American Excelsior Company®

Sustainably Sourced Curlex® & Recyclex® Products Tackle Residential Erosion Issues

Case Study – Residential Erosion and Sediment Control

Introduction

A multitude of factors made a newly-constructed subdivision highly susceptible to erosion and sediment control issues.

First, according to the NRCS Web Soil Survey, the subdivision's two predominant soil groups are classified as "high" in terms of runoff class, meaning any rainfall event the area encounters can easily produce surface runoff. Both soil groups consist of roughly 10" thick layers of stony fine sandy loam underlain by over 20" of clay and bedrock. Once the top 10" become saturated, water cannot easily infiltrate the clay layer, making the soil highly erodible.

Second, most of the existing vegetation was cleared during the site leveling process. The new vegetation had a difficult time establishing itself because of a 100-year drought in the region. Without vegetation, the soil was left with little protection against erosion.

Third, rain patterns in the area generally consist of very dry stretches with occasional 1" to 4" downpours. Therefore, there is often not enough time for precipitation to infiltrate the surface soil layers before becoming runoff.

Figure 1: Sediment and standing water in the driveway after the 0.5" rain event.

Each of these factors contributed to the issues plaguing one of the homeowners in the subdivision. One year, during a 27-day stretch in mid-spring, their property received only 0.12" of total rainfall. They had nearly 0.5" the next day. Sparse vegetative cover across their yard did little to keep the soil in place after this rain event (see Figure 1), so approximately 3" of mud accumulated over a 20' x 20' area of their concrete driveway. The event also severely damaged what remained of the property's original sod.

Introduction (contd.)

- Approximately 1.5 weeks after the 0.5” event, the property encountered a total of 4” of rain within a 9-day stretch. Mud accumulation on the driveway reached 4” deep during this time (see Figure 2).

These precipitation events also caused a drainage channel along the edge of the property’s tree line (right-hand corner of Figure 2) to increase in both width and depth. This channel drains via nearby tributaries into a creek and then into a river, which runs approximately one mile from the property. By mid-June, the channel’s bottom was mostly exposed bedrock and was producing high-velocity flow during rain events, wiping out adjacent sod in the process.

Figure 2: View of the homeowner’s driveway and yard after a 9-day stretch of rain. The remnant vegetation and the lack of erosion/sediment control measures caused multiple gullies to form on the slope leading to the drainage channel in addition to mud accumulation on the driveway.

Project Scope

- The homeowner stated that they “did not want to shovel a cubic yard of dirt and power wash their entire driveway every time it rained.” To prevent future issues, the homeowner needed to identify the appropriate best management practices (BMPs) to mitigate further erosion, encourage new vegetation growth, and protect precious water resources near the property.

The Plan

The homeowner's first objective was to stop the flow of sediment from repeatedly accumulating on their driveway. Curlex® Sediment Log® (see Figure 3), manufactured by American Excelsior Company®, was selected as the first line of defense.

Curlex Sediment Logs are flexible filtering stormwater and sediment control BMPs comprised of engineered curled and barbed Curlex® fibers (from Great Lakes aspen trees) within a degradable containment material. Their porous nature allows water to filter through, not underneath, the diameter of the interlocked Curlex fiber matrix. As it does, velocity is naturally reduced, and sediment is collected on the upslope side of the Sediment Log as well as within the fiber matrix. The driveway's perimeter was lined with Sediment Logs in a U-shaped fashion to filter any runoff from the sparsely vegetated areas.

Figure 3: Example of a Curlex Sediment Log application with sediment trapped on its upslope side.

Without proper cover, the drainage channel along the edge of the property would continue to erode, encroaching further into the yard, destroying existing sod, and releasing additional sediment into nearby tributaries. Recyclex® TRM-V (see Figure 4), a turf reinforcement mat (TRM) manufactured by American Excelsior Company, was selected to line the channel.

Recyclex TRM-V features Recyclex®, 100% post-consumer recycled poly fibers, stitched together between two strong layers of UV resistant poly netting. 80% of the Recyclex fibers in Recyclex TRM-V are 5" or greater in length, and all are tightly crimped and curled to allow the fibers to interlock. Crimping allows the fibers to conform to terrain details and train water to follow the fiber matrix, slowing flow velocity in the process. Further, Recyclex fibers have a specific gravity greater than 1.0, meaning they will not float during hydraulic events. Keeping TRMs close to the subgrade results in less erosion.

Figure 4: Close-up of a vegetated Recyclex TRM-V installation.

Executing the Plan

The drainage channel (see Figure 5) was lined with Recyclex TRM-V (see Figure 6); both the slope and driveway were lined with Curlex Sediment Logs (see Figure 7).

Figure 5: The drainage channel before the installation of Recyclex TRM-V.

Figure 6: Completed Recyclex TRM-V installation in the drainage channel.

Figure 7: Sediment Logs lining the areas above the driveway.

Unforeseen Challenges

The property encountered no measurable precipitation for 70 days after the precipitation events causing sedimentation on the driveway. The following day, it encountered 0.8” of rain in 1 hour (see Figure 8).

