SILT FENCE EFFECTIVENESS

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Sediment is the number one pollutant in Dog River. Seventy percent of the sediment in our waterways in the U.S. comes from construction sites. The most common form of sediment barriers used on construction sites is the silt fence. Silt fences are suppose to allow water to pass through, but filter out sediments greater than 595 microns in diameter. I tested the effectiveness of silt fences by pouring one cup of structural fill, from an active construction site, over a sheet of silt fence. After shaking gently and slowly, any sediment that was able to pass through the silt fence was caught in a pan beneath it. I conducted one trial with five runs. Each run was measured before and after testing the silt fence. The sediment gathered was run through U.S. Standard Sieves to determine grain sizes. Once completed, I calculated the amount of sediment that was held back by the silt fences and I conclude that 85% of sediment greater than 595 microns was filtered out, proving that by EPA regulations, when properly installed and maintained are effective.

Keywords: silt fence, sediment pollution, sediment barrier

Introduction

Dog River Watershed drains about 90 square miles of Mobile City and Mobile County. Seventy percent of the watershed is the city of Mobile and thirty percent of the watershed is Mobile County. The largest form of pollution in the watershed is non-point source pollution which includes litter and sediment caught in stormwater runoff. Stormwater runoff is when it rains and any water not absorbed by the atmosphere, soil, trees, and grasses, runs into nearby storm drains and water bodies. Sediment, from stormwater runoff, is the leading source of pollution in Dog River and in the United States. Over 80 million tons of sediment are washed from construction sites into surface water bodies every year in the United States (D.R.C.R. 2009, Zech et al, 2009). Construction companies bring in structural fill to fill in voids or trenches that were created. It is also common to backfill the area immediately around the foundation of a building or as needed to create a smooth site for the construction of the building.

With large, open areas of bare soil it is easy for the sediment to be washed away. When sediment is being washed away, it can hold onto small particles of other types of pollution. When large amounts of sediment are deposited in water bodies it degrades the quality of water for drinking, recreation, wildlife and the land surrounding the water. Sediment collected in catch basins, streams, and storm drains can increase the potential of flooding (EPA 2007).

When sediment is washed into water ways, most sands will settle out quickly; however, silt and clay will stay suspended for a much longer length of time, causing the water to become very turbid. Turbidity is a term that is used to describe the cloudiness or murkiness of water. Turbidity that is caused by clay particles, causes the water to become very cloudy, making it hard for animals to be able to see food in the water and for natural vegetation to grow, which will destroy and kill even the smallest organisms that live there. Turbid water can cause massive declines of fish populations by clogging the gills of fish, suffocating them. It will reduce their resistance to diseases, lower growth rates and affect their egg and larvae development (Hargreaves, 1999;MARC 2008). These are only a few of the ecological problems that sediment pollution can create and silt fences can help to eliminate.

Silt fences are the most often chosen form of erosion control (SWCC 2009). Silt fences are not meant to control all types of sediment runoff and need to be properly installed and maintained in order to control what they can. The EPA has set guidelines to follow when installing silt fences. To install a silt fence, it must be trenched into the soil six inches wide by six inches deep. The bottom of the fence should be curled upward to help contain runoff. Metal or wooden posts need to be attached to the silt fence and

spaced six to eight feet apart, as seen in Figure 1. Improper installation and maintenance leads to undercutting, overlapping, or collapsing of the fence. Silt fences are not to be used across slopes, streams, drainage ditches or any other areas that have a concentrated flow of water (ASWCC, 2009; Risse, 2008). When sediment reaches half the height of the silt fence it needs to be cleared.

