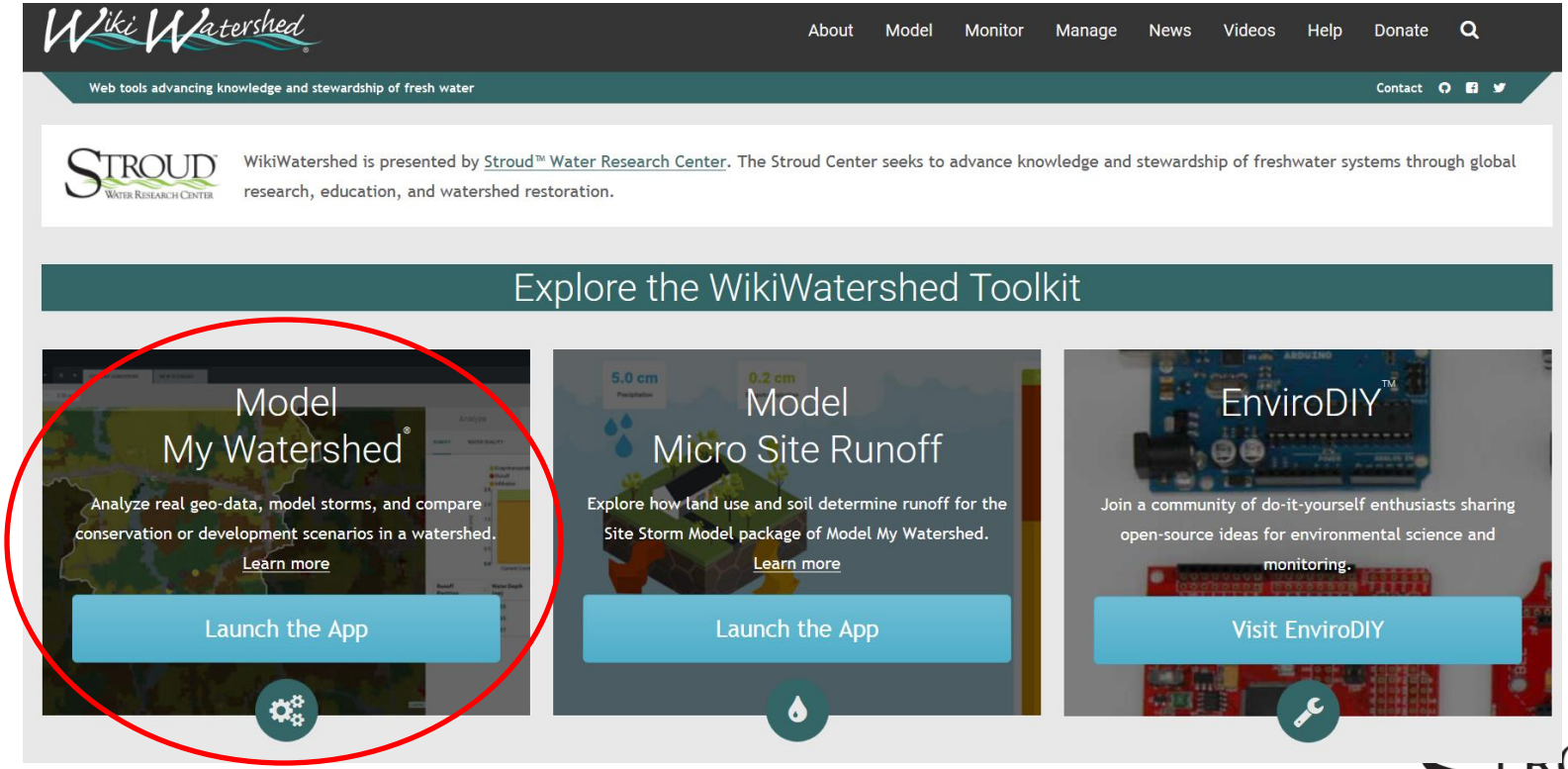
Wikiwatershed.org

- Model My Watershed is a free online tool for getting land use, soils, hydrology and water quality info for your stream or watershed



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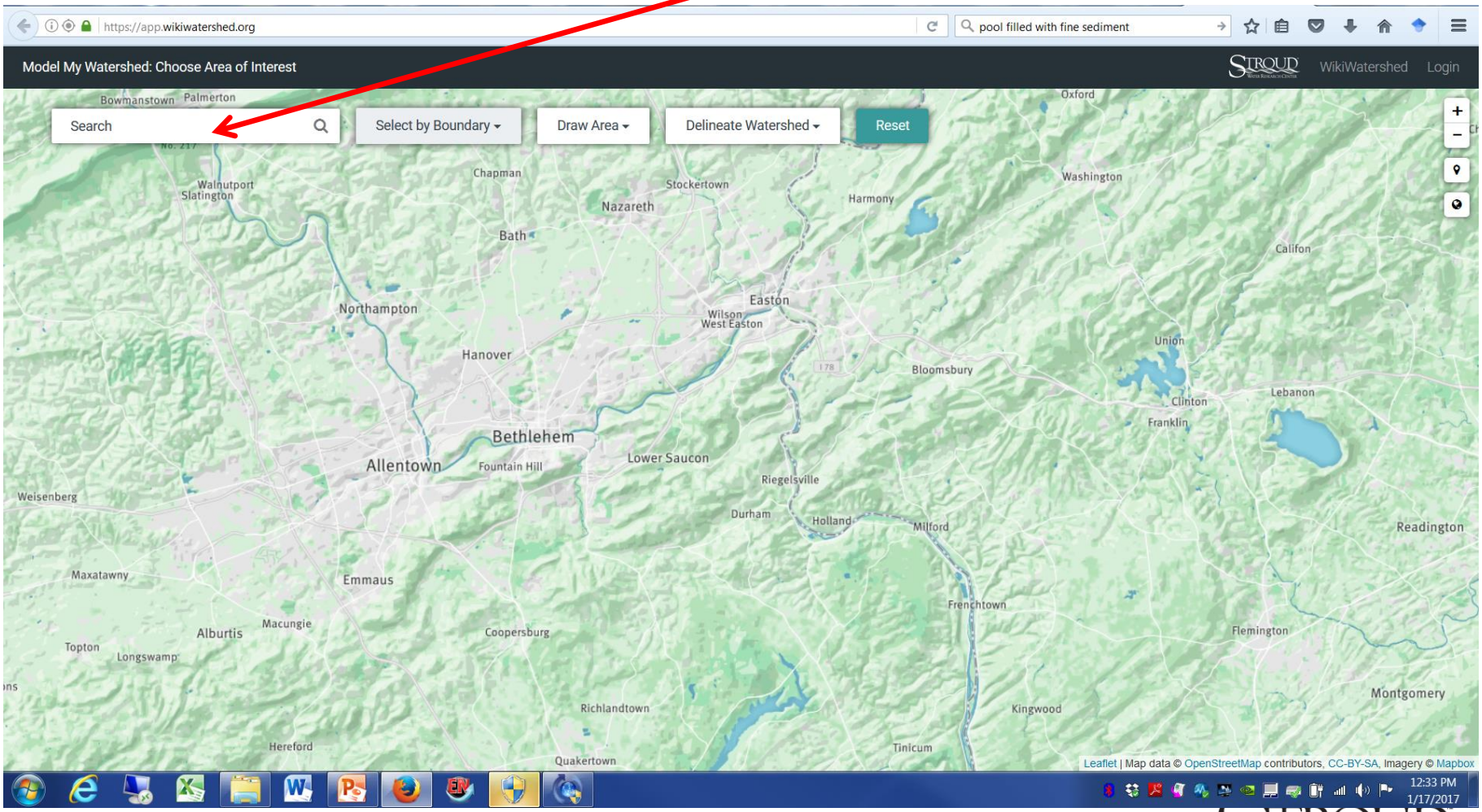
Works all over the lower 48 states, with extra features in the Delaware River Basin
Input your town, street address or point of interest here:



