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SUSTAINABLE TECHNOLOGIES

TechLink Research Summary #3317

Performance of Sediment Control Barriers on Construction Sites

Want to know which new sediment control barrier removes more sediment? Trying to decide which type of technology works better for removing suspended solids? Need to choose a sediment control barrier for your construction site or storm water pollution prevention plan where suspended solids may be an issue?

It is estimated that the national cost to society due to sedimentation of eroded soil is over $17 billion per year. As states begin to revise their erosion and sediment control and/or storm water management manuals to reflect new information and technology on best management practices (BMPs), many are requiring that erosion and sediment control practices meet a minimum performance standard. However, there is very little performance data in the research literature, despite a call for this information by environmental regulators and design professionals and the approval and inclusion of these new BMPs into state manuals. As an example, the effect from failing BMPs may generate a domino effect when accumulated sediment rinses out from behind a device after initial accumulation. This sudden surge of sediment previously held by the device has profound negative impacts on the environment and is rarely calculated. Additionally, 303d listed receiving waters/ watersheds under TMDL designation for sediment may require better performing sediment control management practices.

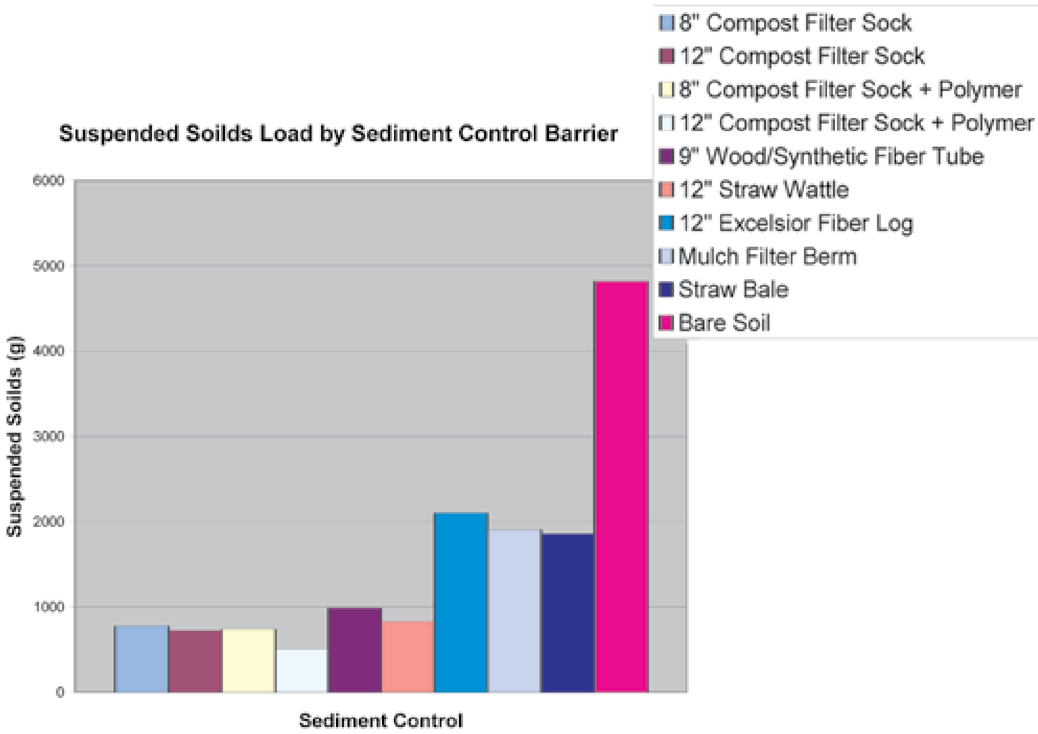
Silt Fence Failure: Accumulated sediment released in a mass failure