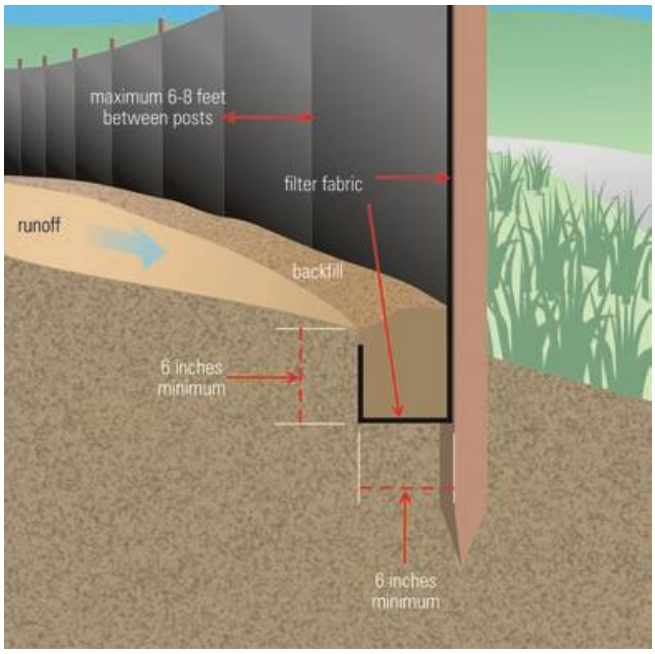

Figure 1; Proper Installation of a Silt Fence
http://www.epa.gov/npdes/pubs/sw_swppp_guide.pdf

The EPA requires that the fence be replaced whenever it becomes damaged. The fences need to be inspected daily and after every rainfall. The general lifespan of a silt fence is five to eight months (Sediment Control, 2003). Silt fences are to be left in place and monitored by the contractor until the land has become stabilized.

Research Question

Is a silt fence effective? How much and what size sediments are able to pass through a silt fence? The EPA has reported varying levels of the success of sediment removal by silt fences. My hypothesis is that the silt fences will be as effective as the EPA states it should be.

Methods

Using a piece of type C silt fencing, I tested its effectiveness as so stated in the guidelines set forth by the EPA. After attaching the silt fence to a pail, I measure one cup

of dry sediment taken from an active construction site located in Tillman's Corner of the Dog River Watershed as seen in Figure 2. After weighing the sediment, I poured it into a set of U.S. Standard sieves and placed them into an agitator for five minutes. Once finished, I weighed the sediment taken from each sieve. This information gave me the starting weight and grain sizes that are found in my sediment samples. I completed one trial with five runs. I began by measuring one cup of dry sediment and pouring it over the silt fence. Beneath the silt fence was an empty pan to catch the dry sediment that could pass through the fence. I gently and slowly shook the pan and silt fence to help the dry sediment to pass through. Once no more sediment would fall into the pan, I placed all sediment that was in the pan into a plastic bag. I also collected all sediment that did not pass through the silt fence. Once all five runs were completed, I took the labeled sediment samples to the Sediment Lab at the University of South Alabama. I weighed each sample individually and poured them into the sieves. The sieves then went into the agitator for ten minutes. Once finished, I weighed the sediment collected in each sieve. Once all samples were run, I calculated the percent weight retained for each grain size.

Figure 2; Dog River Watershed
www.dogriver.org

Results

Type C silt fence has an apparent opening size equal to that of the U.S. Standard Sieve number 30, which is 595 microns. According to the silt fence manufacturers, any sediments larger than 595 microns are supposed to be stopped by the silt fence. To reach my results, I divided the total weight of sediments greater than 595 microns that were held back by the fence, by the total weight of all sediments in the sample greater than 595 microns. Averaging the totals of all five runs, the results were that 85% of sediments larger than 595 microns were held back by the silt fence, as seen in Figure 3. An average of 2% by weight of the sediment that passed through the silt fence was silt and clay.