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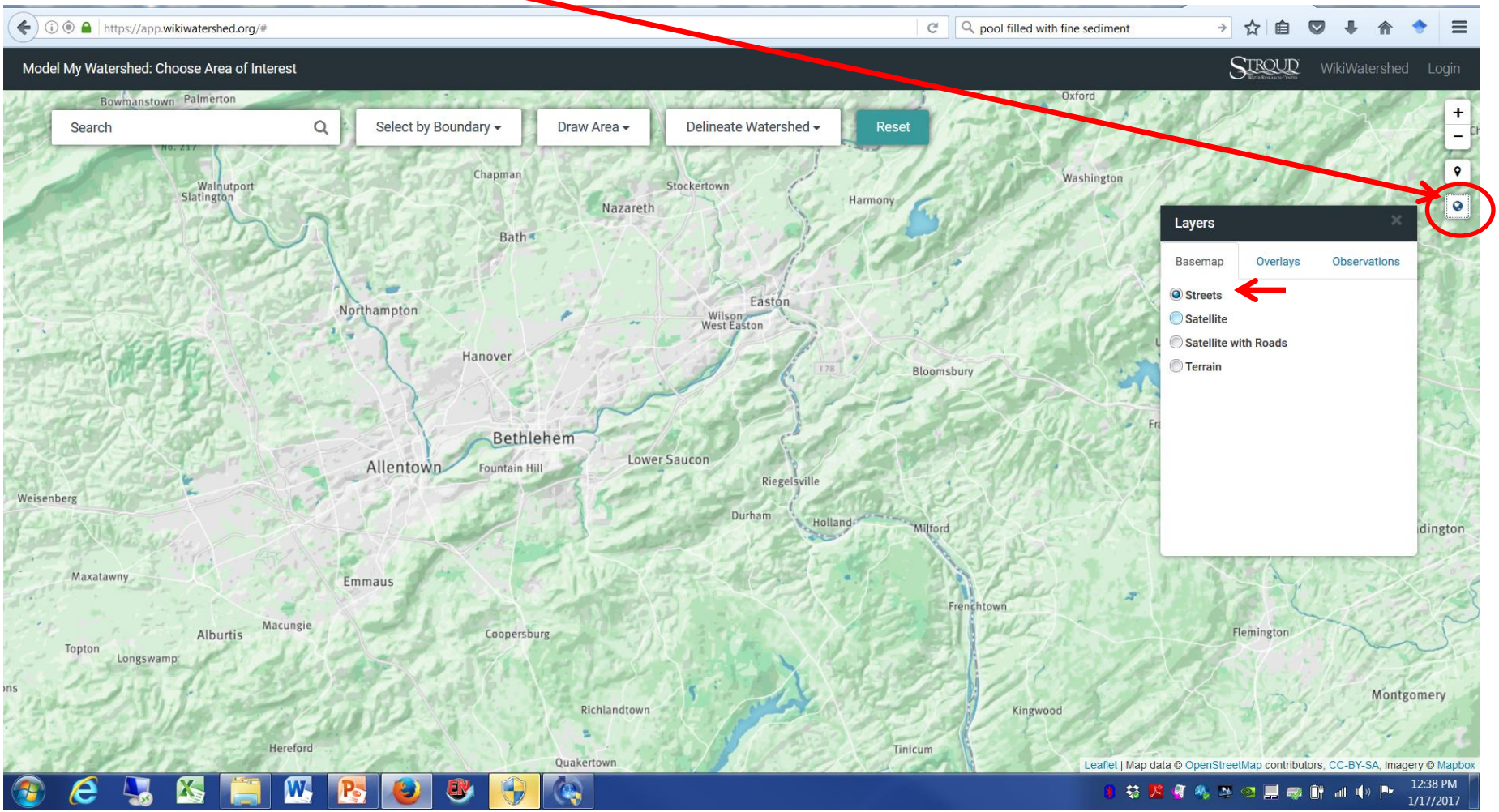
The overlay button gives options for the basemap view as well as overlays



