VEGETATIVE SIDE INLETS TO CONTROL RIPARIAN ZONE GULLIES

S. M. Dabney and F. D. Shields, Jr.*

Riparian zones adjacent to incising streams are often dissected by permanent gullies that increase watershed sediment yield, degrade stream habitats, and adversely impact adjacent floodplain land uses. Current practice for gully control involves blocking the gully with an early embankment and installing plastic, metal, or concrete drainage structures. Less costly measures involving native vegetation would be more attractive for habitat recovery and economic reasons. Grass hedges are narrow strips of dense, erect, thick-stemmed grass that can act as checkdams to slow and pond concentrated runoff. To test the hypothesis that grass hedges planted every 0.5 m vertically within a gully would stop gully erosion, in 2000 we established a series of switchgrass (Panicum virgatum L.) hedges in six riparian gullies at field margins adjacent to Little Topashaw Creek, Mississippi. We gauged the runoff through some of these channels and monitored resulting damage. During February 2002, we tested the stability of one hedge-lined gully ~ 10 m by 3 m deep in sandy, highly erodible soil by pumping creek water to create artificial runoff events with trapezoidal-shaped hydrographs with peak discharge rates of 0.042, 0.061, 0.065 and 0.126 $m^3 s^{-1}$ that produced specific discharge rates similar to those measured during natural runoff events. Flow depths were generally < 0.25 m and flow velocities were generally < 0.8 $m s^{-1}$. During thepumped flow tests we also monitored soil water potential at five depths below the gully bed and turbidity of the water at two points within the gully. Upstream and downstream (within gully) turbidity records for each hydrograph showed that after an initial, brief period of sediment flushing, erosion rates were low for parts of the gully where a vertical interval <0.5 m between hedges was maintained. Thalweg profiles surveyed after each hydrograph also showed only very slight erosion where grass lines were spaced 0.5 m vertically. However, vertical banks and shifting point bars at the confluence between the gully and the creek channel prevented hedge establishment, leaving a 2-m high headcut below the last established hedge. Here soil blocks containing hedge crowns and roots eventually failed as a result **of** undercutting and mass failures. These block failures were associated with a buildup of subsurface pore water pressure. Bank stability computations indicated a factor of safety less than one at the time of the block failures. A sensitivity analysis using measured pore water and soil properties indicated that roots contributed significantly to the stability of 0.5 m steps, giving them a factor of safety greater than one. Results indicate that the hedges can stabilize gullies under the flow conditions tested where they can be established with a vertical spacing of 0.5 m, but not when the vertical interval is as great as 2m.

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* Respectively, Research Agronomist, USDA-ARS National Sedimentation Laboratory, PO Box 1157, Oxford, MS 38655-1157 (662-232-2975, Fax: 662 232 2915; E-Mail: sdabney@ars.usda.gov) and Research Hydraulic Engineer, USDA-ARS National Sedimentation Laboratory, PO Box 1157, Oxford, MS 38655-1157 (662-232-2919, Fax: 662 232 2915; E-Mail: dshields@ars.usda.gov)