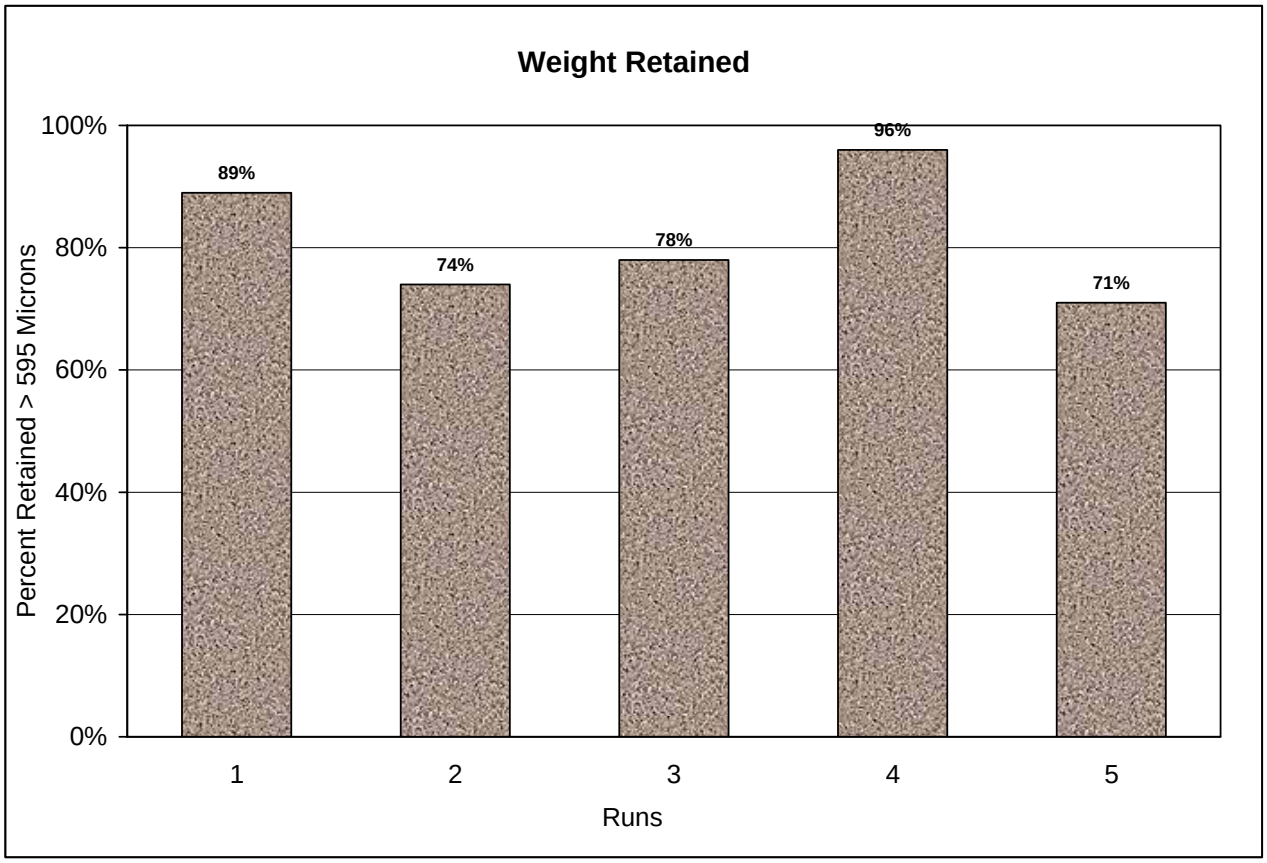

Figure 3

Conclusion

Stormwater runoff is causing sediment pollution in Dog River (D.R.C.R., 2009). This sediment pollution is not a direct result of the failure of properly installed silt fences. When properly installed and maintained, silt fences are very effective. My results show that 85.4% of sediment grain sizes larger then 595 microns were held back by the silt fence. Silt fences are made to hold back sediment larger than 595 microns and the EPA states that when tested, silt fences should retain 85% of sediments larger than 595 microns. My results show that silt fences are effective when properly installed and maintained. If the silt fence is ineffective it may be because the fence was not properly installed, it was not inspected daily and after rainfalls, or because the damaged fences were not repaired. Construction work strips the land bare, and without any vegetation to catch the runoff, any exposed sediment or structural fill is washed into the storm drains, creeks, lakes, and rivers that all lead to Dog River. Once the sediment is in the water it can destroy wildlife, cause economic problems for humans and interfere with, or even stop, water recreational activities. Many ecological problems are caused by the amount of turbidity that sediment runoff, mostly by clay, causes. It is important that citizens of the Dog River Watershed be watchful of construction sites that are using silt fences that are torn or falling down. If sites such as these are seen and reported, we can help to make the Dog River Watershed cleaner and safer for all of us. An additional experiment could include testing how effective the fence is after multiple runs by documenting how long it takes for the fence to become worn and less effective than when the testing began. Another test could be to rerun this experiment with wet sediment.

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