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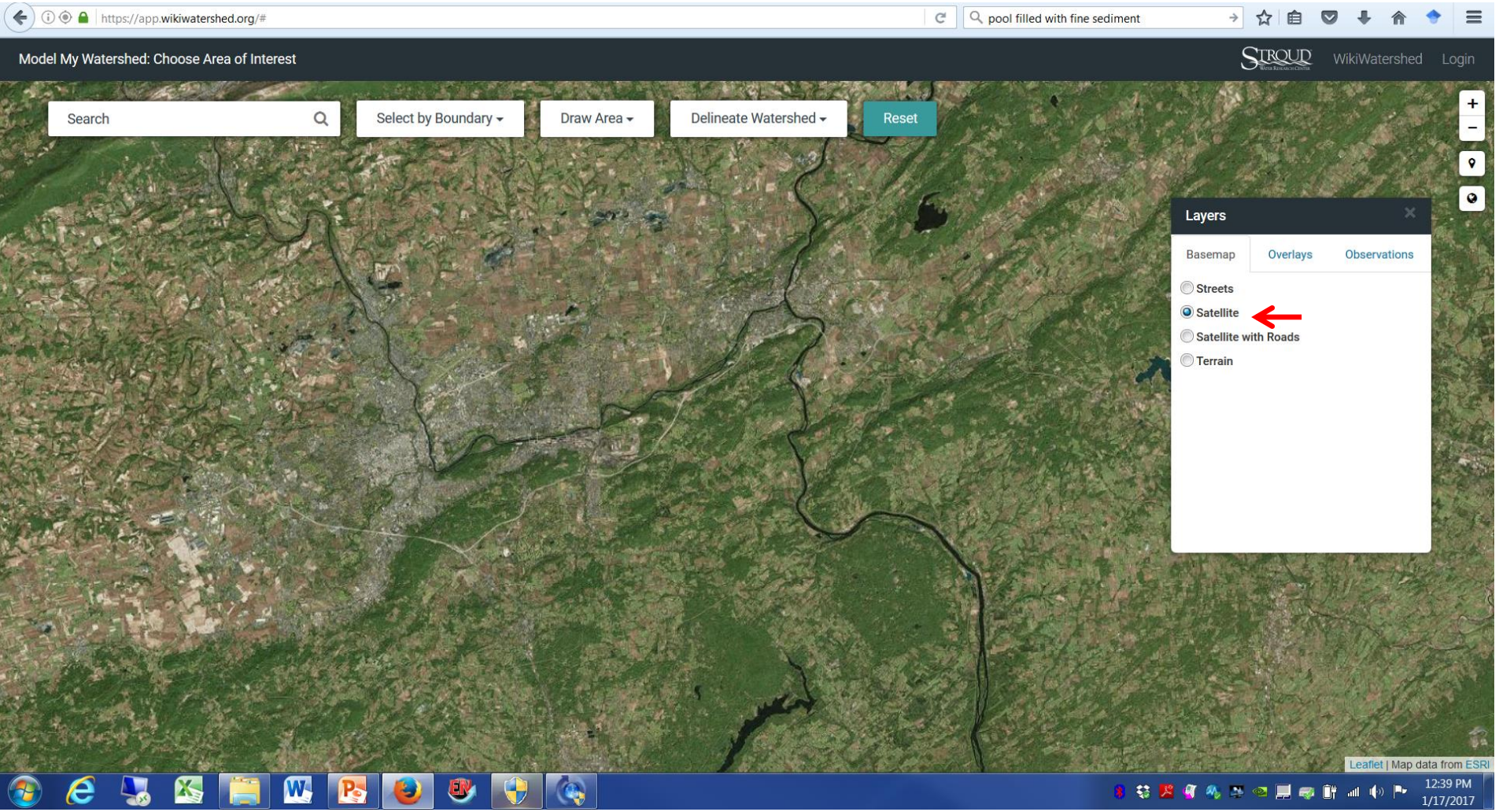

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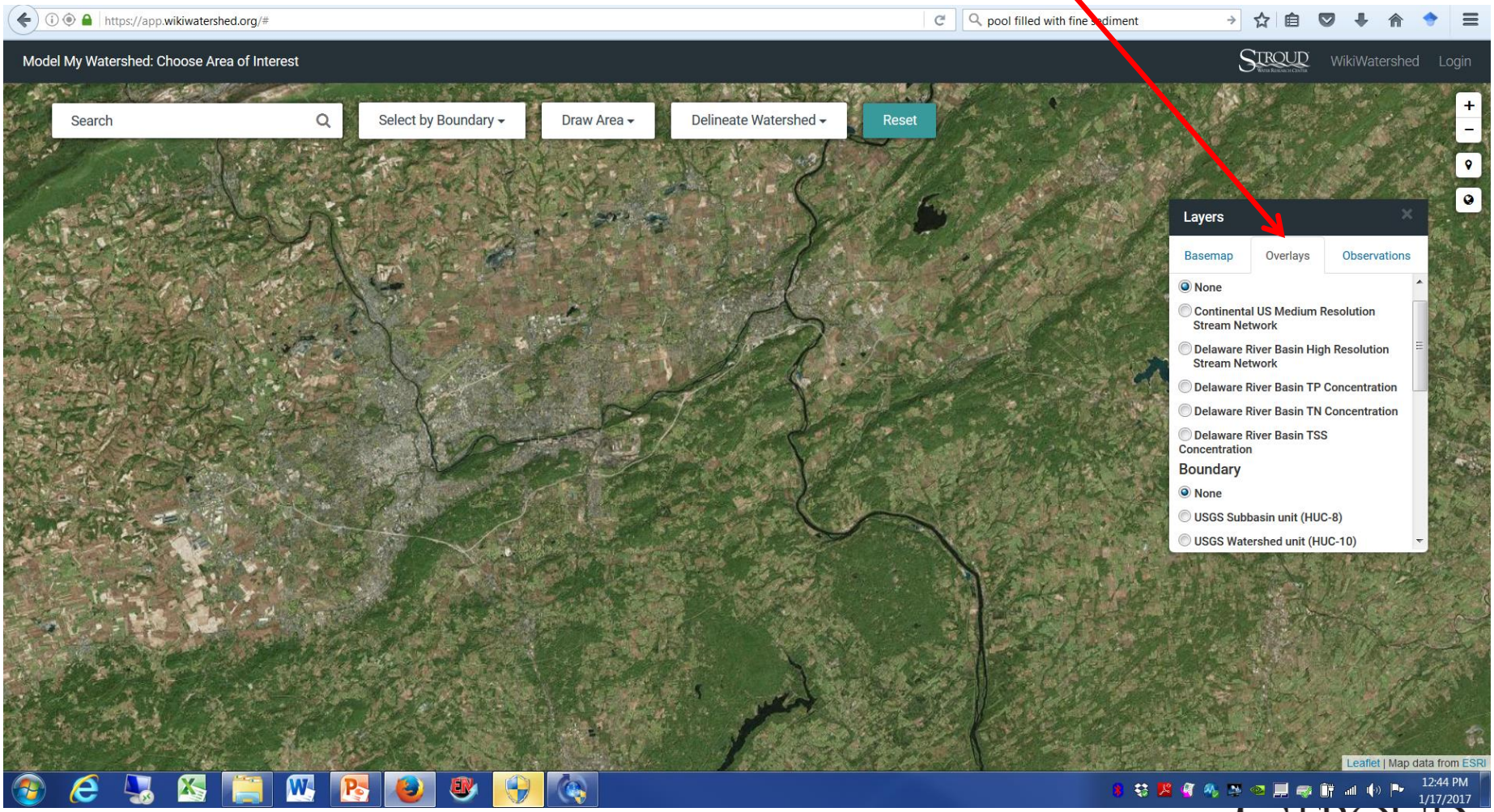
Overlays tab gives options for stream network, land cover, soils, and boundaries



