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DEPARTMENTS

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RESEARCH

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YOUR FORUM TO REACT TO PUBLISHED ARTICLES, TO EXCHANGE IDEAS, AND DESCRIBE INNOVATIVE APPROACHES TO CONSERVATION INCLUDING LEGISLATION

The need for quantifying the effectiveness of BMPs

Sediment is the number one pollutant of U.S. water resources. Millions of tons are lost annually, yet no one knows the effectiveness of best management practice (BMP) sediment retention devices! In fact, there are no quantitative design/specification formulas for any sediment control BMP.

Additionally, and tragically, billions of dollars are spent every year on sediment retention devices without knowing whether a device is effective at all, or why it fails. Marketing claims touting highly effective products abound, but there is no means for specifiers to verify those claims, nor any standardized means to evaluate new or old products. This unknowing atmosphere consequently leads to millions of tons of sediment runoff into our water resources.

A standard testing protocol has been developed, tested for efficacy, and submitted to ASTM. Funding is the problem! It is the public's responsibility to test and rate these devices for effectiveness with an independent third party. Yet no one is stepping up, and everyone is looking at someone else. Please help us find a way to fund this extremely valuable research project.

— Thomas Carpenter, CPESC
Carpenter Erosion Control, Ankeny, Iowa

Readers are invited to express their views on land and water management.

Please make your letter less than 150 words. Letters may be edited for length and clarity.

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— Deb Happe, editor

Discussion of, "Automated erosion wheel: A new measuring devise for field erosion plots" (Klik et. al) *Journal of Soil and Water Conservation* 59(3): 116-121.

The measuring device presented by the authors is interesting. However, we would like to know more about it. The presentation is unclear and the evaluation might be improved/clarified with additional graphs and explanation. With the material presented, we would hesitate attempting to build a prototype for confident deployment in a field application.

Following are some recommendations to improve clarity:

The word "wheel" is confusing because it is not obvious where a wheel is incorporated in the design. The origin of the sampler name needs to be explained.

The sampler operation is not clear from the text and figures.

The authors state the automated erosion wheel is built for plots up 60m-square. We wonder if the authors evaluated other plot sizes and flow rates?

Tipping buckets have been widely used to measure precipitation. It seems to us that some calibration may be needed because the volume held by the bucket will decrease as flow rate increases due to splashing at rapid tip rates. It is not clear whether any calibration was performed and what the flow-rate limitations might be. At large flow rates, the tipping-bucket mechanism can become overwhelmed with water and tip rates can decrease, making calibration multivalued.

Runoff rates in Figure 4 are not as smooth as one might expect. Is this typical of the output of your device? Perhaps some smoothing is necessary when processing the data, however, smoothing can incorporate errors in the computed runoff rates.

What is the sensitivity (resolution) for the equipment to record small flows? Measuring the time of the start of hydrograph with a tipping bucket is uncertain because the first measurement is a tip and water will have taken time to accumulate in the bucket. The same applies for the end of an event.

The sediment load in the flow most likely affects the calibration because sediment can accumulate in the buckets and either remain there because they may not drain completely (especially at fast tip rates), they may add weight to the bucket and the bucket tips sooner than it would with clear water, or they may tip late (with possible overflow) if the deposited sediment weight on the opposite bucket must be overcome. We cannot assess if this was a problem in your field or laboratory setup and what the limitations of sediment concentration and load are if the device is to function properly?

Do you have any data-based guidelines on limiting particle sizes of sediments that can be sampled?

Continued on page 8A.

Continued from page 7A.

Your paper indicates (page 119) that "…….during the highest 5-minute intensity, I_{5min}= 61.2 mm h^{-1}, runoff rates of 63 mm h^{-1} were measured indicating no infiltration into the soil." This might also be interpreted to mean that the sampling accuracy is questionable if the runoff rate is greater than the precipitation rate producing runoff.

Sampler performance might be better evaluated with some additional graphs. Some suggestions are:

Plot sampler fraction (Y) versus flow rate (X). This might show that for all flow rates that the sampler works well (or there is a limitation). Flow rate can be constant as in a laboratory or it can be the mean flow for an unsteady hydrograph. Such a graph might be helpful to expose sampler limitations.

For unsteady hydrographs, a plot of sampler fraction versus time (days) can help expose changes in sampler performance and identify factors that might affect performance.

A plot of sample volume (Y) versus runoff volume (X) would help show the proper functioning of the sampler. If a point plotted significantly off a regression line, then there is a possible problem with the sampler, and you might identify factors affecting performance. It appears that some of graphs (such as Figure 8) might document good performance, but such graphs would highlight limitations and provide implementation guidance to a reader.

Tipping buckets have been used for years to measure precipitation. The first use of such a device for measuring flow rates that we are aware of was at Coshocton, Ohio (Bentz and Amerman, 1968).

The value of the automated erosion wheel sampler might be enhanced if the material sampled had a greater particle size range. For example in semiarid streams, particles are often > 5mm in size. Can the wheel described be used for large particles? With additional clarifying information, the reader might be able to understand how the new sampler might be superior to existing samplers like the Coshocton wheel (Bonta, 2002), the drop-box weir with diverter sampler for large rock particles (Bonta, 1999), the multi-slot divisor (Barnes and Frevert, 1954; 1956; Replogle and El-Swaify, 1985), or the traversing slot flume/sampler (Dendy, 1973; Smith et al., 1981; Renard et al., 1986).

In summary, development and testing of measuring devices is important for erosion and sedimentation research progress. With additional detail, the automated erosion wheel might be further evaluated and improved.

— *Kenneth G. Renard and James V. Bonta U.S. Department of Agriculture – Agricultural Research Service, Southwest Watershed Research Center, Tucson, Arizona*

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