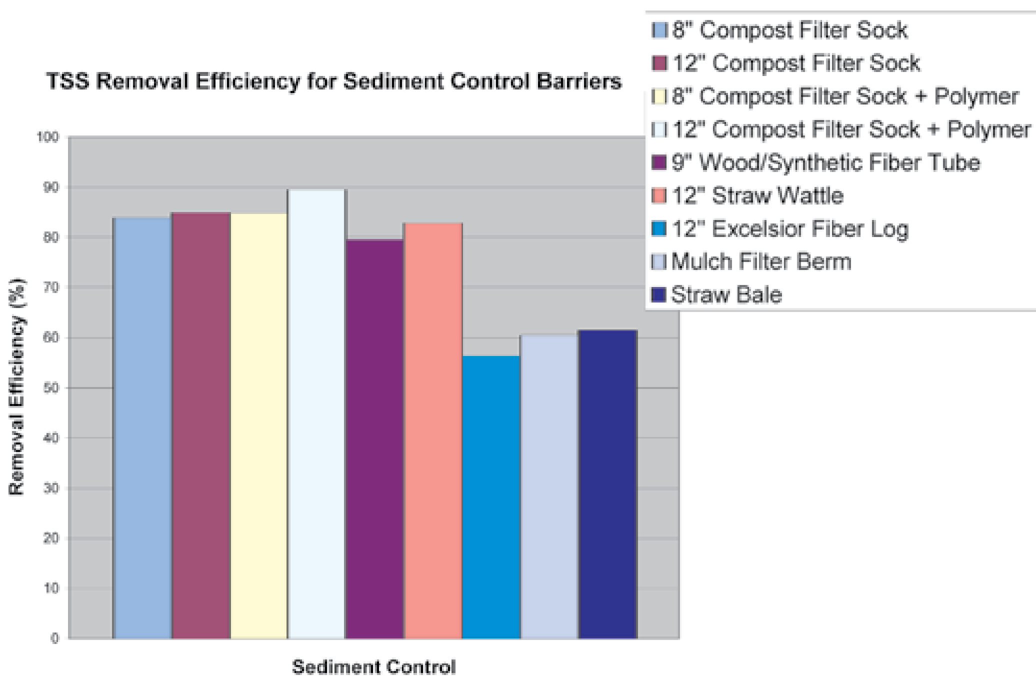
Rainfall simulation (Norton Rainfall Simulator with 4 variable speed V-jet oscillating nozzles obtained from the USDA ARS National Soil Erosion Research Lab) was used to produce a standard storm intensity of 12.5 cm (5.0 in) h-1 for a duration of 3 hrs and total rainfall of 37.5 cm (15.0 in). This is greater than the 1-hour storm event for a 100-year return and similar to a 24-hr 10-yr return for North Georgia. Site soil was classified as an eroded Pacolet Clay Loam to Sandy Clay Loam and has a soil erodibility factor (K value) of approximately 0.36. The testing area was cleared of vegetation and graded to a 10% slope exposing the subsoil (B horizon) to simulate construction site conditions without soil stabilization or erosion control best management practices.

"Our Soxx™ Don't Fall Down": Accumulated sediment doesn't release; no mass failure

Nine sediment control barriers were installed across the entire base-width of individual test plots. The control (bare soil) received no sediment control barrier. All treatments and the control were replicated in triplicate for a total of 30 test plots. Runoff sampling procedures and calculation methods followed procedures used for the Water Erosion Prediction Project (WEPP) developed by the USDA National Soil Erosion Research Lab. Total suspended solids were determined following methodology outlined by the US EPA.

Runoff total suspended solids load and removal efficiencies were evaluated for all sediment control treatments. The mean TSS load for bare soil for the 3 hr rainfall-runoff event 4819.2 g. Runoff suspended solids accounted for 70% of the total solids in the runoff. Typically, suspended solids are more difficult to remove from storm water runoff than the non-suspended solids fraction. Historically, sediment ponds and traps have been used to remove fine suspended solids instead of sediment control barriers such as silt fence. Mean TSS concentrations from the sediment control barriers ranged from 718.3 to 2264.0 mg/l, and TSS loads ranged from 506.4 to 2106.0 g. Removal efficiency for TSS load ranged from 56.3 to 89.5%. The following figures depict TSS loads and removal efficiencies for each of the sediment control barriers.





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