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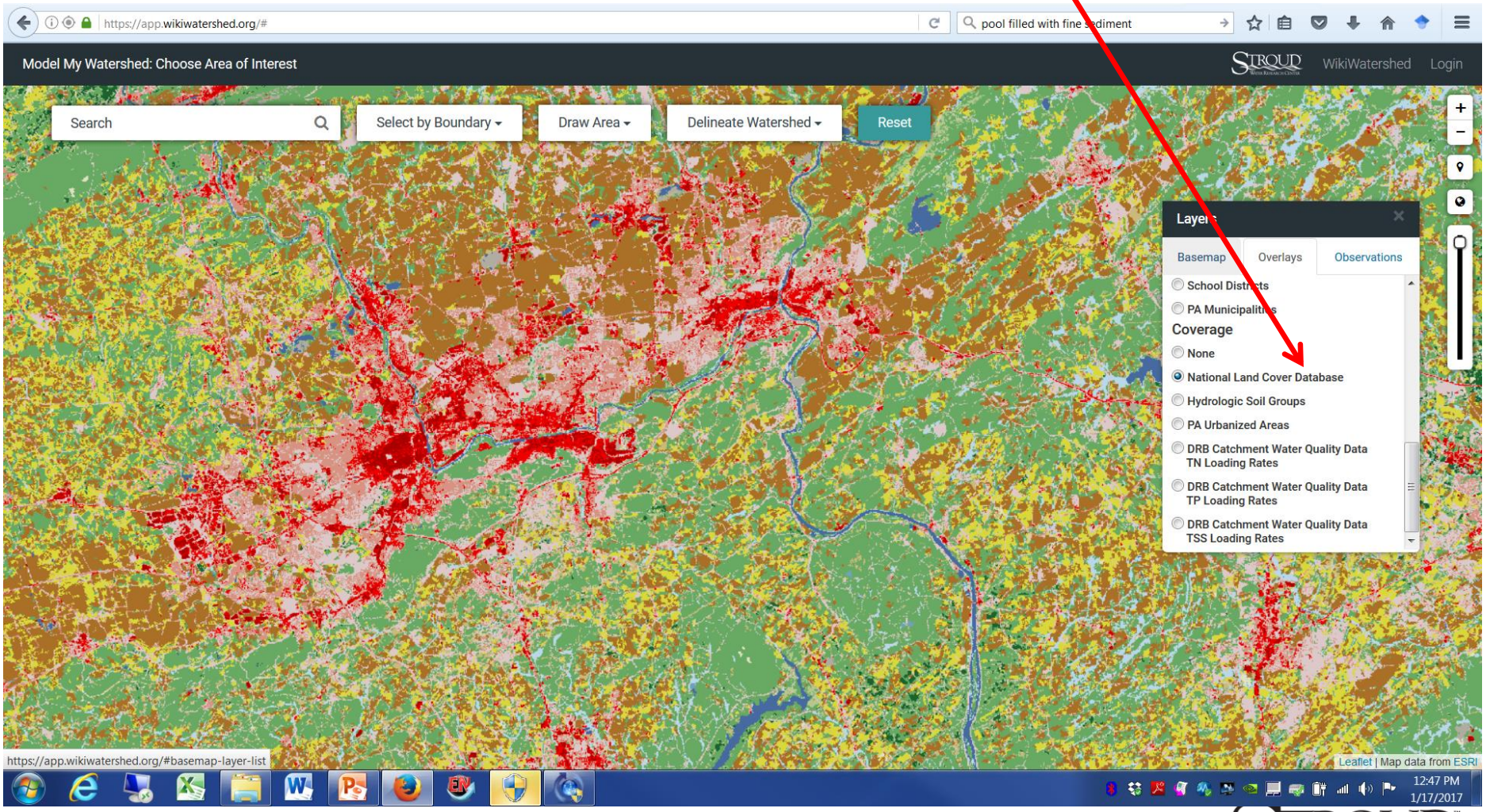
National Land Cover Database overlay selected (red is urban, green is forest, etc.)



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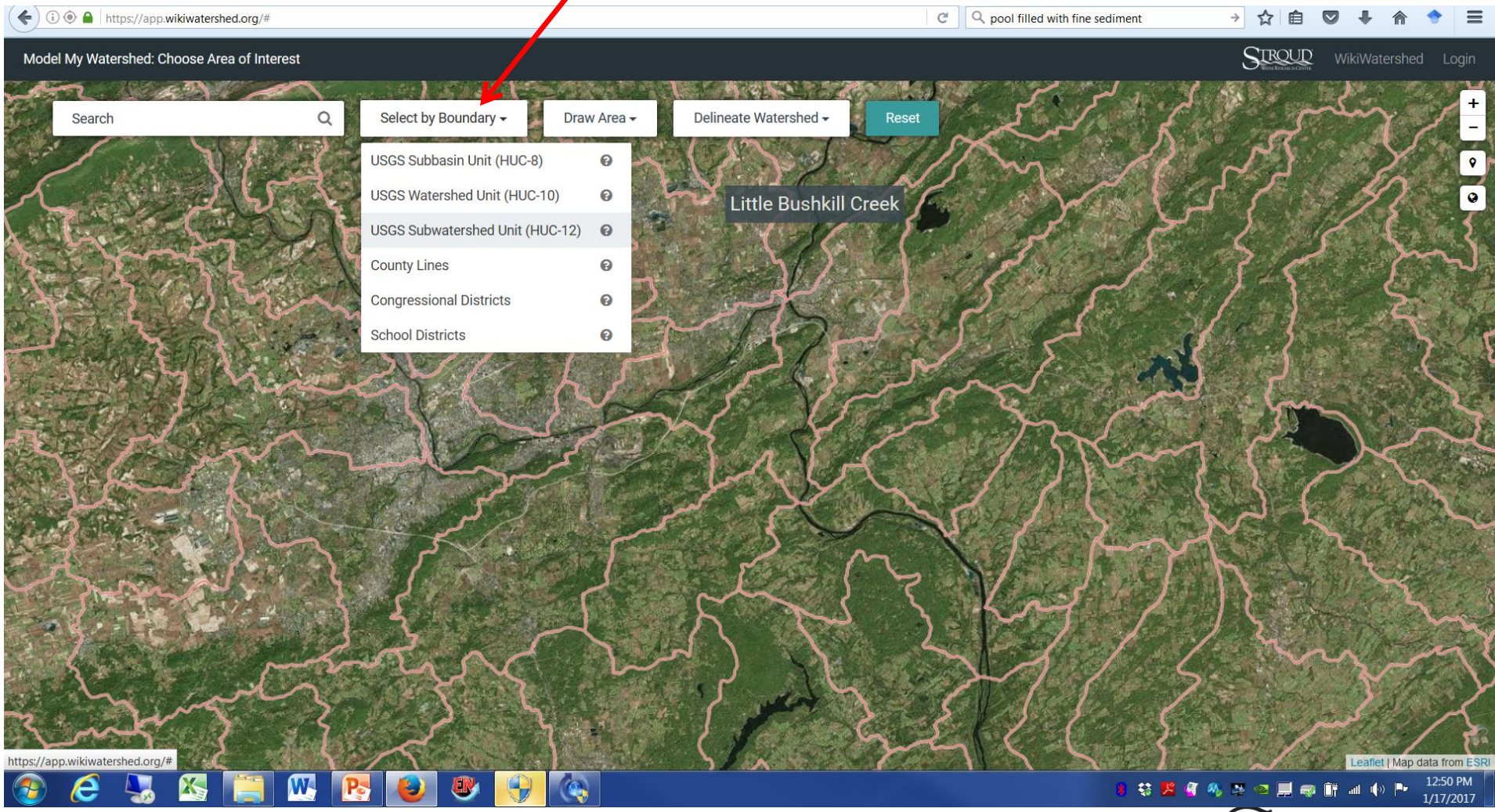
Can select area of interest by pre-existing boundary options



