ERTEC Environmental Systems

Protecting the Integrity of Global Lands and Waterways™

Case Study

Application:	Gully Stabilization
Product:	ERTEC Gully Stabilization System ™ (GSS ™)
Location:	Lake Chabot, Hayward, CA
Customer:	East Bay Regional Park District

Project description and background	• Gully Stabilization System (GSS) - installation completed August, 2004 • Gully System: 400 feet long, 100 foot drop. 25% slope. Deepest point 12 feet and growing. Caused by storm water outflow from uphill parking lot. Previously used as a missile site, abandoned by the U.S. Military, the area surrounding the Gully was acquired by the park district in 1999. The parking lot is at the highest point. The storm water outfall from the parking lot was directed over a 400 foot grassy 25% slope, towards the Lake Chabot though an 18" culvert. At the outflow point, a gully began to form several years ago and accelerated as the cutting went deeper and reached softer material. The volume of water in heavy storms approximated 20 to 40 cubic feet per minute. The steep incline, additional ground water flow into the gully, significant water volume and velocity combined to generate high erosive energy and down-cutting. Without a check-dam system to slow the flow, the water would continue down-cutting, the sides of the gully would continue to seek their new angle of repose and the gully channel would continue to widen. In addition to land loss, the process of down-cutting and subsequent slumping of the gully slopes was sending significant amounts of sediment into Lake Chabot below (as much as 30 cubic yards per year). It was expected that the gully would continue to get deeper and wider and send growing amounts of sediment into the lake, generating unwanted fill and harm to wildlife. To stop the erosion and stabilize the gully system by restoring vegetation at this site, the Park District tried a new and cost-effective approach rather than the conventional use of rock or natural check-dams, which have limited advantages.

Gully System: 400 feet long, 100 feet high

Why the project was necessary	The East Bay Regional Park District initiated this project to: 1) improve water quality in Lake Chabot; 2) stop the land loss, restore and protect park lands.

Pre-project site conditions

Economic consequences of not solving the problem	• If Gully development was left unchecked, the cost of restoration and repair would increase disproportionately. Small gullies are inexpensive to repair. Large gullies can become very difficult and expensive to stabilize. This Gully system would have continued down-cutting and widening for quite some time. Erosion resistant material is thought to be many feet below the existing gully floor.
Alternatives	• Install a slope-drain to channel storm water down the slope and into the lake. Deferred because of high cost and time constraints. • Concrete or rock structures. Eliminated because Park District sought a system that could be installed with in-house skill sets.

Nine structures ready for installation

Solution	According to proper Gully Stabilization Design principles, the 4 foot structures should be placed at 12 to 14 foot intervals on a 25% slope. By placing at these intervals, the top of the downstream structure would be level with the base of the upstream structure. This would allow water coming over the top of the upstream structure to flow into the pool created by the downstream structure, to absorb the erosive energy at the water drop and eliminate head-cutting between structures. Due to limited resources it was decided to reduce this interval by two thirds. It was understood that this method could still enable stabilization, but that some head-cutting would still occur between structures threatening structures upstream. It was decided that the system would be monitored closely and additional structures would be added on an as needed basis. The erosion-control structures selected for the project were one-foot diameter polygonal modules (Ertec Environmental Systems ™) of high-density polyethylene with internal support structures. Each module consisted of 12 4 foot modules length fastened into a mattress shape design (2' X 4' X 6'). Two sets were fastened to each other to increase structural integrity, forming a module two feet thick. To increase soil retention, a 212-micron AOS filter fabric was layered between the module walls. Using a labor crew from the Park District, trenches were dug as required for each structure. A rule of thumb for Gully Stabilization structures is to key-in the structures as follows: Depth = 25% of the height of the structure. Width – key in 25% of the Gully Width (mid-depth) on each side. Initial clearing of debris and soil excavation provided a level footing to set the modules. Geotextile was placed under the structures, to prevent piping or undermining. The modules were then butted up against each other as needed across the width of the gully (typically 2 or 3 modules wide) and anchored with steel T-Posts. As a last step, because it was readily available, crews positioned rock immediately downstream of the structures. The heavy storm season conditions of 2005 indicate the structure held up well against heavy flow and sediment load. A soil analysis was not completed but it is expected that the Gully soil could be classified as Clay or Silty-Clay loam, although varying with depth.

	Summary • 2" X 4' X 6' GSS modules. 2 or more modules installed in each check-dam – depending on width of gully. • 9 Check-dam structures • Use of park labor crews to install, 1 day with excavation equipment • Check-dam anchored and secured with 5 foot metal t-posts driven flush with top of check-dam structures • Because it is readily available, rock was placed downstream of each structure to act as a splash apron, to help remove erosive energy from the flowing water. • Geo-textile fabric was installed underneath, upstream and down stream of check-dam

Structure 4: Installation complete August 2004

Results	• After the first storm season (Winter 2004/05 had significant rainfall) – gully down-cutting has stopped • Ertec Gully Stabilization Systems remain solidly in place • Sediment to the lake significantly reduced
Customer Quotes	"We're very happy with the installation. The gully appears to have stabilized, and the sediment load to the lake has been reduced drastically. We believe this is the best way to eventually restore vegetation in the channel, and eliminate this as a concern for Park Management." **- Joe Britton, Supervisor Lake Chabot Park**
Summary	This was a successful program for the following reasons: • Low cost • Simple installation • Robust solution • Immediate reduction of erosion and land loss
Future plans:	Install additional modules where the downstream modules are at capacity, and where substantial amount of upstream sediment load from collapsing banks continues. As the banks slump and reach their angle of repose, the park will seed to encourage robust vegetation growth.


Oct 2004: Post-storm: Structures 8 and 4


Dec 2004: During storm: Structures 4 and 7


Feb 2005: Structures 3, 4 and 7

April 2005: Structure 4