



Mad River Stream Order and Particle Size Correlations



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Introduction

The purpose of this study was to gain a better understanding of the relationship between soil grain size distribution and stream order within the Mad River watershed of Vermont. It was hypothesized that there would be a correlation between stream order, and soil grain size distribution that make up those stream's banks. With a vast network of various stream orders, finding a significant correlation with soil particle size could increase the accuracy of erosion/sediment deposition computer models.



Figure 1. Map of Mad River Watershed showing sample collection locations marked by red circles.



Figure 2. Map of Mad River Watershed showing the stream orders.

Methods/Materials

To obtain the soil samples uniform pvc pipe sections (2.5in diameter 6in length) were hammered into undisturbed soils below any vegetation roots, and dug up for collection. In the lab samples were weighed before and after drying, and then processed through a sieve analysis. In total 60 samples were obtained at 20 different locations throughout the mad river watershed. At each location, three samples were taken within 3-5 ft of each other and the global locations were found by recording their coordinates with a Garmin g.p.s.

Results

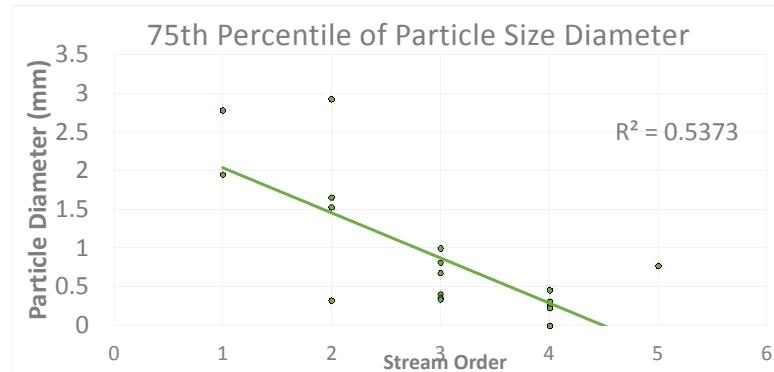


Figure 3. Graph of the 75th percentile particle size diameter.

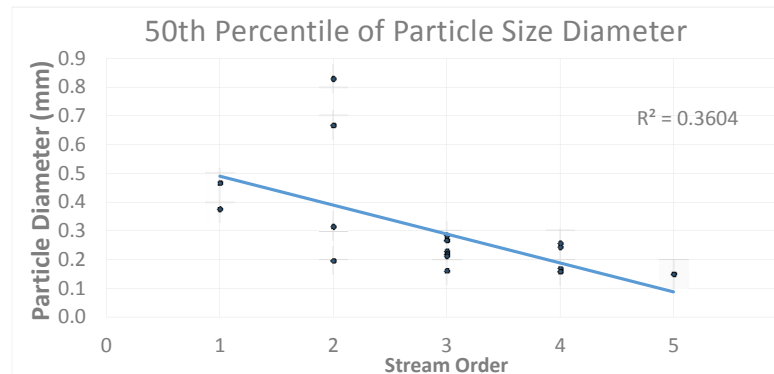


Figure 4. Graph of the 50th percentile particle size diameter.

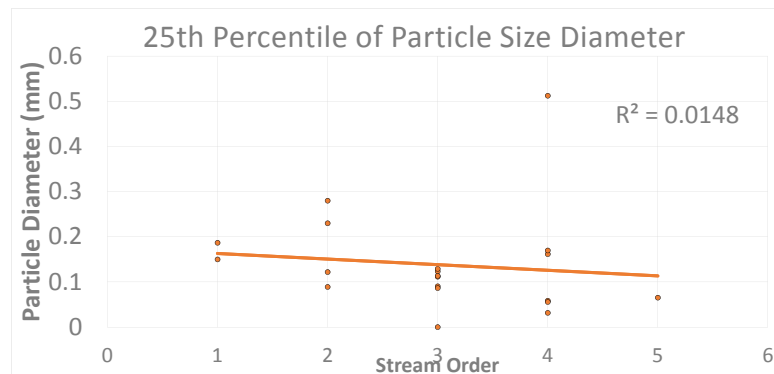


Figure 5. Graph of the 25th percentile particle size diameter.

Discussions/Conclusions

The results of this study support the initial hypothesis. For the 75th percentile of particle size diameter, there was a significant correlation of -0.733 ($R^2=0.5373$) with the respective sample's stream order. As well as a -0.640 correlation ($R^2=0.3604$) with the 50th percentile, but only a -0.122 correlation ($R^2=0.0148$) with the 25th. The significant correlation of the increasing diameter size is most likely a result of the effects of down stream fining. This new information can be used to better understand the effects of sediments seen in the watershed along with predicting their behavior in future storm events.



References

- Leidinger, S. (2015). Strahler orders of streams in Mad River Watershed.
- Gasparini, N., Tucker, G., & Bras, R. (1999, December). Downstream fining through selective particle sorting. Department of Civil and Environmental Engineering, Massachusetts Institute of Technology, Cambridge, Massachusetts www.tulane.edu/.



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