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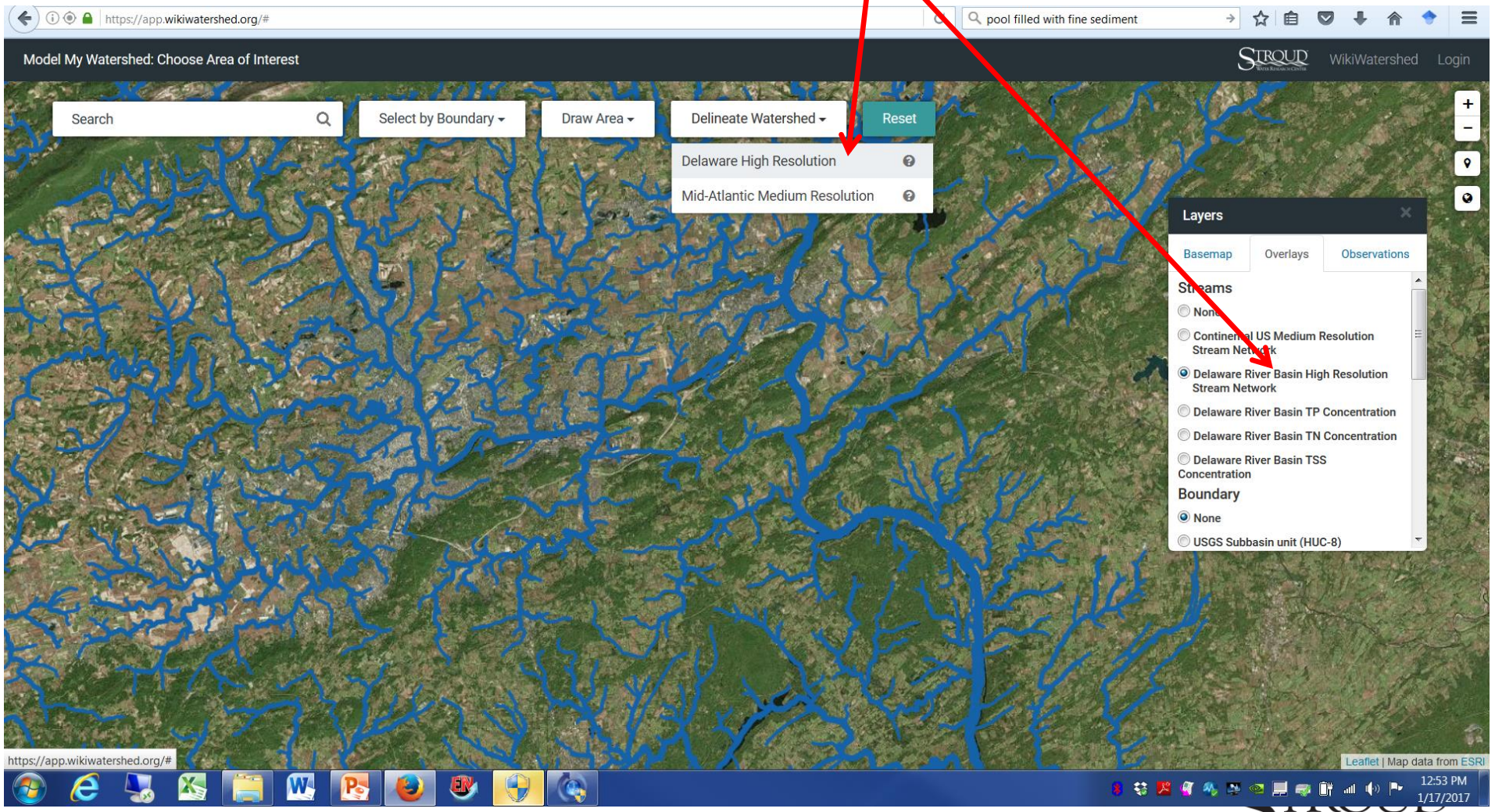
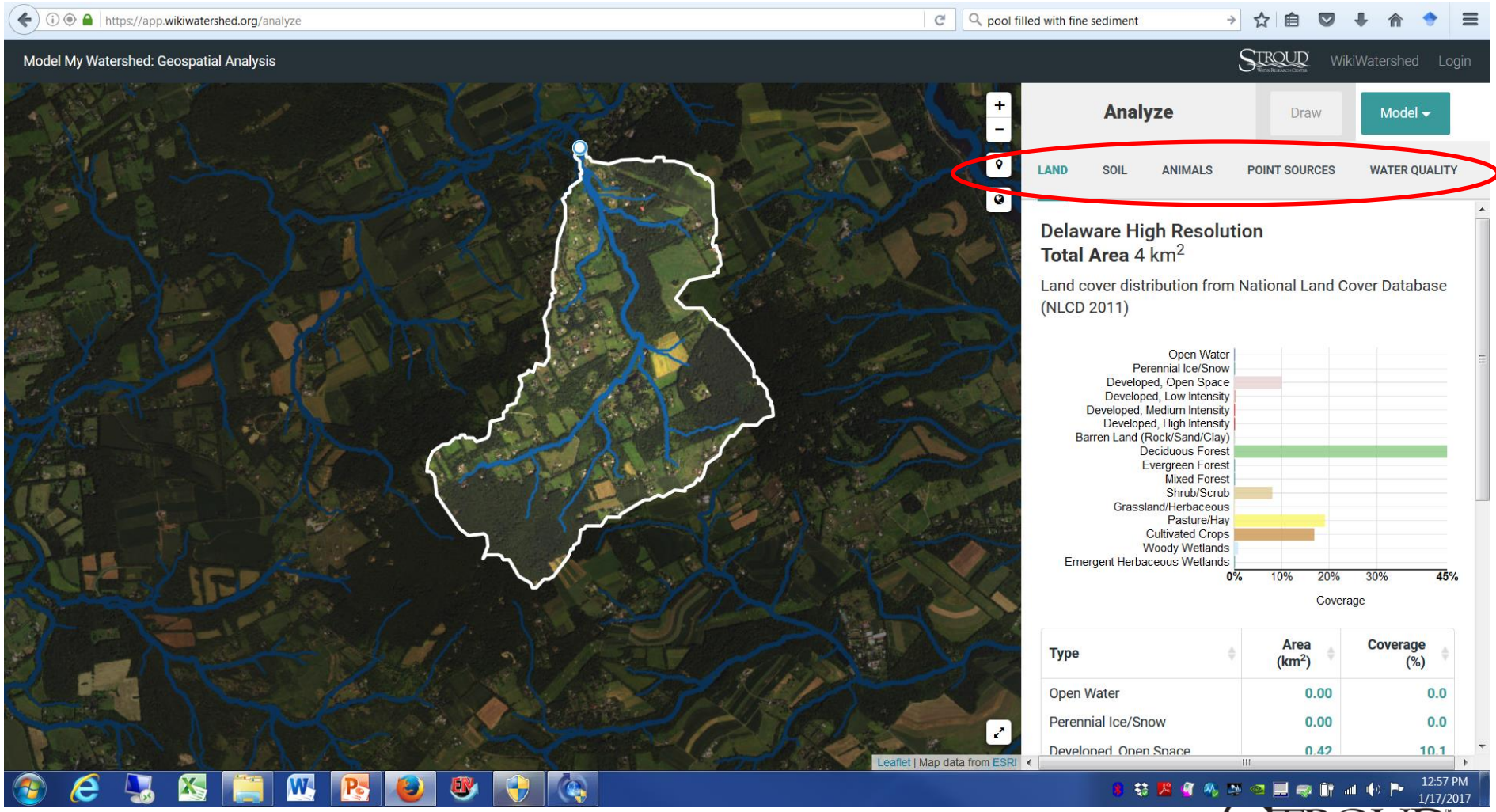
Or you can draw your own watershed that contributes to your specific point of interest. Activate DRB high resolution network, zoom in, and then place the mark on the streamline closest to your point of interest.