The drainage channel filled slowly and only began to overflow near the end of this event. The Recyclex TRM-V protected the channel and helped slow the water, allowing it to infiltrate into the soil and preventing the channel from encroaching further into the adjacent sod. The Sediment Log installation also kept the driveway nearly free of sediment-laden runoff; the only instance of sediment getting past the Logs came from an installation oversight.

Figure 8: View from inside the homeowner’s house during the cloudburst.

Key Takeaways

At least one wooden stake should be driven through the netting when two Sediment Logs are adjoined according to the Sediment Log Installation guidelines on www.curlex.com to provide stability during heavy ponding events. Visuals from Sediment Log CAD details (also on www.curlex.com) regarding joint types are shown in Figure 9; the common abutment joint is shown on the left, and the optional overlapping joint is on the right. These installation methods were followed after the minor oversight at the seam between the Sediment Logs early on during this project.

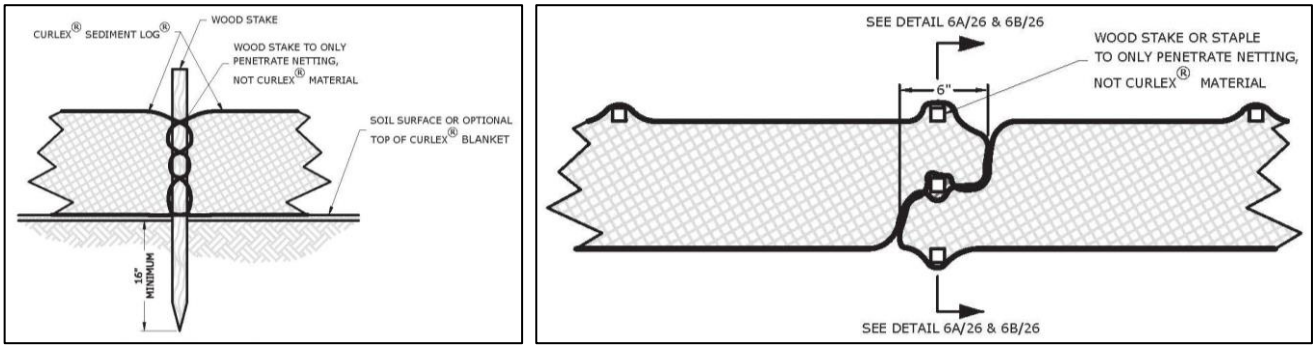

Figure 9: Curlex Sediment Log Perimeter Control Part 2 CAD details (“front view” on the left, “plan view” on right).

The New Plan

To aid in protecting and revegetating the homeowner's property, Curlex® I QuickGRASS® erosion control blankets (ECBs) were installed on the higher velocity flow areas surrounding the driveway, on the previously sodded areas adjacent to the drainage channel (see Figure 10), and underneath some of the Sediment Logs (see Figure 11).

Curlex I QuickGRASS ECBs feature the same Curlex fibers found in Sediment Logs; the only difference is that the Curlex I QuickGRASS's fibers are colored green to present a clean, finished look until vegetation is established. In ECB form, the Curlex fibers train water flow to follow the interlocking fiber matrix upon contact, slowing water flow velocity and breaking up rainfall impact. Gravity takes over once the water flow slows, leading to increased infiltration compared to other commonly used natural erosion control fibers.

Figure 10: Curlex I QuickGRASS installed to revegetate the previously sodded areas.

Curlex fibers are also hygroscopic, meaning they attract and hold water molecules from the surrounding environment. This causes them to expand when wet, allowing them to "cling" to the underlying soil and create a "greenhouse effect" for the seed bed. The absorbed moisture is returned to the soil during dry conditions, which further nurtures seeds and promotes revegetation.

The final step for the new plan was to remediate the Sediment Log installation oversight by following the instructions shown in Figure 9. Additional Sediment Logs were also installed above the blankets on the slope leading to the drainage channel.

Figure 11: Curlex I QuickGRASS installed underneath the existing Sediment Logs close to the property's runoff ditch.

Results

By December, vegetation had taken root in the drainage channel and was growing in and around the Curlex I QuickGRASS (see Figure 12). According to the homeowner, this amount of vegetation growth had not occurred before.

Several precipitation events tested the effectiveness of the new erosion control solution in the months following the Curlex ECB and additional Sediment Log installations. During a mid-December rain event of 0.64" over 2 hours, even though the rain could not infiltrate quickly enough to avoid becoming surface runoff, no sedimentation occurred on the driveway (see Figure 13).

Figure 12: Vegetation emerging through the Curlex I QuickGRASS.

Figure 13: The aftermath of the mid-December rain event at the property shows a sediment-free driveway due to the successful Curlex ECB, Curlex Sediment Log, and Recyclex TRM-V solution.

Next Steps

The homeowner will periodically mow the new vegetation, and the Sediment Logs will be removed after sufficient vegetation is established at the property or replaced if they fill up with retained sediment before then.

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