WATER RESEARCH CENTER

Draws the watershed contributing to your point and reports data on right of screen



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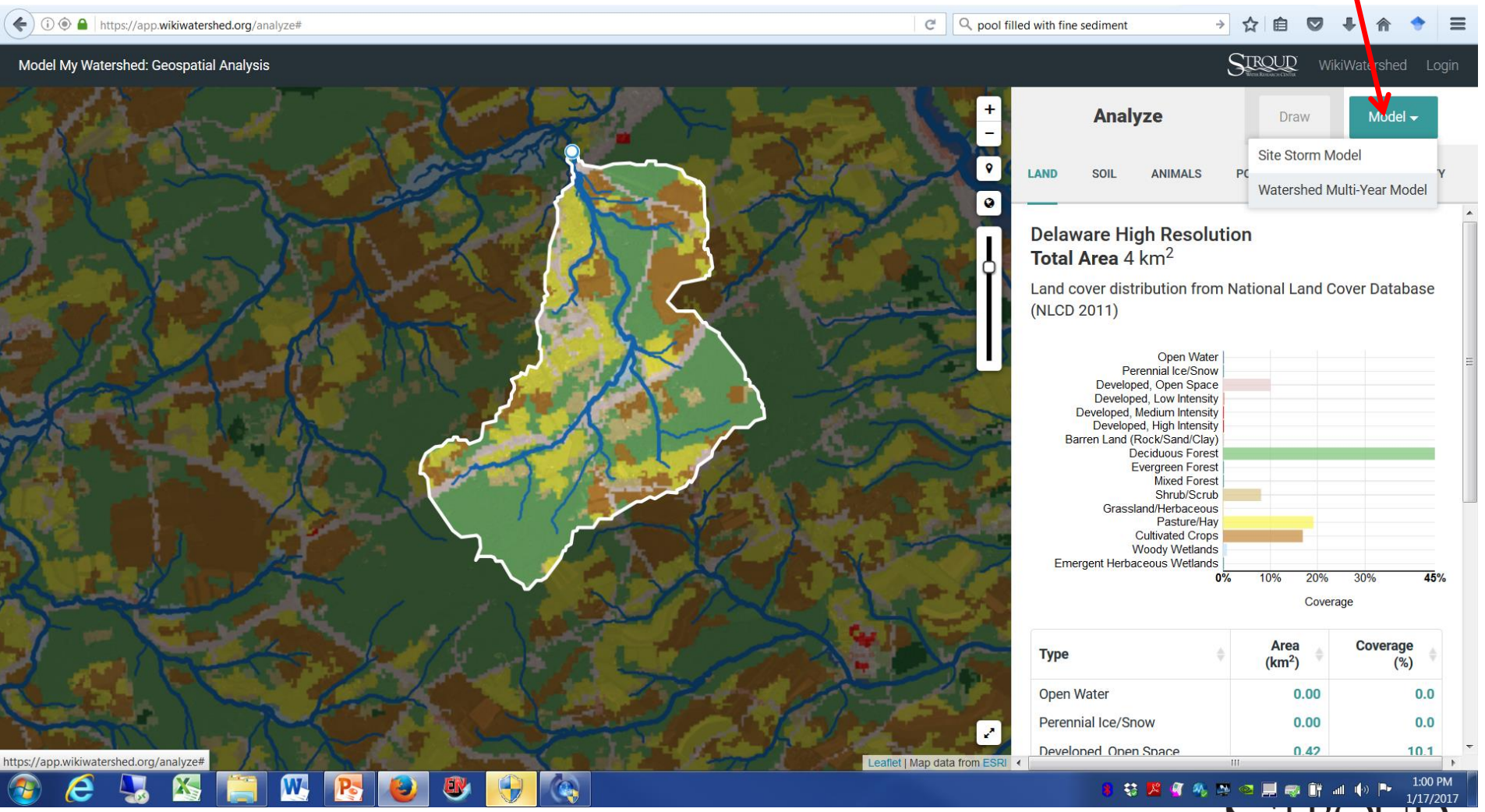
You can model the hydrology and water quality of your watershed or area using the Watershed Multi-Year Model



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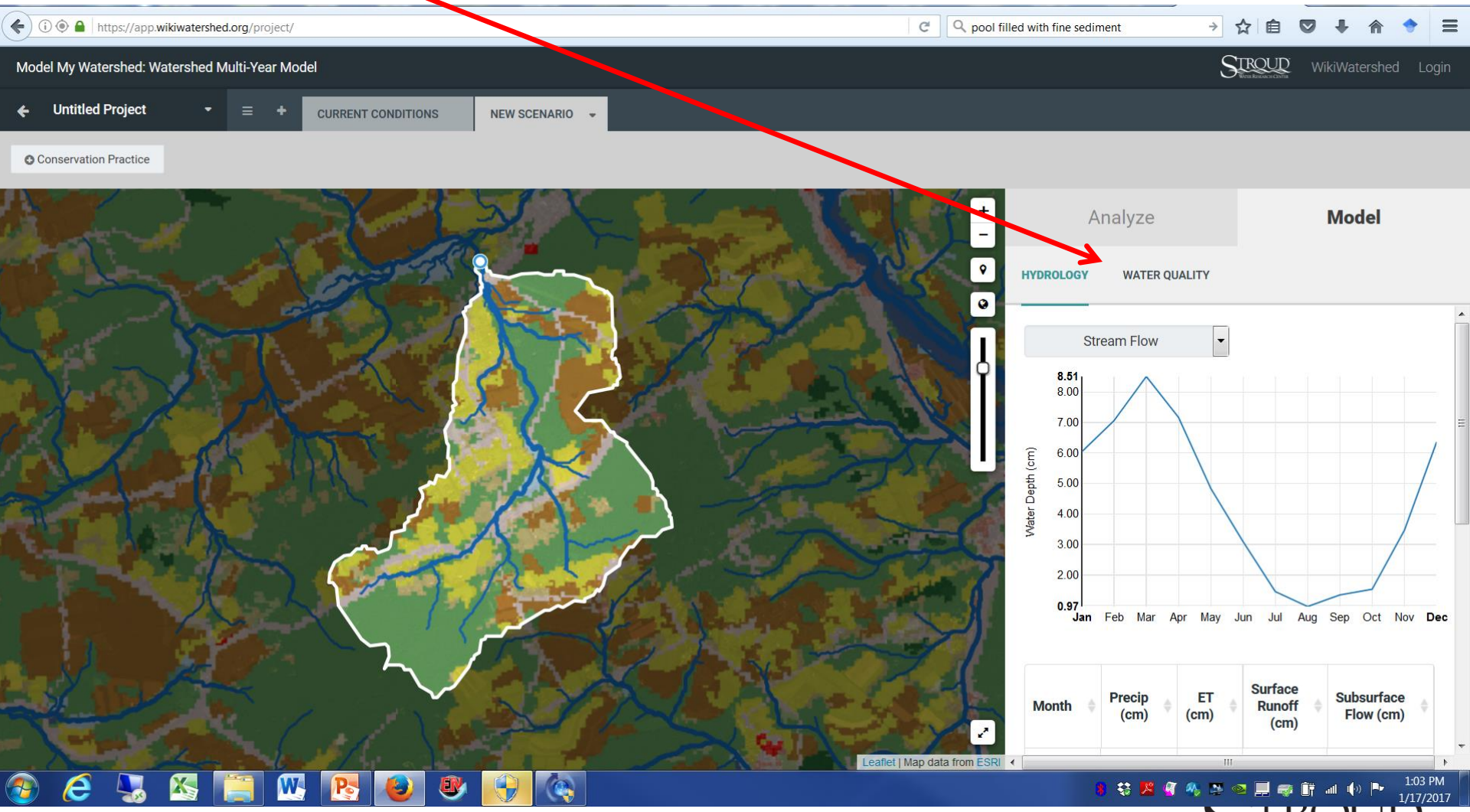
The Watershed Multi-Year Model outputs several hydrological and water quality parameters



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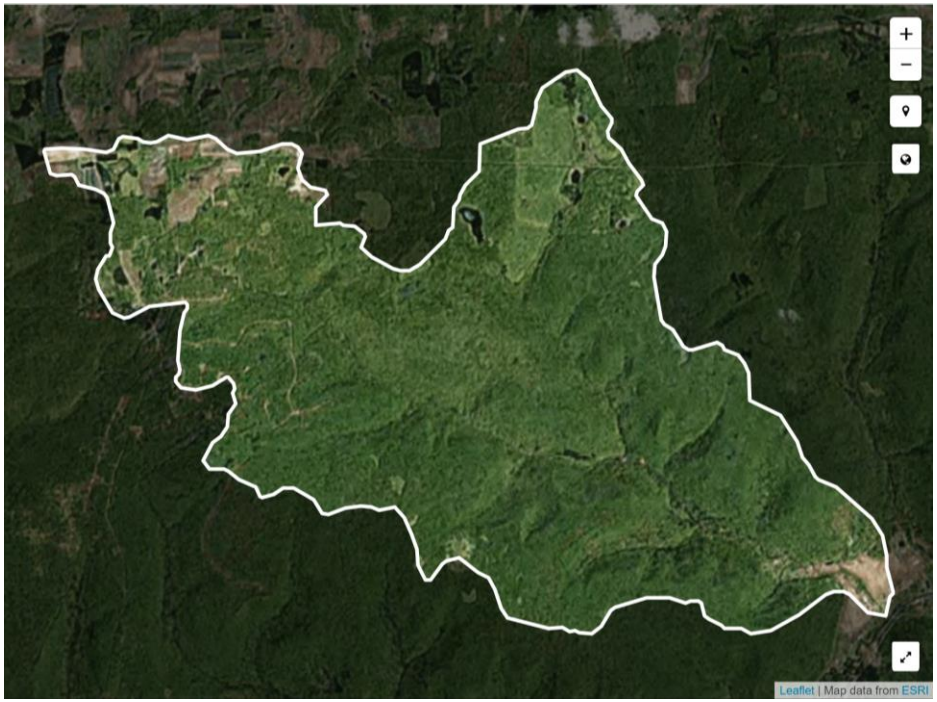
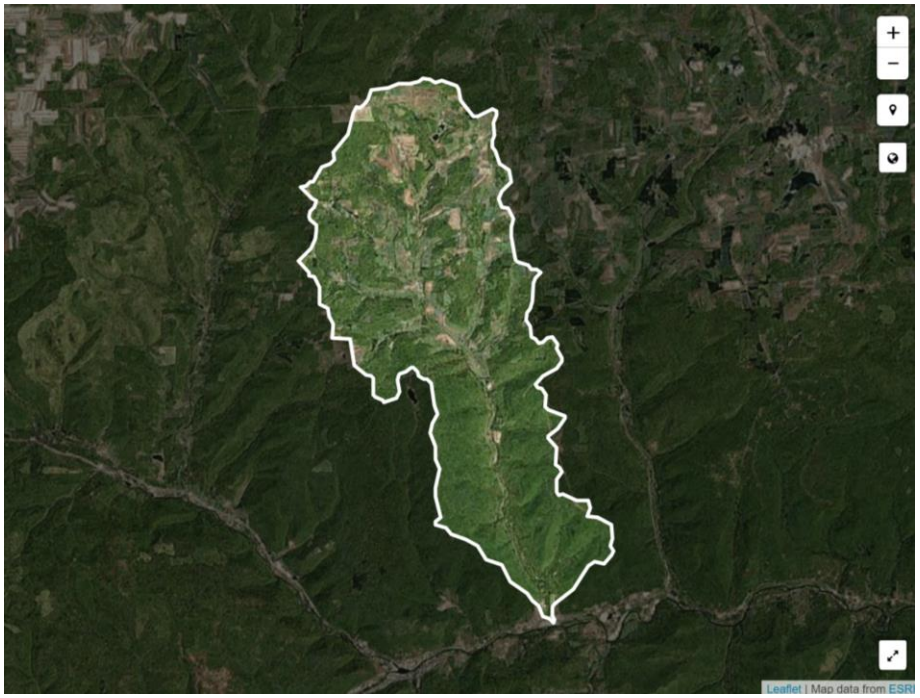
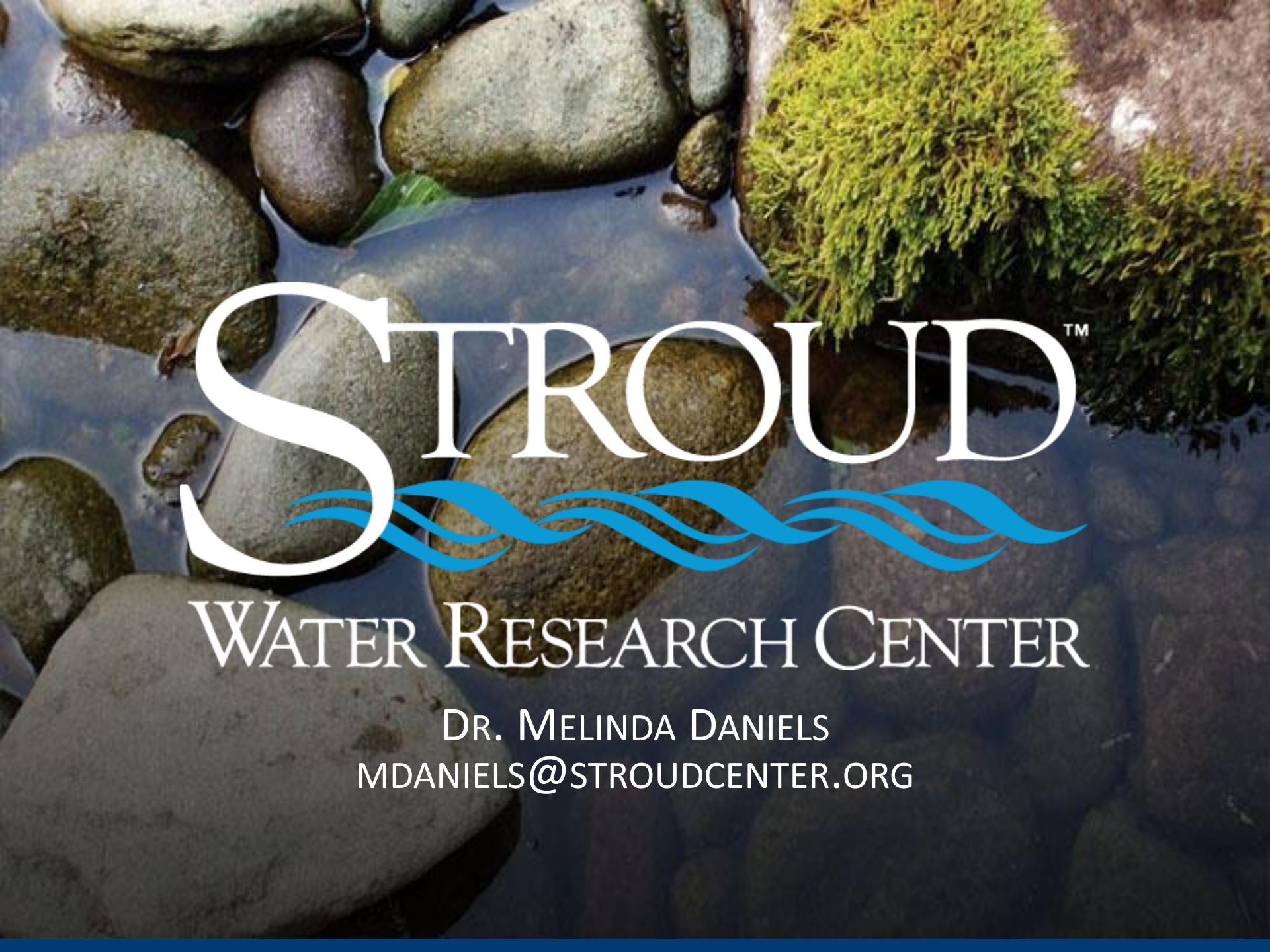




Sources	Sediment	Total Nitrogen	Total Phosphorus
Total Loads (kg)	237,247.9	9,611.9	846.6
Loading Rates (kg/ha)	55.09	2.23	0.20
Mean Annual Concentration (mg/l)	10.40	0.42	0.04
Mean Low-Flow Concentration (mg/l)	29.80	0.77	0.13

Sources	Sediment	Total Nitrogen	Total Phosphorus
Total Loads (kg)	899,103.2	13,439.0	1,486.1
Loading Rates (kg/ha)	152.92	2.29	0.25
Mean Annual Concentration (mg/l)	29.74	0.44	0.05
Mean Low-Flow Concentration (mg/l)	101.35	0.80	0.15



DR. MELINDA DANIELS
MDANIELS@STROUDCENTER.ORG